Boys buying two sausages each: On the syntax and semantics of distance-distributivity
Zimmermann, M.
Boys Buying Two Sausages Each – On the Syntax and Semantics of Distance-Distributivity

investigates a number of issues at the syntax-semantics interface, among them strict compositionality, structural ambiguity, and the emergence of adverbial readings with adnominal elements.

The discussion focusses on the syntactic and semantic behaviour of distance-distributive elements such as binominal each in The boys bought two books each, and in particular on its German counterpart jeweils. At first sight, such items appear to pose a problem for strict (surface) compositionality. Throughout, it is argued that an integrated syntactic and semantic account of distance-distributive items is superior to a purely syntactic account. The analysis is therefore split in two parts. The syntactic analysis shows that distance-distributive elements are regular quantifiers in a special (DP-internal) syntactic configuration. Observable cross-linguistic differences in the syntactic distribution of distance-distributive elements are reduced to general syntactic differences between languages, and to differences in the morphosyntactic feature make-up of a distance-distributive item in a given language. The semantic analysis shows how distance-distributive items can be interpreted compositionally in their surface position. The two main results of the analysis are, first, that strict compositionality does not have to be given up for distance-distributive items, and, second, that adnominal elements systematically give rise to adverbial readings if certain well-defined structural and morphosyntactic licensing conditions are fulfilled.

This study is of relevance to anyone interested in questions pertaining to the syntax-semantics interface.
Boys Buying Two Sausages *Each*

On The Syntax And Semantics Of Distance-Distributivity
Boys Buying Two Sausages *Each*

On The Syntax And Semantics Of Distance - Distributivity

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Samenvatting (Summary in Dutch) 307
When I started my studies of German language and literature at the University of Cologne ten years ago, little did I know that I would end up writing a PhD thesis in linguistics. As a matter of fact – back then, I did not even know what linguistics was all about. Over the years, a lot of people have helped at various stages of my becoming a linguist.

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Chapter I  Syntax and Semantics

This thesis provides an analysis for a number of phenomena concerning the relation between syntax and semantics, or between the structure and the meaning of natural language expressions. In particular, the thesis attempts to provide answers to two central questions of modern day linguistics. How is the syntactic structure of a sentence translated into meaning? And what is the influence of interpretive requirements on the structure of a clause, if any? The first question touches upon the general question of ‘compositionality’, i.e. whether and how the meaning of a complex expression is derived from the meaning of its parts. The second question touches upon the general question of the ‘autonomy of syntax’ (Chomsky 1965). In the thesis, it will be argued that syntactic structure translates into meaning in compositional fashion. The meaning of a clause depends on the meaning of its parts, and the way they are combined. Furthermore, it will be argued that the meaning of a clause is derivable from its surface structure in the default case. The result of treating surface structures as appropriate inputs for semantic interpretation is that a greater part of the burden of interpretation is placed on the semantic component. The prominent role played by semantics is also highlighted by the answer that is given to the second question. It will be argued that interpretive requirements have a certain influence on the grammaticality of syntactic structures. This influence is exerted in two ways. First, the semantic component acts as a filter on the output of the syntactic component. Certain syntactically well-formed structures cannot be interpreted and are consequently ruled out as grammatical structures of a given language. Second, the semantic component is argued to have an even stronger impact on covert syntax in that at least some syntactic operations at this level must be licensed by interpretive requirements. That is, syntax is argued to be not fully autonomous, but to interact with other modules of grammar (here the conceptual-interpretive system), possibly in form of correspondence rules (Jackendoff 1997).

1 Four Puzzles

Regarding the empirical phenomena under discussion, the thesis sets out to find solutions to four puzzles that arise in connection with the German distributive element jeweils ‘each’, ‘each time’, ‘respectively’, and that have a bearing on the syntax-semantics interface. The puzzles are illustrated in (1) – (4).

The first puzzle is the ambiguity puzzle. The distributive element jeweils can occur both in adverbial (1a) and in adnominal position (1b).

(1)  a. Peter hat jeweils gewonnen.  
    Peter has each.time won  ‘Peter has won each time.’

     the boys have with each two friends talked  
     ‘The boys have talked to two friends each.’
In (1a), jeweils occupies a position typical for adverbs. In (1b), jeweils forms a constituent with a nominal expression embedded inside a prepositional phrase. This naturally raises the question if jeweils is ambiguous in meaning (as suggested by its two English counterparts), or if jeweils has the same reading in both cases, the meaning difference being due to a difference in syntactic position. In chapter IV, the second position is argued to be correct, highlighting the importance of structural factors for interpretation.

The second puzzle is the puzzle of ‘distance-distributivity’. (2a) is synonymous to (2b) even though the position of the distributive element is different. Synonymy is here understood as being true of the same situations.

(2) a. Jeder Junge hat zwei Currywürste gekauft.
    each boy has two curry sausages bought
    ‘Each boy bought two curry sausages.’

b. Die Jungen haben jeweils zwei Currywürste gekauft.
    the boys have each two curry sausages bought
    ‘The boys bought two curry sausages each.’

(2a) instantiates the regular pattern of universal quantification. The distributive element jeder ‘each’ forms a constituent with its NP-restriction Junge ‘boy’, the expression that denotes the range of quantification for jeder ‘each’. In (2b), the distributive element occurs at a distance to its NP-restriction die Jungen ‘the boys’ over the denotation of which it quantifies. It thus appears to exhibit an irregular pattern of quantification at first sight. The major part of the thesis is devoted to showing that the behaviour of adnominal jeweils is not irregular. Jeweils is analysed as a regular quantifying expression both syntactically (chapter III) and semantically (chapter IV). In particular, it is shown that the quantifier combines with its NP-restriction syntactically, and that the expression as a whole denotes a generalised quantifier. Please notice immediately, that the term ‘distance-distributivity’ is restricted to adnominal elements like jeweils, and does not subsume regular floated quantifiers. Arguments to the effect that distance-distributive elements differ from floated quantifiers are forwarded in chapter II.1.10.

The third puzzle concerns the fact that instances of adnominal jeweils sometimes receive an interpretation which resembles that of adverbial jeweils. Jeweils in (3) is interpreted as distributing over events even though it appears to occur adnominally.

(3) Jeweils zwei Jungen standen Wache.
    each two boys kept guard
    ‘Two boys kept watch at a time.’

In chapter V.1, I provide arguments to the effect that jeweils occurs in adnominal position in (3). Chapter V also explores the necessary structural and semantic conditions which an adnominal element must satisfy in order to give rise to – what looks like – an adverbial reading. There, it will also be shown that the adverbial-like reading is a direct result of the semantics of adnominal jeweils and its syntactic position.

Finally, a smaller part of the thesis is devoted to the puzzle of cross-linguistic variation concerning the syntactic distribution of distance-distributive elements. As (3) shows, the distribution of English distance-distributive each is more restricted than that of jeweils. Distance-distributive each cannot occur in subject position with an adverbial-like reading. Another example is given in (4).
(4) Peter kritisierte und lobte Maria aus jeweils zwei Gründen.  
Peter criticised and praised Maria for each two reasons  

*‘Peter criticised and praised Maria for two reasons each.’

(4) shows that English each cannot distribute over the plurality of events expressed by the two conjoined verbs. In such cases, English has to use the expression respectively. A small survey of languages shows that many other languages (Russian, Bulgarian, Italian, French, Dutch, Icelandic, Norwegian, Korean, Japanese) also have distance-distributive elements, and that these tend to pattern either with English or with German concerning their syntactic distribution. The cross-linguistic puzzle will be addressed repeatedly in the course of this thesis, namely in chapters III, IV, and V. This is because the differences in distribution are partly due to syntactic factors (the feature content of the distance-distributive element) and partly to semantic factors. The result of this investigation will be a unified analysis of distance-distributivity across languages which accounts for the observable differences at the same time. This unified analysis may provide the basis for a more comprehensive typology of distance-distributivity in natural language, which I will leave for future research.

The foregoing considerations have shown that a careful syntactic and semantic analysis of the German distributive element jeweils is not a purpose in itself (although a complete description and analysis of the observable phenomena is missing so far). The present work provides an opportunity for a better understanding of distance-distributivity in natural language in particular, and of the syntax-semantics interface in general.

The remainder of the introduction is reserved for laying out the syntactic background (section 2), the semantic background (section 3), and my views on the syntax-semantics interface (section 4). Section 5 presents a brief preview of the things to come.

2 Syntactic Assumptions

2.1 The Framework
The syntactic assumptions of this thesis are embedded in the general framework of generative grammar in its various implementations (cf. Chomsky 1965, 1981, 1986ab, 1995, 1998, 1999). In particular, I adopt some basic assumptions of the Government & Binding (GB) – framework (Chomsky 1981, 1986ab), and of the Minimalist Program (MP) as developed in Chomsky (1995). This may sound as a contradiction at first sight since the Minimalist Program was developed as a replacement for the GB-framework, and designed to overcome certain weaknesses of the latter. However, the main focus of this thesis is on the interface of syntactic and semantic component, thus reaching out of the domain of syntax proper. The thesis is not concerned with finding the optimal model for the syntactic component itself. For this reason, I take the liberty to adopt well-established elements from both frameworks where nothing hinges on it. I take the analysis to be compatible with both frameworks in principle. The basic syntactic assumptions that I adopt are the following.

(5)i. Syntactic structure is built successively out of lexical and functional (possibly covert) elements through the processes of (categorial, semantic, functional) selection and merge. The resulting structures are conform with Jackendoff’s (1977: 34) phrase structure rule schema. A syntactic head X can form a maximal projection by combining with its complement and specifier.
ii. Adjunction of modifiers is possible in principle. In this case, the categorial status of the adjunction site remains unchanged.

iii. Syntactic structures are binary branching: Every syntactic node in a tree has at most two daughters (Kayne 1994).

iv. The structures built are subject to further transformations through the application of movement operations. Movement operations displace an element out of its base position to another position for grammatical (case assignment, feature checking), and discourse reasons (topics appear to the left of clauses in many languages).1

v. Movement leaves behind a covert element (either a trace or a silent copy) which marks the origin of the moved element in line with Emonds’ (1976) ‘Structure Preservation Principle’.

vi. Movement operations can apply overtly (visible) or covertly (invisible).

vii. Movement is restricted by independent syntactic principles (e.g. the ‘Empty Category Principle’ (Chomsky 1981, 1986a) or ‘Shortest Move’ (Chomsky 1995).

In addition, I adopt two other well-established concepts from Chomsky’s (1981, 1986b) GB-system. The ‘Binding Principles’, which govern the distribution of pronouns and referential expressions, and the notion of ‘government’ under c-command.2

On the other hand, in line with the MP, I take there to be no independent level of deep structure. Instead, merger of lexical elements and movement operations apply in a stepwise procedure in order to form ever larger structures. In the process, grammatical features and properties are checked along the way, and not at certain levels of representation. The resulting derivational model of syntax is shown in (6).

(6)

```
Lexicon
  ↓
structure building, movement operations
  ↓
Surface Structure (“Spell Out”)
    ↓
Phonological Form (PF) Logical Form (LF)
```

Of particular interest here is the “covert” syntactic level of Logical Form (LF), which in the GB and MP-framework is taken to be a covert level of syntactic representation that serves as the input to semantic interpretation. Originally, LF is the syntactic level at which movement for semantic reasons (e.g. scope) takes place (cf. May 1977, 1985). In the MP, LF-movement can also take place for grammatical reasons (case, agreement) if it has not applied overtly. As a result, the structures of analogous sentences in different languages

---

1 I will remain neutral on the question whether discourse requirements trigger syntactic movement directly, or whether discourse-driven movement is mediated by the presence of syntactic discourse features (topic, focus) that need to be checked by overt movement.

2 Again, the mixture of frameworks presented here is motivated by expository reasons. The decision for a mixed presentation is based on the assumption that primitives and predictions of the GB-framework can be reformulated in MP-terms in principle. Chomsky’s (1998, 1999) recent incorporation of the notions of ‘Agree’ and ‘phase’ into the MP-framework may have been motivated by the need to account for certain generalisations which were formerly captured by the notion of ‘government’.
are more or less identical at the level of LF. Differences in surface order follow simply from arbitrary morphosyntactic properties of lexical items (their feature strength), which do or do not trigger overt movement (Chomsky 1995).

In this thesis, I would like to shift the attention back to surface structure, showing that a lot of interpretations can be derived directly from the level of overt syntax. This change in perspective significantly lessens the importance of LF-movement for semantic reasons. However, this is not to say that other LF-movement operations (e.g. for grammatical reasons) need not apply. I will remain largely agnostic on this point even though I follow Chomsky (1998) in assuming that grammatical properties (such as case or agreement) can be licensed at a distance through a process of ‘Agree’, which is subject to structural conditions. These properties therefore need not be licensed by LF-movement. Finally, the shift from LF-movement is not to say that LF-movement never applies for interpretive reasons, but that such movement is restricted by interpretive requirements as in Fox (2000). This issue is taken up in chapter V.2.4.2, where one instance of LF-movement for interpretive reasons is discussed.

2.2 The Syntax of Clauses

In the wake of Pollock (1989), clauses are assumed to contain a number of functional projections. The heads of these projections are the hosts of grammatical features such as T(ense), Agr(eement), Neg(ation), Asp(ect), Voice. Rizzi (1997) assumes a number of functional projections in the left periphery of the clause, including Foc(us)P, Top(ic)P, Fin(iteness)P. The most elaborate functional architecture of the clause to date is found in Cinque (1999), who assumes a variety of functional projections for different classes of adverbials on top of the functional projections argued for elsewhere.

The clausal structure adopted here contains only two functional projections, namely I(nfl)P and C(omp)P. I is the locus of tense and agreement features and (in some languages) modal auxiliaries, and responsible for assigning nominative case to the subject of the clause in SpecIP. C is the locus of mood (question, declarative) and possibly discourse features (see fn.1). SpecCP is the left-peripheral position for discourse prominent constituents or question words. Elements are usually not base-generated in SpecIP or SpecCP, but move there in order to satisfy some grammatical requirement. Throughout, I assume the VP-internal subject hypothesis (e.g. Koopman & Sportiche 1985), according to which subjects are base-generated inside the maximal projection of the verb from where they move to SpecIP for case reasons. Finally, modifying adverbials (including negation) can freely adjoin to VP or IP. With these assumptions, the syntactic structure of (7a) is as in (7b).

(7) a. Peter did not meet the girl.
b. $\begin{array}{l}
\text{IP} \\
\text{NP}_1 \quad \text{I'} \\
\text{I} \quad \text{VP} \\
\text{I} \quad \text{did} \\
\text{not} \quad \text{VP} \\
\text{I}_1 \quad \text{V'} \quad \text{meet} \quad \text{the girl}_{\text{NP}}
\end{array}$
The structure of the interrogative clause (8a) is given in (8b). The interrogative wh-pronoun has moved overtly to SpecCP in order to check its [wh]-feature.

(8) a. Who did Peter meet?

   a. Who did Peter meet?

b.

   CP

   NP

   C

   IP

   C’

   who

   did

   NP

   t1

   Peter

   t2

   V

   t3

   meet

(2.3) The Syntax of German

The German clause structure differs from that of English in (7) and (8) in two respects.\textsuperscript{3} First, I take the underlying order of German to be SOV (Bach 1962, Bierwisch 1963). The verb is always base-generated in sentence-final position, after the direct object. The underlying word order shows up regularly in German embedded clauses, such as (9).

(9) ..., weil die Mädchen die Jungen küssten.

   because the girls\textsubscript{NOM} the boys\textsubscript{ACC} kissed

   ‘... because the girls kissed the boys.’

The well known V2-phenomenon of German is the result of movement of the finite verb from its sentence-final base position to I and onwards to C (cf. den Besten 1977/83). The part of the clause between the V2-position of the verb and its sentence-final position is called the ‘middle field’ in traditional grammatical approaches. I will also adopt this term as a descriptive device.

The analysis of German as underlyingly SOV conflicts with proposals by Kayne (1994) that all languages are underlyingly SVO. Although this position is theoretically attractive, I stick to the more traditional SOV-analysis, which is also found in many recent analyses of German (cf. e.g. Haider 1997, Vikner 2001). A reason for this will emerge in chapter IV.6., where it is argued that a difference in the distribution of distance-distributive jeweils and each follows from the different underlying word orders of German and English.

The second striking difference is that German is more flexible in overt word order than English. Various elements can be moved to SpecCP for discourse needs. (10a) illustrates the topicalisation of a direct object, (10b) that of an adverb. The fronted element has a prominent discourse status in both sentences, showing that the left periphery (= CP) of German declarative clauses is an appropriate landing site for discourse prominent elements, normally topics or (contrastively) focussed elements.

\textsuperscript{3} For an introduction to German syntax in the generative tradition, see e.g. Grewendorf (1988), and Haider (1993), for an analysis in GB-terms, and Grewendorf (2002) for an analysis in the framework of the MP.
The V2-property of German requires that at most one element can be fronted. As a result, (11) is ungrammatical in German.

(11) *Einen Hund gestern habe ich gestreichelt.
    a dog yesterday have I petted

German also exhibits a greater degree of flexibility in the middle field. The well known phenomenon of ‘scrambling’ leads to a reordering of constituents in the middle field. A constituent can raise out of its base-position inside or adjoined to VP, and adjoin to the left of other middle field material. Scrambling derives (12b) from the base order in (12a) (see Lenerz 1977 for arguments that (12a) exhibits the basic, undervield word order).

(12) a. ...weil Peter [VP dem Professor die Hausarbeit gegeben hat].
    because Peter the professor term paper given has
    b. ...weil Peter [VP die Hausarbeit [VP dem Professor gegeben hat].
    because Peter the term paper the professor given has
    ‘…because Peter has given the homework to the professor.’

Overt reordering via scrambling is accompanied by a change in discourse structure. In the case of (12ab), the scrambled direct object die Hausarbeit changes its status from (information) focussed constituent to topic of the clause, whereas the indirect object changes its status from topic to (information) focussed constituent.4

To conclude, German differs from English in underlying word order (SVO vs SOV) and allows for word order alternation more freely. As shown in (12), a change in word order comes along with a change in the discourse structure of the clause.

2.4 The Syntax of Nominal Arguments

Since a large part of the discussion of adnominal jeweils concerns the internal structure of nominal arguments, it is necessary to lay out the basic assumptions concerning their structure. The syntax of nominal arguments in German has been studied extensively, e.g. by Vater (1986), Haider (1988), Löbel (1989), Bhatt (1990), Olsen (1991), Fortmann (1996), Demske (2001), and others. Vater (1986) adopts Jackendoff’s (1977) X’-framework, which postulates three structural layers inside NP. The later references are inspired by Abney’s (1987) DP-hypothesis. They assume the presence of an additional functional projection DP above the NP, and discuss an abundance of DP-internal phenomena. To keep the discussion of nominal arguments manageable, I will concentrate on two aspects: The categorial status of nominal arguments, and the status of numeral

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4 When an indefinite expression scrambles, it must be interpreted under a specific, a presuppositional, or under a contrastive focus interpretation (see Diesing 1992). This fact can also be stated the other way round. DeHoop (1992) argues that specific or presupposed indefinites in German must leave the VP by overt scrambling for semantic reasons.
phrases such as zwei Bücher ‘two books’. Both aspects have a direct bearing on the analysis of adnominal jeweils in chapter III. I will adopt the following position concerning the two aspects:

(13) i. All nominal arguments are D(eterminer)Ps, i.e. all nominal arguments contain a functional D-layer, which contains a case-feature as well as the phi-features gender, number, and person. (see e.g. Hellan 1986, Abney 1987, Stowell 1989, 1991, Szabolcsi 1994, Longobardi 1994, and - for German - Felix 1988 and Bhatt 1990; but see Haider 1988)

ii. Numeral and indefinite NPs do not form a DP by themselves, i.e. numerals and indefinites are not quantificational functional heads, but attributive (cardinality) predicates, adjoined to NP (see Lewis 1975, Kamp 1981, Heim 1982, Higginbotham 1987; but see Bhatt 1990, and Pafel 1994).

From (13i) and (13ii) it follows that all numeral NPs in argument position contain a zero D'-head that is the locus of case- and phi-features.

2.4.1 Functional Projections in the Nominal Domain

Hellan (1986) and Abney (1987) are among the first proponents of the DP-hypothesis. The DP-hypothesis states that nominal arguments are headed by a functional head D that hosts their grammatical features, that selects for an NP as its complement, projecting a maximal projection DP, and that can be filled by lexical determiners such as the or a(n).

In the following, research concentrated mainly on the following questions: (i.) is the DP-level obligatory, and (ii.) are there other functional projections above DP?

Stowell (1989, 1991), Szabolcsi (1989, 1994), and Longobardi (1994) answer the first question in the positive. According to them, all nominal arguments are DPs, presumably universally. This is the strong DP-hypothesis. The strong DP-hypothesis makes it possible to view clausal and nominal arguments as parallel in structure as shown in (12).

(14)a. The structure of nominal arguments  
[DP D NP]  
b. The structure of clausal arguments
[CP C IP]

Longobardi (1994) argues that a D-head is also required for semantic reasons. It hosts an operator whose function is to turn the NP-denotation (a predicate, which cannot serve as an argument) into an individual, which can serve as an argument.

The second question is also answered in the positive by many researchers. A number of functional heads have been suggested as hosts of particular grammatical features and target sites for overt movement of the nominal head: Ritter (1988) proposes a Num(eral)P, Abney (1987) additional K(ase)Ps, and QPs. Let us summarise these analyses under the cover term ‘Multiple FP-analysis’. The development of the multiple-FP-analysis for the nominal domain took place in parallel to the proliferation of functional projections in the clausal domain in the wake of Pollock (1989). The most elaborated forms of multiple FP-

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5 See also the references in Bittner (1994:67)
6 Abney (1987) draws a parallel between D and I(nfl) because the determiner seems to govern possessive agreement in languages like Hungarian.
7 The assumption of a QP seems to be a corollary of the assumption that D is the host of referentiality, given that quantificational categories are inherently non-referential. Proponents of a QP in German are Löbel (1989), Bhatt (1990), and Giusti (1991) among others.
analyses even assume the presence of Agr(eement)Ps within nominal arguments (cf. Coene 1999).

As argued above, I adopt a rather minimalist position, and restrict the number of functional projections in German to one. All nominal arguments are taken to be DPs, irrespective of the fact if they host an overt determiner element, or not. This decision implies that quantifiers are located in D as well. The restriction to one functional layer is motivated by the simple reason that we do not need more for a satisfactory analysis of the phenomena surrounding adnominal jeweils. In chapter III.4, I argue that jeweils occupies the specifier position of a functional projection, namely DP, at surface structure. The decision for DP is motivated by the fact that it seems to be the least controversial of all functional projections in the nominal domain (and in addition motivated by the existence of a closed class of lexical determiner elements).

2.4.2 The Categorial Status of Indefinite and Numeral Phrases

In chapter III, I argue that adnominal jeweils forms a complex nominal constituent with numeral (or more generally: indefinite phrases), such as two books. In order to determine the categorial status and the internal structure of this complex constituent, it is necessary to first establish the categorial status of ‘bare’ numeral phrases. Depending on the outcome, there are different possibilities for the position of jeweils in relation to the numeral phrase. One option is that such phrases are full DPs by themselves. An alternative option is that indefinite and numeral phrases are simply NPs, the numeral being a cardinal adjective adjoined to NP. This position is found in various forms in Kamp (1981), Heim (1982), Higginbotham (1987), and Kamp & Reyle (1993), and this is the position that I will adopt below.

The researchers who locate the numeral in the head of DP (or QP) do so because of the purported quantificational properties of the numeral. According to Bhatt (1990) and Pafel (1994), the structure of ‘bare’ numeral NPs is as in (15).

\[
\text{[D/Q zwei [NP Bücher]]}
\]

I would like to discuss two empirical arguments against the analysis in (15). One is syntactic in nature and is based on the co-occurrence of numerals with clear cases of lexical determiners, as in (16).

\[
\text{die zwei Bücher}
\]

If the lexical determiner occupies D, the numeral cannot do so at the same time.\(^8\) The second argument is semantic in nature, and concerns the supposed quantificational status of numerals. It follows from the argumentation in Bhatt (1990) and Pafel (1994) that there

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\(^8\) Bhatt (1990) and Pafel (1994) neutralise this counter-evidence in different ways. Bhatt (1990:77) assumes the existence of a QP below a DP. On her analysis, die ‘the’ in (16) is located in D, while zwei ‘two’ is located in Q. Pafel (1994) treats numerals variously as quantifying adjectives adjoined to NP, or as quantifying adjectives adjoined to an empty D-head. When the numeral is adjoined to the D-head, the entire DP behaves as a quantifying expression. For instance, it exhibits scope interaction with other quantifying expressions or negation. Crucially, both analyses assume that numerals in bare nominal arguments are located under a functional head. I argue against this claim in the main text.
will be no need for locating numerals in D (or Q) if it can be shown that these are not inherently quantificational.

There is a tradition in modern semantics, beginning with Kamp (1981) and Heim (1982), and based on observations by Fodor & Sag (1982), to treat indefinites such as some, a, and later also numerals (Kamp & Reyle 1993) not as inherently quantifying elements, but as (cardinality) predicates over sets. Syntactically, these elements are realised as attributive adjectives (see e.g. Higginbotham 1987). \(^9\)

The basic observation is that constituents containing these elements differ from other constituents containing quantifiers such as every, each, or most in their scope taking abilities. In particular, numerals and indefinites can take scope out of syntactic islands, as shown in (17) (the example is taken from Reinhart 1995, whose argument I follow). \(^10\)

(17) If we invite three philosophers, Lucy will be offended.

(17) has two readings. On one reading, (17) is true if Lucy will be offended, if we invite any group of three philosophers. The constituent three philosophers takes narrow scope inside the conditional if-clause, which is a syntactic island for extraction. On its second reading, (17) is true if there is a specific group of three philosophers such that Lucy will be offended if we invite these three. This reading allows for her being perfectly happy if we invite three other philosophers (or only two of the first three). On this reading, three philosophers takes wide scope with respect to the if-clause.

In contrast, quantified phrases containing every cannot take wide scope out of the if-clause as shown by the impossibility of reading (18ii) for (18).

(18) If we invite every philosopher, Lucy will be offended.

i. Lucy will be offended if we invite all philosophers.

ii.*For every philosopher it holds that, if we invite him, Lucy will be offended.

(18) only has the narrow scope reading in (18i). (18) does not have the wide scope reading in (18ii) on which Lucy would be offended even if we invited only a single philosopher. The absence of this wide scope reading can be attributed to the island sensitivity of the syntactic operation of ‘Quantifier Raising (QR)’ (May 1977, 1985), which applies at LF, and which applies only to quantified phrases. The same island sensitivity is exhibited by overt movement operations as shown in (19).

(19) a. *Who, if we invite t, Lucy will be offended.\(^11\)

b. *Who, Lucy will be offended, if we invite t.

If the absence of a wide scope reading for (18) depends on the syntactic island status of the if-clause, which blocks QR, and if QR is the only way to derive wide scope effects with quantifying expressions, it follows either that QR with numerals is subject to different syntactic restrictions, or that numerals are not quantificational at all. In this case, their wide scope must come about in some other way. The first option is a mere restating of the facts, whereas the second option asks for an explanation for the different behaviour

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9 This class of elements is also defined as the class of ‘weak’ (Barwise & Cooper 1981), or ‘existential’ (Keenan 1987) quantifiers.

10 The facts are the same for German.

11 See Reinhart (1997) for arguments to the effect that QR should be subject to standard constraints on movement.
of quantifiers and numerals which lies in the different semantic and categorial nature of the expressions involved.

The discussed empirical difference between genuine quantifiers like every on the one hand, and numerals and indefinites on the other, has motivated the analysis of these expressions as inherently non-quantificational expressions. In ‘Discourse Representation Theory’ (DRT) (Heim 1982, Kamp 1981) indefinite expressions, and later also numeral expressions (Kamp & Reyle 1993), are analysed as introducing individual variables into the semantic representation. The quantificational force which is usually associated with the numeral comes about through existential closure of the indefinite’s individual variable by an existential operator ‘∃’ at the level of LF (Heim 1982). This existential operator binds any free variables introduced by indefinite or numeral expressions. In the case of (17), local insertion of the ∃-operator within the if-clause yields the narrow scope reading. Insertion at the matrix level yields the wide scope reading.12

The main point of the foregoing discussion is the following: There is semantic evidence that numeral and other indefinite expressions are not inherently quantificational because they behave differently from ‘real’ quantifiers. I conclude on the base of this that there is no need to locate a numeral or an indefinite in the D-head of a nominal argument. Numerical expressions by themselves are NPs. The numeral, being an adjective, is adjoined to NP (see Haider 1988 and Tappe 1989 for the position that prenominal adjectives are adjoined to NP).

2.4.3 Licensing Empty D-heads in German

The conclusions of the two previous sections seem to be contradictory. In 2.4.1, it was argued that all nominal arguments contain a D-head. In 2.4.2, it was argued that the numeral in numeral expressions is not a D-head. The question arises how the two positions can be reconciled when a numeral expression (with or without adnominal jeweils) occurs in argument position as in (20).

(20) Zwei Jungen kamen herein.

two boys came in

12 This is an oversimplification of the facts. It turns out that existential closure of the indefinite’s variable by ‘∃’ at the matrix level does not give the correct truth conditions if the numeral or indefinite occurs in the restriction of universal quantifiers, or inside an if-clause as in (17). Heim (1982) points out that the resulting truth-conditions are way too weak (see also Abusch 1994 and Reinhart 1995, 1997 for discussion). In order to see this, consider the semantic representation of (17), with existential closure applying at the matrix level.

(i) ∃X [ (*philosopher’(X) & three’(X) & *invite’(w’X)) → offended’(lucy)]

Since the semantic representation in (i) contains a material implication, it is predicted that Lucy would be offended if we invited any group of individuals that are not philosophers, for this would falsify the premise of the material implication, thus verifying the whole expression. But clearly, (17) does not say that Lucy is offended if we invite any group of non-philosophers. In response to the problem in (i), Heim (1982) assumes that indefinite expressions can raise at LF after all, thus violating syntactic island conditions. Abusch (1994) proposes a semantic ‘storage’ mechanism that allows for a correct interpretation of the indefinite expression in situ. Nevertheless, as pointed out in Reinhart (1997), this storage mechanism is only a reformulation of syntactic LF-movement in semantic terms. Reinhart (1995, 1997) and Winter (1997, 1998) present an empirical argument to the effect that numeral and indefinite expressions need not be moved, not even out of the restriction of universal quantifiers and conditionals. The reader is referred to the references cited for details, but it should be mentioned that the proposed solution (i.) treats numerals and indefinites as inherently non-quantificational, (ii.) assumes no movement of these expressions out of islands, and (iii.) interprets them as denoting variables over choice-functions (functions that select individual elements out of sets), which are bound by existential closure.
In response to the problem posed by (20), I argue that numeral NPs are selected by an empty D-head when they occur in argument position. The structure of the subject expression in (20) is given in (21).

(21) \[ \text{DP } D^0 \left[ \text{NP } \text{zwei } \left[ \text{NP } \text{Junge-n} \right] \right] \]

Two boy-s

Postulating empty heads in syntactic analysis carries the danger of leading to more and more abstract structures. Therefore, the presence of empty heads needs to be constrained by theoretical arguments (see section 2.4.1), as well as by empirically verifiable licensing mechanisms. In general, there are at least three ways to license an empty D-head, $D^0$.

First, $D^0$ can be licensed by lexical government, e.g. by a verb, like other empty categories (cf. Chomsky 1981). Second, $D^0$ can be licensed by incorporating a lexical N-head (cf. Longobardi 1994, see Baker 1988 on incorporation). Third, $D^0$ can be licensed by overt morphology on its NP-sister. This overt morphology expresses (part of) the feature content (case, number, gender) of the empty D-head, thereby licensing it (Emonds 1987). Emonds (1987) assumes that empty D-heads in English numeral phrases are licensed by the overt presence of plural morphology on the NP, namely the plural /s/-suffix. Notice that different languages can make use of different licensing mechanisms, depending on their general (morpho-) syntactic properties.

I take the empty D-heads in German numeral phrases also to be licensed by overt morphology on the NP-complement. In German, numeral NPs inflect not only for plural, but also for case, even though the inflectional paradigm is partly impoverished and does not always allow for a proper identification of case. The inflectional (case) paradigm for numeral expressions in three inflectional classes is shown in table 1:

| Table 1: The inflectional paradigm of numeral plural expressions |
|-----------------|-----------------|-----------------|
| Class           | I: (e)n-plural   | II: $\emptyset$-plural | III: er-plural  |
| NOM             | two/three women  | two/three angels  | two/three books |
| GEN             | zwei/drei Frauen | zwei/drei Engel   | zwei/drei Bücher |
| DAT             | zwei/drei Frauen | zwei/drei Engel   | zwei/drei Bücher |
| AKK             | zwei/drei Frauen | zwei/drei Engel   | zwei/drei Bücher |

GEN is marked on the numeral in all inflectional classes. DAT is marked on the noun in class II and class III. Structural case is marked by the absence of overt inflection. With numerals higher than three, which never inflect, the bare genitive form is ungrammatical (22ab). In such a case, a prepositional von ‘of’-phrase with dative complement has to be used (22c). In this case, the argument of the preposition is inflected overtly for dative case.

(22) a. *anstelle fünfzehn-er Engel
    in-place-of fifteen-gen angel<sub>pl</sub>

b. *anstelle fünfzehn-∅ Engel-∅

c. anstelle von fünfzehn Engel-n
    in-place of fifteen angel-dat<sub>pl</sub>

Class I only exhibits a distinction between GEN and the other cases and does not allow for proper identification of case. Nevertheless, the NPs are inflected for plural, and can therefore license the empty D-head.
I conclude that licensing of the case and phi-features of an empty D-head through inflectional morphology on the sister of D is possible in the case of German numeral arguments. In particular, structural case in argument position can be identified by the absence of overt case morphology. Therefore it seems justified to maintain the strong DP-hypothesis for numeral phrases in German. I conclude that numeral phrases in argument position have the structure in (21). They are NPs that are selected by an empty D-head, which hosts case and phi-features. In chapter III, we will return to the licensing of empty heads through movement and/or overt morphology in connection with the analysis of adnominal jeweils. This concludes the discussion of the syntactic background.

3 Semantic Assumptions

The semantics employed in this thesis follow the semantic system presented in Heim & Kratzer (1998). The chief properties of this system are summarised in (23):

(23) Properties of the semantic system:
   i. The semantics are extensional
   ii. The semantics are truth-conditional (Tarski 1935)
   iii. The semantics are mostly static, but incorporate some insights from dynamic theories of meaning, in particular DRT (Kamp 1981, Heim 1982, Kamp & Reyle 1993)
   iv. Natural language expressions are directly interpreted (Montague 1970a)
   v. Interpretation is compositional and type driven.

In what follows, I will briefly comment on each property in turn.

Regarding (23i), the discussion of the semantics of jeweils is only concerned with the denotations of natural language expressions in the ‘real’ or actual world. Since, we are not concerned with the denotations of expressions in other possible worlds, the semantic model does not contain an intensional component. As a result, I will freely use the terms ‘meaning’, ‘denotation’, and ‘semantic value’ as synonyms for the same thing: The referent of a natural language expression.

Regarding (23ii), natural language expressions are evaluated as to their truth with respect to the state of affairs in the actual world. A sentence is interpreted as defining a set of truth-conditions which must be satisfied in the world. If the truth conditions of a sentence are not met by the state of affairs in the actual world, the sentence is judged to be ‘false’. If the truth-conditions are met, the sentence is judged ‘true’ (cf. Tarski 1935).

Regarding (23iii), the semantic analysis of jeweils in chapter IV is for the most part concerned with the interpretation of individual sentences in isolation. Their meaning can be adequately captured by a static semantic model which does not look further than the clause level. Nonetheless, a few discourse phenomena are observable in connection with adverbial jeweils and with adnominal jeweils under adverbial-like interpretations. In these cases, an antecedent for an anaphoric element is provided by the preceding discourse. In order to account for this, it is necessary to incorporate some aspects of dynamic semantic

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14 Notice that the semantic system does not make use of models in order to evaluate the (in)felicity of natural language expressions. See T. E. Zimmermann (1999) for arguments to the effect that models in semantics are at best redundant, and potentially harmful.
theories. To this end, I will make use of the model of ‘Discourse Representation Theory’ (DRT) as explicated in Kamp & Reyle (1993).

Regarding (23iv), the semantic component interprets natural language expressions directly. This means that they are interpreted without a translation into an intermediate formal language such as simple or higher-order predicate calculus, or \( \lambda \)-calculus, the syntactic and semantic properties of which are well defined. For this reason, formal languages were thought to be interpretable more accurately, avoiding the messy unclarities, ambiguities, and instances of vagueness which are often encountered in natural language. An example in question is (24), which is scopally ambiguous. The intermediate-translation approaches resolve this ambiguity by translating the syntactic structure of (24) into two different logical formulas (25ab).

(24) All men did not lie.

(25) a. \( \forall x [\text{man'}(x) \rightarrow \neg \text{lie'}(x)] \)
For all men it is the case that they did not lie. \( \Leftrightarrow \) No man lied.

b. \( \neg \forall x [\text{man'}(x) \rightarrow \text{lie'}(x)] \)
It is not the case that all men lied. \( \Leftrightarrow \) Some men did not lie.

Prominent proponents of the intermediate translation approach are Frege (1891), Russell (1905), Russell & Whitehead (1910-13) and Quine (1960). Montague (1970a) was the first to show that natural language expressions can be treated like formal languages, and that an intermediate translation into a formal language is therefore unnecessary. Montague provided the necessary tools for interpreting natural language expressions directly, while at the same time coping with the ambiguities etc. Heim & Kratzer (1998) take up this idea and interpret natural language expressions directly. In the course of this thesis, I will often make use of formulae from the predicate calculus and \( \lambda \)-calculus as useful abbreviations for the denotations of natural language expressions. This should not divert from the fact that I assume direct translation of natural language expressions throughout. We will come back to the relation of syntactic structure and meaning in the next section.

In general, different classes of natural language expressions have different types of denotations in terms of what they refer to. Natural language expressions can refer to individuals, to sets of individuals, to sets of sets of individuals, to truth-values and so forth. Since any set is definable in terms of its characteristic function (see Heim & Kratzer 1998), it is possible to reduce the number of ontological entities in the semantics to three: individuals (denotations of proper names and definite DPs), truth-values (denotations of sentences), and functions (denotations of all other expressions). The semantics used here include these three entities plus the category of ‘events’ (which are individuals of a different sort, see chapter IV.1). I will also adopt the common practice of representing semantic functions in the \( \lambda \)-calculus, which provides a concise and elegant means of formalising complex denotations. (26) provides a few examples of denotations that will show up in later chapters.

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15 Of course, the objectives of the proponents of an ideal intermediate language differ from Montague’s. The first are interested in creating a precise and unambiguous language to be used in (scientific) reasoning, while Montague is interested in analysing the semantics of English. Montague (1970b) reverts to using intermediate translations in the analysis of the semantics of English. However, he also shows that the intermediate level can always be eliminated as long as the translation procedure is homomorphic, i.e. structure preserving. Thanks to Ede Zimmermann for bringing this to my attention.
(26)  

a. [[Peter]] = \text{peter}\textsuperscript{16} 

b. [[man]] = \lambda x. x is man 

c. [[laugh]] = \lambda x. x laughs 

d. [[meet]] = \lambda x. \lambda y. x meets y 

e. [[every man]] = \lambda P. for every man x it is the case that x has the property P 

(i.e. the quantified expression every man denotes the set of properties that every man has) 

f. [[Peter smokes]] = 1 iff it is true that Peter smokes. 

Regarding (23v), I adopt the 'Principle of Compositionality' as stated in (27). 

(27)  

Principle of Compositionality:\textsuperscript{17}  

The meaning of a complex expression is derivable on the base of the meaning of its immediate constituents, and the way they are combined (i.e. their syntactic structure). 

In the course of the thesis, we will frequently encounter the principle of compositionality. It is one of the chief claims of the thesis that compositionality can (and should) be maintained even in difficult cases that – at first sight – suggest otherwise. From (27), it follows that semantic derivations must take syntactic structure seriously. In other words, if some constituent \( \alpha \) is the syntactic sister of a constituent \( \beta \), it must also compose with \( \beta \) semantically, before the derivation can proceed. This way, the semantic interpretation proceeds in parallel with the formation of ever more complex syntactic structures. 

Following Heim & Kratzer (1998), I assume that the process of semantic composition is type-driven. This means that two syntactic sisters can only combine if they are of appropriate types. If they are of the wrong type, a type mismatch ensues, and the derivation cannot proceed – unless some sort of rescue mechanism comes to help. We will encounter two such rescue mechanisms in chapter IV.4. Semantic types go back to the Russellian theory of types and – in their present form – to Church (1940). They abstract away from the peculiar lexical content of natural language expressions, and focus on the status of a natural language expression concerning its combinability with other expressions. Frege (1891) shows that there is a fundamental difference between saturated expressions, which denote truth-values or individuals, and unsaturated expressions, which in the present framework denote functions (see also chapter IV.4.2.1 for further discussion).\textsuperscript{18} The semantic type of a truth-value denoting expression is defined as \(<t>\) (for 'truth-value'), and the semantic type of individual-denoting expressions is defined as \(<e>\) (for 'entity'). These are the basic semantic types for saturated expressions. All other semantic types, i.e. the types of all function-denoting expressions are defined recursively.

\textsuperscript{16} (26a) reads as ‘The meaning of the natural language expression Peter is the individual Peter in the actual world.’ Lower case expressions are used to talk about entities in the world, in contrast to the natural language expression itself.

\textsuperscript{17} The ‘Principle of Compositionality’ is frequently attributed to Frege although he never stated it explicitly (see Janssen 1997 for extensive discussion). Szabó (2000:488) presents a quote from Frege (1919:255) that could be interpreted as expressing the idea of compositionality: “corresponding to the whole-part relation of a thought and its parts we have, by and large, the same relation for the sentence and its parts”. In Montague (1970b), compositionality is brought into the semantic analysis of natural language in form of a homomorphism requirement on the translations of natural language expressions. The phrasing of the principle in (27) is close to that found in Partee, Ter Meulen, and Wall (1990:318). (27) explicitly acknowledges the importance of syntactic structure for semantic interpretation.

\textsuperscript{18} I will also make use of the traditional terms ‘predicate’ and ‘relation’.
on the base of these two basic types. For instance, an expression which denotes a function from individuals to truth-values (e.g. intransitive verbs) has the semantic type $<e,t>$. Expressions which denote functions from individuals into functions from individuals into truth-values (e.g. transitive verbs) are of type $<e,<e,t>,$ and quantified expressions such as every man, which denote functions from functions from individuals into truth-values, are of type $<<e,t>,t>$. The semantic type-scheme has the advantage that it allows for a quick calculation if a given combination of natural language expressions is interpretable or not. Observe also that semantic types are insensitive to the syntactic category of an expression. Both the common noun man and the intransitive verb laugh in (26) denote a function from individuals into truth-values. Therefore, both are of semantic type $<e,t>$. 

Finally, I follow Heim & Kratzer (1998) and assume that the meaning of two natural language expressions can be combined by means of two basic semantic mechanisms. The first is ‘Functional Application’ (FA), which involves an unsaturated entity (a function) taking another entity of the right semantic type as its argument, and mapping it onto another entity. A basic instance of FA is found with predication of a verb over its subject, as illustrated in (28a). The second mechanism is ‘Predicate Modification’ (PM), which combines two predicative expressions (of type $<e,t>$) into a complex predicative expression. A basic instance of PM is found with attributive modification, as illustrated in (28b).  

(28)  

a. Peter smokes. $\rightarrow$ the unsaturated predicate smoke functionally applies to the saturated expression Peter, yielding a truth value  
b. gray cat $\rightarrow$ the two properties expressed by gray and cat combine to form a complex property expressed by gray cat  

This concludes the overview over the main semantic assumptions.

4 The Syntax-Semantics Interface

An important task of natural language semantics is to account for the scopal ambiguity of sentences. The problem with scopally ambiguous structures such as (24) (All men did not lie) is that two interpretations are matched with a single syntactic structure, raising a serious problem for compositionality. The traditional language-philosophical approach (e.g. Russell & Whitehead 1910-13, Quine 1960) to the problem of ambiguity was to translate natural language expressions into an intermediate formal language where the ambiguity was resolved (see section 3). In the direct translation approach adopted here, this is no longer possible. The literature offers two possible ways of for approaching the ambiguity problem in a direct translation approach. The introduction of a syntactic level of L(ogical) F(orm) in May (1977, 1985) and Chomsky (1981) has made it possible to resolve ambiguities at this level. On this view, a scopally ambiguous sentence such as (29) is disambiguated at LF by means of reconstructing (lowering) the subject DP into its base position. The two LF-structures of (29) are shown in (30ab).
(29) A unicorn seems to be in the garden.

(30) a. LF1: [IP a unicorn [VP seems [IP t, to be in the garden]]]

b. LF2: [IP e [VP seems [IP a unicorn to be in the garden]]]

The two LFs in (30) serve as input for semantic interpretation. LF1 is interpreted as ‘There is a (specific) unicorn which seems to be in the garden.’ This reading is also called the ‘surface reading’ because the scope relation between the two scope-bearing expressions a unicorn and seems matches the syntactic prominence relation that is definable in terms of c-command.\(^{21}\) The DP a unicorn takes scope over seems. LF2 is interpreted as ‘It seems to be the case that there is a unicorn in the garden’. This reading is called the ‘inverse reading’ because the scopal relation inverts the c-command relation that holds at surface structure. It follows that (29) is structurally ambiguous at LF as much as (31) is structurally ambiguous at surface structure:

(31) The girl cut the boy with the knife.

i. The girl cut [DP the boy [PP with the knife]]

ii. The girl [VP [VP cut [DP the boy] [PP with the knife]].

Aoun & Li (1993) argue that all scopal ambiguities should be resolved through structural ambiguity at the level of LF. They make heavy use of the syntactic operation of ‘Quantifier Raising (QR)’ which applies to quantifier expressions (of type <et,t>), and which can adjoin them to IP. This way, the two readings of (32) are derived from the LFs in (33ab). In (33b), QR has raised the object QP to a position above the subject, giving it scope over the latter.\(^{22}\)

(32) Some man loves every woman.

(33) a. [IP some man\(_1\) [VP every woman\(_2\) [VP t, loves t,]]]

b. [IP every woman\(_2\) [IP some man\(_1\) [VP t, loves t,]]]

In recent years, it has been observed, though, that free application of QR leads to unwelcome overgeneralisations. In particular, many more inverse readings are predicted to be possible than are actually attested (cf. Liu 1990, Beghelli 1993, 1995, Stowell & Beghelli 1997). In response to this problem, application of QR was restricted in two ways. Beghelli (1993, 1995) and Stowell & Beghelli (1997) restrict QR to apply to distributive QPs such as each, every, and possibly most. All other DPs, including numeral and indefinite DPs, are not inherently quantificational and therefore cannot be raised by QR. As a result, inverse readings are impossible with them.\(^{23}\) The second restriction directly concerns the licensing conditions of QR. Reinhart (1995) and Fox (2000) propose that LF-movement of a quantified expression is – like any form of movement in the minimalist framework – costly, and should be avoided if possible. The only way for QR to escape the

\(^{21}\) The notion of ‘c-command’ is defined as follows in Reinhart (1976): Node A c (onstituent)-commands node B iff the branching node α\(_1\) most immediately dominating A either dominates B or is immediately dominated by a node α\(_2\) which dominates B, and α\(_2\) is of the same category type as α\(_1\).

\(^{22}\) Notice that it is generally assumed in the LF- framework that quantified objects must LF-move for reasons of interpretability. The object QP is of type <et,t> and cannot combine with the transitive verb of type <e<et>>. Therefore, it has to raise and adjoin to VP in the unmarked case (cf. May 1985). Or it raises further and adjoins to IP, giving rise to an inverse reading.

\(^{23}\) Beghelli & Stowell (1997) capture the wide scope of specific indefinites, by postulating a separate Ref(P) whose specifier can serve as a landing site for specific (=referring) expressions at LF.
ban on costly movement is if the resulting structure gives rise to a new interpretation which was not available before movement (cf. Fox 2000). In other words, semantic factors can overrule the syntactic ban on movement at least in covert syntax at LF. The two restrictions taken together give a much more accurate picture of the availability of inverse scope readings in natural language. They adequately capture the fact that inverse readings are the exception rather than the norm.

I summarise the second type of approaches to the ambiguity problem under the label of ‘categorial grammar approaches’ (cf. e.g. Jacobson 1996). These approaches do not assume a syntactic level of LF. The interpreted structures are surface structures (cf. Hendriks 1987, Jacobson 1996). The ambiguity in meaning is attributed to additional processes applying in the semantic component, such as type-shifting, functional composition (Jacobson 1996), and argument lift (Hendriks 1987). It is the trademark of these approaches that they simplify the syntactic component (no LF-movement) at the expense of a more complex semantics.

On the scale between heavily LF-based and extremely “surfacy” approaches to the syntax-semantics interface, this work is inclined towards the latter. The following two principles are adopted as methodological principles:

(M1) Derive the meaning of sentences compositionally. I.e., build up the meaning parallel to syntactic structure in 1:1-fashion.

(M2) If a sensible and compositional interpretation is possible from surface structure, it is to be preferred.

The usefulness of (M1) as a methodological principle is stressed by Janssen (1997). (M2) states that LF-movement for purely interpretive reasons should be avoided, thus reducing the importance of LF for semantic interpretation. As will be shown in the course of the thesis, almost all occurrences of jeweils, including occurrences of distance-distributive jeweils can be interpreted directly from surface structure. Sometimes, this will involve the assumption of additional semantic processes, but in any event, there is no need for jeweils to move at LF for interpretive reasons. To the contrary, in chapter III.4.3 I present empirical evidence to the effect that distance-distributive jeweils does not move at LF. Nonetheless, the syntactic structures to be eventually interpreted are LF-structures in the syntactic framework adopted here (see (6) above). In chapter V, this will be shown to be with good reason. There, we encounter a single case where the interpretation of adnominal jeweils seems to necessitate LF-movement of another constituent. This shows that LF-syntax is not totally obsolete for reasons of interpretation, but that there is only very little LF-movement for semantic reasons. As a result, looking at surface structures generally provides us with all the information we need for a proper semantic interpretation.

A last point to be raised in connection with the syntax-semantics interface is whether there is a one-way relation between syntax and semantics, or whether the relation is two-ways. Is the only relation between syntactic and semantic structure such that syntax provides the input for interpretation? Or can semantic factors exert an influence on the syntactic component as well? The second position would be denied in classical generative approaches (Chomsky 1965), which maintain that the syntactic component is autonomous. However, the discussion in Reinhart (1995) and Fox (2000) shows that this position has been weakened in recent years. These authors assume that syntactic operations can be triggered (or licensed) by extra-syntactic, namely discoursive or semantic factors. As mentioned above, I adopt the position that syntax is sensitive to semantic factors in principle. In the course of the thesis, we will encounter two areas were syntax is
determined by semantic factors. The first concerned the triggering of LF-movement by semantic (interpretive) needs, which was discussed above. Second, I assume that semantic requirements can have a more indirect influence on the syntactic order of constituent. It can act as a filter on the output of free adjunction, ruling out certain syntactically well-formed structures because they cannot be interpreted. In other words, sometimes the syntax would allow for free variation in the relative order of two constituents which are adjoined to the same constituent, but the semantics rule out one of these orders as ungrammatical because it cannot be interpreted in a meaningful way (cf. Jackendoff 1972:72). In chapter IV, this interpretability requirement is held responsible for the relative order of adverbial (event) quantifiers and adverbial (event) modifiers, both of which are adjoined to VP.

Summing up, the two main positions regarding the syntax-semantics interface are, first, that the semantic interpretation is derivable from surface structures in most cases. Second, semantic factors can have an effect on syntax (i.) by filtering out certain syntactic structures, and (ii.) by restricting the application of QR at LF. This concludes our survey of background assumptions.

5 Preview of Things to Come

The thesis has three objectives. The first objective is to account for the puzzles listed in section 1. The key to solving the problems is a surface-compositional analysis of the German distributive element jeweils, and in particular of adnominal jeweils with its distance-distributive behaviour. The second objective of this thesis is to provide a unified cross-linguistic analysis of distance-distributivity for a number of related and not so related languages. The third objective is to show that an integrated syntactic and semantic account of the phenomenon is preferable to purely syntactic accounts.

Chapter II introduces the basic facts from German and other languages with distance-distributive elements. The chapter provides evidence for the assumption that jeweils occurs both in adverbial and in adnominal position. Second, the chapter shows that distance-distributivity with adnominal elements (as illustrated in (2)) is not restricted to German and English, but that it is attested in a range of languages. This observation makes distance-distributivity a cross-linguistic phenomenon which needs accounting for.

Chapter III presents the syntactic analysis of jeweils. The major part of the chapter is devoted to the analysis of adnominal jeweils, which is the interesting case due to its apparent distance-distributivity. It is argued that adnominal jeweils is a regular QP which is base-generated in postnominal position of a complex DP, and moves overtly to DP-initial position. Distance-distributivity is shown to be only a spurious phenomenon. The structure of DPs containing jeweils is argued to be identical to that of other German DPs that contain postnominal (quantificational) modifiers. The last part of the chapter extends the analysis to other languages. It is shown that a unified cross-linguistic analysis of distance-distributive constructions is possible, and that most observable differences between languages reduce to principled syntactic differences.

Chapter IV presents the semantic analysis of jeweils. It is shown that both adverbial and adnominal jeweils can be interpreted as generalised quantifiers. The difference in meaning stems from the difference in syntactic position, thus accounting for the ambiguity puzzle. Second, it is shown that adnominal jeweils can be interpreted compositionally in its surface position, thus accounting for the distance-distributivity puzzle. Finally, a
difference between English each and German jeweils is reduced to an interaction of semantic and syntactic factors.

Chapter V is devoted to the analysis of adverbial readings with adnominal jeweils. First, the discussion focusses on general licensing conditions for the availability of adverbial readings with adnominal elements. The discussion proceeds to show that the adverbial reading of adnominal jeweils can be derived from surface structure, using a newly introduced semantic mechanism of crosswise $\lambda$-abstraction. In a third step, the analysis is applied cross-linguistically, suggesting that crosswise $\lambda$-abstraction is a universal semantic process. Finally the semantic mechanism of crosswise $\lambda$-abstraction is shown to be applicable in a range of constructions which are at first sight unrelated to constructions with jeweils.

Chapter VI summarises the main results of the thesis.
Chapter II  

Introducing *jeweils*

This chapter serves as the starting point of the thesis. It presents the main data to be analysed, and it develops the main questions to be addressed. The thesis aims (among other things) at a complete syntactic and semantic account of the German distributive quantifier *jeweils* ‘each’, and therefore we will start out with an overview over the main properties of *jeweils* in section 1. One of the findings of section 1 will be that *jeweils* occurs both adverbially and adnominally, leading to different interpretations. Section 2 will tease apart the adnominal and adverbial occurrences of *jeweils* in more detail. The second important finding of section 1 is that the adnominal occurrence of *jeweils* shows the behaviour of what was called distance-distributivity in chapter I. Unlike other adnominal distributive quantifiers, adnominal *jeweils* appears not to form a syntactic constituent with its restriction. Instead, it appears to form a constituent with the distributive share, which comes in the shape of a non-specific DP. The ambiguity of *jeweils* and the distance-distributive behaviour of adnominal *jeweils* lead up to the two main questions to be addressed in chapters III and IV:

(1) i. Is the ambiguity of *jeweils* structural or lexical in nature?
   ii. Can the distance-distributive behaviour of adnominal *jeweils* be analysed surface compositionally?

Chapters III and IV will provide answers to the questions under (1). It will become apparent that adnominal and adverbial *jeweils* have the same meaning underlyingly. The observed ambiguity must therefore be structural in nature. The different readings results from a different syntactic position of *jeweils*. Furthermore, chapters III and IV will show that a surface compositional analysis of adnominal *jeweils* is feasible, given certain assumptions about the syntactic structure and the semantics of adnominal *jeweils*.

Sections 3 and 4 will set the discussion of *jeweils* on a broader empirical footing. It will be shown that the properties of *jeweils* are observable with other elements, both intra- and cross-linguistically. Section 3 discusses the class of *s*-expressions, such as *höchstens* ‘at most’ and *wenigstens* ‘at least’. Members of this class share with *jeweils* the morphological make-up and the cross-categorial (i.e. adverbial and adnominal) distribution, which is accompanied by semantic ambiguity. Section 4 shows that distance-distributivity is a more general phenomenon that is observable in a variety of languages. Examples from different languages are presented, and a number of recurring patterns are observed. As such, section 4 will provide the base for a general theory of the syntactic and semantic properties of distance-distributivity, the beginnings of which are sketched in chapters III (for the syntax) and IV and V (for the semantics). The main claim to be defended throughout the thesis is found in (2):

(2) The Distance-Distributivity Hypothesis:

Distance-Distributivity is only a superficial phenomenon. All instances of apparent distance-distributive quantifiers are reducible to regular adnominal quantifiers.
The chapter concludes with a brief overview over previous analyses of distance-distributivity (mostly focussing on English *each*) in section 5.

1 Properties of *jeweils*

The German distributive quantifier *jeweils* exhibits the following syntactic and semantic properties:

1.1 Adverbial and Adnominal Occurrence

*Jeweils* occurs both adverbially and adnominally. The adverbial occurrence is shown in (3a), the adnominal occurrence is shown in (3b).

(3) a. …weil Peter *jeweils* verloren hat.
    because Peter *each.time* lost has
    ‘…because Peter has lost each time.’

b. Die Jungen haben gerade *jeweils* zwei Würstchen bestellt.
    the boys have just *each* two sausages ordered
    ‘The boys have just ordered two sausages each.’

In (3a), there simply is no nominal category to which *jeweils* could be attached. I assume that *jeweils* in (3a) is adjoined to the VP, which contains the subject trace in line with the VP-internal subject hypothesis (Koopman & Sportiche 1985). More arguments in favour of VP-adjunction of adverbial *jeweils* are provided in section 2, and in chapters III.1, and IV.1. In contrast, *jeweils* forms a constituent with the numeral object in (3b). This is shown by the fact that the entire constituent can be displaced, e.g. under passivisation.

(4) [Jeweils zwei Würstchen], werden gerade von den Jungen bestellt.
    each two sausages are just by the boys ordered
    ‘Two sausages are being ordered by each of the boys.’

More arguments in favour of the constituency of *jeweils* and the numeral NP in (4) are provided in chapter III.2.

1.2 Ambiguity

The English paraphrases of (3ab) show that adverbial and adnominal *jeweils* give rise to two different readings. As a first approximation, *jeweils* distributes the proposition expressed by the clause over a set E of events when it occurs adverbially. The restricting set of events is provided by the context. On this use, *jeweils* corresponds to English *each time*, *at a time*. When *jeweils* occurs adnominally, it functions like English binominal *each* in the paraphrase of (1b). Like binominal *each* (Choe 1987:3), adnominal *jeweils* establishes a distributive relation between two arguments. In (3b), *jeweils* distributes sets of two sausages over atomic members of the set denoted by *die Jungen* ‘the boys’.

Introducing the notions ‘Distributive Key’ (DistKey) and ‘Distributive Share’ (DistShare), the distributive relations in (3ab) are schematised in (5ab). DistKey refers to the set over which the distribution takes place (i.e. it refers to the restriction of the

---

1 The term ‘binominal *each*’ was coined by Safir & Stowell (1988). Other terms found in the literature are ‘shifted *each*’ (Postal 1975), and ‘anti-quantifier *each*’ (Choe 1987, see also section 1.4).
universal quantifier). DistShare refers to the (set of) object(s) that are distributed over the DistKey.²

(5) a. [Event] DistKey jeweils[proposition] DistShare (adverbial reading)
    b. [NPplur] DistKey jeweils[NPnum] DistShare (adnominal reading)

A more formal representation of the readings of (3ab) is given in (6ab). The distributive effect is captured by the presence of the universal quantifier ‘∀’.

(6) a. ∀e [relevant’(e)] → peter-has-lost’(e)]
    b. ∀x [boy’(x)] → ∃Y [2sausages’(Y) & ordered’(x,Y)]

(6a) reads as ‘Every relevant event e is such that Peter has lost in e.’ (6b) reads as ‘For each boy x there is a set of two sausages Y such that x ordered Y.’ In what follows, I will refer to the reading in (6a) as the ‘adverbial reading’ for obvious reasons.³ Similarly, I will refer to the reading in (6b) as the ‘adnominal reading’.

In many cases, a single occurrence of jeweils can be interpreted either adverbially or adnominally. Sentence (7a) is a case in question. It is ambiguous between the adverbial reading in (7b) and the adnominal reading in (7c).

(7) a. …, weil die Jungen jeweils zwei Bücher kauften.
   b. ‘…because the boys bought two books each time / at a time.’
   c. ‘The boys bought two books each.’ = ‘Each of the boys bought two books.’

In section 2, I argue that the two readings in (7bc) are derived from different syntactic surface structures, making (7a) a case of structural ambiguity. In the semantic analysis in chapter IV, it will be shown that both instances of jeweils have the same underlying meaning. Given this, the ambiguity of (7a) is solely the product of the different syntactic position of jeweils.

² Unfortunately, there is considerable terminological confusion in the literature. The terminology used here is closest to Choe’s (1987), who refers to DistKey and DistShare as ‘Sorting Key’ and ‘Distributive Share’ respectively. Safir & Stowell (1988) use the notions ‘R(ange)NP’ and ‘D(istributing)NP’, Link (1986/98) uses ‘distributive domain’ and DistShare.
³ jeweils can give (marginally) rise to a seemingly different adverbial reading which is discussed in Gil (1982:16), and which can be paraphrased as in threes in English. Imagine a scenario in which a physicist can shoot many pairs of electrons at each other with one push of the button. (i) is felicitous in this scenario.

(i) Der Physiker schoss mit einem Knopfdruck jeweils zwei Elektronen aufeinander.
   ‘The physicist shot the electrons at one another in pairs of two with one push of the button.’

In my view, German (i) does not necessitate the assumption of a third reading for jeweils. jeweils could be taken to distribute pairs of electrons over an unspecified set of locations (e.g. the places of collision). Or, the string jeweils zwei Elektronen ‘each two electrons’ could be represented as Gruppen von jeweils zwei Elektronen ‘groups of two electrons each’. In both cases, we deal with an instance of adnominal jeweils, as will be shown in due course.

⁴ One may wonder why (3b) is not ambiguous as well. In section 2, it will be shown that the adverbial reading is blocked by the presence of the imperfectivity marker gerade ‘just, right now’, which states the existence of an ongoing event, and consequently excludes an each time-interpretation that is compatible (in present tense) only with generic or iterable event readings.
1.3 Morphosyntactic Complexity

A further property of the distributive element *jeweils* is its morphosyntactic complexity. *Jeweils* consists of three parts, as indicated in (8).

(8) je-weil-s

The first morpheme *je* is attested as a free form from the 9th century onwards (Kluge 1999: 410). The second morpheme *weil(e) ‘time, while’ is a nominal form. Finally, *jeweils* contains the bound suffix –s, which is found with other adnominal/adverbial expressions such as *wenigsten-s ‘at least’, or with temporal and locative adverbials such as *abend-s ‘in the evening’, and *diesseit-s ‘on this side’. The suffix -s is a genitive marker. In chapter IV, it is argued that the genitive marking on *jeweils* expresses semantic content. The existence of genitive adverbials in German supports this view. In (9), it seems to be the genitive marking that expresses a relation. This relation can alternatively be expressed by a preposition proper, as witnessed by the minimal pairs in (9).6

(9) a. (des) abend-s = am Abend b. dies-seit-s = auf dieser Seite
c. jeden-falls = auf jeden Fall

The relation-denoting function of genitives will become important for the semantic analysis of *jeweils* in chapter IV. Also note that the genitive case marking suggests a nominal status of the string *jeweil-*, since only nominal phrases can be case-marked. The nominal status of *jeweil-* is supported by the fact that it can be suffixed with –ig(e). The suffix –ig(e) usually combines with bare nouns (11a). But it can also attach to compounds that consist of a head noun plus a prenominal modifier that can be adjectival, prepositional, or determiner-like in nature (11bc) (cf. Booij 1995:4)

(11) a. [λ [N gier]- ig]  b. [λ [P aus [N häus]]- ig]  c. [λ [D dies [N seit]] – ig]

‘greedy’  ‘out of the house’  ‘being on this side’

The data in (11) suggest that the complex form *jeweil-* is a complex nominal expression that consists of a head noun and a prenominal element. We will come back to the internal...
structure of *jeweils*, and its categorial status in chapter III. The morphological make-up of *jeweils* will play a prominent role in the analysis to be developed.

1.4 Distance-Distributivity

The most striking property of adnominal *jeweils* is its behaviour as an “anti-quantifier”. The term comes from Choe (1987), who uses it to refer to a similar phenomenon in Korean and to binominal *each* in English. Even though I will replace the notion of ‘anti-quantifier’ shortly, the term may serve to highlight the peculiar behaviour of these elements. While regular quantifying determiners such as *jeder* ‘each’ take the restriction-denoting element (the DistKey) as their syntactic complement, ‘anti-quantifiers’ seem to stand at a distance to their DistKey, forming a constituent with the DistShare instead. This is schematised in (12ab).

\[
\begin{align*}
\text{(12) a. } & \text{ jeder [Dist-Key]} & \cdots & \text{[DistShare]} & \text{ (distributive quantifier)} \\
& \text{ [Dist-Key]} & \cdots & \text{jeweils [Dist-Share]} & \text{ (distributive anti-quantifier)}
\end{align*}
\]

Sentences with ‘anti-quantifiers’ are a challenge to compositional analyses because their readings are often truth-conditionally equivalent to those of sentences with regular quantifiers even though their (surface) syntax appears to be fundamentally different. Consider (13), which has the same truth conditions as (3b), but which differs syntactically from (3b).

\[
\begin{align*}
\text{(13) a. } & \text{ Jeder Junge} & \text{ hat gerade zwei Würstchen bestellt.} & \text{ each boy has just two sausages ordered} \\
& \forall x \left[ \text{boy}'(x) \rightarrow \exists Y \left[ (2(Y) \& \text{sausages}'(Y) \& \text{ordered}'(x,Y)) \right] \right] \\
\text{b. } & \text{ Die Jungen haben gerade jeweils zwei Würstchen bestellt.} & \text{ the boys have just each two sausages ordered} \\
& \forall x \left[ \text{boy}'(x) \rightarrow \exists Y \left[ (2(Y) \& \text{sausages}'(Y) \& \text{ordered}'(x,Y)) \right] \right]
\end{align*}
\]

To put it another way, two different syntactic (surface) structures receive the same interpretation. In chapters III and IV, we will explore whether this truth-conditional equivalence should be accounted for in syntactic, and/or in semantic terms. As will become clear in the course of the discussion, ‘anti-quantification’ is only a superficial phenomenon, and the syntactic behaviour of the ‘anti-quantifier’ *jeweils* is not as dramatically different from that of the quantifier *jeder* as appears on first sight. In section 4, I show that elements with the behaviour of ‘anti-quantifiers’ exist in a variety of related and unrelated languages. The syntactic and semantic differences observed are systematic in nature. From the perspective of universal grammar, this argues for a unified cross-linguistic analysis, the beginnings of which will be developed in chapter III.5.

As mentioned above, I would like to replace Choe’s term “anti-quantifier” with the notion of distance-distributivity. There are three reasons for this. First, the term ‘anti-quantifier’ is somewhat misleading in that it suggests that constructions with these elements involve no quantification. We have seen above, however, that the distributive effect with adnominal *jeweils* is due to universal quantification. Second, “anti-quantification” seems to be exclusively found with distributive quantifiers. Third, some languages (e.g. Bulgarian) employ non-quantifiers to mark “anti-quantification”, suggesting the use of a more neutral terminology. Nonetheless, the claim that the
phenomenon of distance-distributivity is only a superficial phenomenon stands, no matter how we choose to refer to it.

It is important to point out that the term ‘distance-distributive element’ is reserved exclusively for elements that form a constituent with a nominal DistShare expression (cf. 12b). Crucially, it does not apply to elements that are commonly referred to as floated quantifiers (Sportiche 1988). In 1.10, I show that distance-distributive elements differ from floated quantifiers in important respects. Consequently, I consider distance-distributive elements (in the sense defined here) and floated quantifiers as two different elements with different properties.7

1.5 Co-occurrence Restrictions on Adnominal jeweils

While adverbial jeweils can adjoin to any VP, adnominal jeweils is subject to two co-occurrence restrictions. First, the DistKey has to be expressed by a plural expression that denotes a group or set of individuals (cf.14a). With no plural expression present, as in (14b), only the adverbial reading is possible.

\[(14)\] Plural Restriction on DistKey:

a. Die Jungen / Zwei Jungen / Peter und Klaus / kaufen jeweils zwei Bücher.
   The boys / two boys / P. and K. buy each two books
   ‘The boys / two boys / Peter and Klaus are buying two books each.’

b. Peter / der Junge kauft jeweils zwei Bücher.
   Peter / the boy buys each.time two books
   i. ‘Each time, Peter / the boy buys two books.’
   ii.* ‘Peter / the boy buys two books each.’

The plural restriction on DistKey is semantic in nature. Recall that adnominal jeweils distributes sets denoted by the DistShare over atomic members of the pluralic set denoted by the DistKey. Distribution is impossible if the DistKey is a singular DP and denotes an atomic individual, for there is nothing to distribute over in this case. Any semantic account of adnominal jeweils must account for this restriction.

The second restriction concerns the DistShare. The DistShare must be expressed in form of an indefinite expression (cf.15a). With definite expressions, or with expressions headed by strong quantifiers (cf. Barwise & Cooper 1981, de Hoop 1995), only the adverbial reading is available (cf.15b).8

7 The term ‘distance-distributive’ element is also reminiscent of the phenomenon of ‘quantification at a distance’ in French, which is discussed in Doetjes (1997: ch.10) and illustrated in (i):

\[\text{(i)}\] Jean a beaucoup lu de livres.
   Jean has a-lot read of books ‘John has read a lot of books.’

In (i), the quantifying element beaucoup ‘a lot’ also occurs at a distance to its restriction de livres. However, it seems to me that the two phenomena are unrelated and should be treated separately.

The term ‘indefiniteness restriction’ is not quite correct in two respects. First, adnominal jeweils cannot occur with indefinite mass term as DistShare, as in (ia). And second, adnominal jeweils can occur with syntactically definite expressions as DistShare, as long as these have a non-specific, or type-denoting interpretation as in (ib).

   the boys buy just each sugar

b. Die Mädchen haben jeweils die beste Freundin (von sich) eingeladen
   the girls have each the best girlfriend of REFL invited
   ‘The girls have invited their best girlfriend each.’

Both (iab) seem to follow from semantic reasons: The DistShare of adnominal jeweils must denote a predicate over sets of atomic entities, thus excluding (ia) and including (ib). See also fn.9. With the necessary qualifications in place, I will go on to use the term ‘indefiniteness restriction’.
**Indefiniteness Restriction on DistShare:**

   *The boys love two / several / some / many women each.*

b. Die Jungen lieben jeweils die/ jede/ alle Frau(en).
   *The boys love the / every / all woman/en each time.*

In chapter IV.5, I argue that this restriction is semantic in nature as well. Adnominal *jeweils* requires a predicate-denoting expression as its first argument.\(^9\) Let us add immediately that the possible co-occurrence of adnominal *jeweils* and genuine adjectives like *verschiedene* ‘different’ shows that *jeweils* is not restricted to occur with numerals or other quantificational adjectives.

### 1.6 Adnominal *Jeweils* in Subject Position

A further interesting property of adnominal *jeweils* that sets it apart from English binominal *each* is that it can – unlike the latter (cf. Burzio 1986, Stowell & Safir 1988) – occur with the underlying subject of a clause. In this case, the subject DistShare can distribute ‘backwards’ over the object DistKey.\(^{10}\)

   *Each ballerina was accompanied home by one officer.*

b. *One officer each accompanied the ballerinas home.*

To be sure, any analysis of adnominal *jeweils* should say something about this difference. In III.5.4.2, this difference will be attributed to a difference in the syntactic feature content of *jeweils* and *each*.

### 1.7 The Clausemate Condition on Adnominal *Jeweils*

The DistKey of adnominal *jeweils* is subject to a locality restriction. Adnominal *jeweils* can only distribute over a clausemate co-argument, but not over plural DPs in a higher clause. This is shown for adnominal *jeweils* in object position in (17a), and in underlying subject position in (17b). The DistKey status of the matrix subject *die Verkäufer* ‘the store clerks’ is indicated by co-indexation with *jeweils*.

---

\(^9\) The co-occurrence of adnominal *jeweils* with the quantifying expression *genau zwei Frauen* ‘exactly two women’, which is not easily construable as a (second order) predicate over sets, seems to pose a problem for the restriction to predicates.

(i) Die Jungen lieben jeweils genau zwei Frauen.
   *The boys love exactly two women each.*

However, closer inspection shows that the sequence *genau n NP* ‘exactly n NPs’ can be used as a predicate nominal, a diagnostic for predicative expressions (cf. Higginbotham 1987, Stowell 1991, Winter 1999):

(ii) Das sind genau zwölf Kerzen.
   *These are exactly twelve candles*

These are exactly twelve candles

\(^{10}\) (16) has an additional reading that will be discussed in chapter V.
   the store clerks say that Peter just each a balloon bought has 
   **The store clerks say that Peter has just bought a balloon each.’

   b.* Die Verkäufer sagen, dass jeweils zwei Jungen einen Ballon gekauft haben. 
   the store clerks say that each two boys a balloon bought have 
   **The store clerks say that two boys each have bought a balloon.’

The same holds for English binominal each (cf. Choe 1987). In chapters IV.5 and V.3, the 
clausemate condition is shown to follow from semantic factors. It is shown that the 
semantics of adnominal jeweils allow for no meaningful semantic interpretation for (17ab) 
even though the structures are syntactically well formed.

1.8  Adnominal jeweils can Distribute over Non-DPs
Another interesting property of adnominal jeweils is that it is quite flexible regarding the 
syntactic and semantic nature of its DistKey. Moltmann (1997) shows that adnominal 
jeweils does not necessarily distribute over pluralities of individuals denoted by a DP, as 
in (18a). It can also distribute over pluralities of events which are expressed e.g. by verb 
conjunction, as in (18b). I will refer to this observation as ‘Moltmann’s observation’.

(18)  a. Peter und Maria kauften jeweils zwei Bücher. 
   P. and M. bought each two books 
   ‘Peter and Maria each bought two books.’

   b. Peter hat Maria aus jeweils zwei Gründen kritisiert und gelobt. 
   Peter has Maria for each two reasons criticised and praised 
   ‘Peter has criticised and praised Maria for two reasons respectively.’

Again, this property sets German adnominal jeweils apart from English binominal each, 
which does not have this use. In English, respectively must be used instead.

1.9  The Short Form je
The morphological complexity of jeweils from 1.3 is supported by the existence of a short 
form je.

(19)  Die Jungen haben je zwei Bücher gekauft. 
    the boys have each two books bought 
    ‘The boys bought two books each.’

The short form je has drawn some attention in the literature (cf. Link 1986/98, Choe 1987, 
Moltmann 1991, Sauerland 2001). What is important here, is that je can be shown to be 
the short form of adnominal jeweils when used as a distributive element.11 Distributive je 
can occur in all and only in those positions where adnominal jeweils occurs. The short 
form je is excluded from adverbial position in (20a). In (20b), the adverbial reading is 
absent, showing that je cannot be a substitute for adverbial jeweils (see also Link 1986/98: 
123).

11 Je has other uses as a free form. In (ia), it functions as a negative polarity item licensed by the question mood. In (ib), it introduces a correlative structure.

   (i)  a. Bist du je in New York gewesen? 
        are you ever in NY been 
        ‘Have you ever been to New York?’

   b. Je kälter es wird, desto dunkler wird es. 
      the colder it gets, the darker gets it 
      ‘The colder it gets, the darker it gets.’
INTRODUCING JEWEILS

(20) a. Peter hat je*(weils) gewonnen.
P. has each(time) won
‘Peter has won each time.’
b. …, weil die Jungen je zwei Bücher kauften.
because the boys each two books bought
‘…because the boys have bought two books each.’

The data in (20) clearly show that je is the short form of adnominal jeweils only.

1.10 Adnominal Jeweils ≠ Floating Quantifier

Before going on, it is necessary to point out that adnominal jeweils is not a floated quantifier. The question arises because in many cases the adnominal reading of jeweils (cf.21b) is truth-conditionally equivalent to that of the floated distributive quantifier jeder ‘each’ (cf.22b).

(21) a. …, weil die Jungen jeweils zwei Würstchen kauften.
because the boys each two sausages bought
‘…because the boys bought two sausages each.’
b. ∀x [x ∈ [[the boys]] → ∃Y [two_sausages′(Y) & bought′(x,Y)]]

(22) a. …, weil die Jungen jeder zwei Würstchen kauften.
because the boys each two sausages bought
b. ∀x [x ∈ [[the boys]] → ∃Y [two_sausages′(Y) & bought′(x,Y)]]

Two influential positions on floated quantifiers can be found in the literature. The first account goes back to Sportiche (1988) and treats floated quantifiers as genuine adnominal quantifiers that are stranded by an NP complement, which acts as restrictor semantically, and has moved to some case position overtly. The second account goes back to Dowty & Brodie (1984) and treats floated quantifiers as adverbial elements that are adjoined to VP and distribute the predicate denotation over a pluralic NP-antecedent. The two positions are illustrated in (23).

(23) a. [Die Jungen] _i_ haben [VP _i_ jeder _i_ [ _V_ der Raum verlassen]].
the boys _i_ have each _i_ the room _i_ left
b. [Die Jungen] _i,j_ haben [VP jeder, [ _V_ der Raum verlassen]].
the boys _i,j_ have each the room left

For our purposes it does not matter which analysis is more adequate, for it is easy to show that adnominal jeweils has properties different from that of floated jeder.

To begin with, the two elements differ in form, with jeder being formally identical to the quantifying determiner. Second, both accounts of floated quantification locate the floated quantifier jeder at the edge of VP (either in SpecVP, or adjoined to VP). This is not the position of adnominal jeweils, which cannot be adjoined to VP because it forms a constituent with the object DP inside VP. As a result, adnominal jeweils can front with the DP, as shown in (4), repeated as (24a). A similar fronting of floated jeder and an object DP is impossible, as shown in (24b) (see section 2 and chapter III.2 for more arguments to this effect).

12 An exhaustive list of proponents of both accounts is found in McCloskey (2000).
Third, floated jeder can occur with intransitive predicates (25a), whereas adnominal jeweils cannot. (25b) has only an adverbial reading on which the boys left each time (either individually or together).


The boys are each left  the boys are each time left
‘The boys have each left.’  ‘The boys left each time.’

Fourth, adnominal jeweils cannot combine with definite object NPs, whereas floated jeder can. Again, (26b) differs in reading from (26a) in that it only allows for the adverbial reading on which the boys have left the room each time (either individually or together).

(26) a. Die Jungen haben jeder den Raum verlassen.

The boys have each the room left  ‘The boys have each left the room.’

b. Die Jungen haben jeweils den Raum verlassen.

Each time, the boys left the room.’

Fifth, adnominal jeweils can occur embedded inside another nominal constituent (27a). In contrast, floated jede(r) must occur at the edge of VP (27b).

(27) a. [Die Mütter [von jeweils zwei Söhnen]] wurden geehrt.

The mothers of each two sons were honoured  ‘Mothers, which had two sons each, were decorated.’

b. *[Die Mütter [von jede zwei Söhnen]] wurden geehrt.

The mothers of each two sons were honoured

I take this to be sufficient evidence that German adnominal jeweils is not a floated quantifier at the edge of VP. Therefore, there is no reason for assuming that adnominal jeweils should have the semantics of the floated distributive quantifier.

1.11 Summary of Properties

This concludes our preliminary survey of the syntactic and semantic properties of jeweils that any analysis needs to account for. These are in short:

(28) i. Its cross-categorial occurrence in adnominal and adverbial position (1.1).

ii. Its ambiguity between an adnominal and an adverbial reading (1.2).

iii. Its morphosyntactic complexity (1.3).

13 Some of these tests are taken from Sakaguchi (1998:60ff), who shows that English binominal each differs from English floated each along the same lines. See also Junker (1995) for similar differences between French binominal chac-un(e) ‘each’ and floated chac-unt(e) ‘each’.
iv. The distance-distributive nature of adnominal *jeweils* (1.4).
v. The co-occurrence restrictions on adnominal *jeweils* (1.5).
vi. The occurrence of adnominal *jeweils* with underlying subjects (1.6).
vii. The clausemate condition on adnominal *jeweils* and DistKey (1.7).
viii. The flexibility of adnominal *jeweils* regarding the syntactic and semantic nature of its DistKey (1.8).
ix. The existence of a short form *je* for adnominal *jeweils* (1.9).
x. Adnominal *jeweils* is not a floated quantifier (1.10).

We now turn to the syntactic distribution of *jeweils* and its two readings in detail.

2 Teasing Apart the Two Occurrences of *Jeweils*

In (7ab) above, it was shown that some instances of *jeweils* are ambiguous between an adverbial and an adnominal reading. This fact is illustrated again in (29), with the semiformal paraphrases in (29ab).

(29)  Die Jungen haben jeweils zwei Würstchen gekauft.

the boys have each two sausages bought

a.  $\forall x [\text{boy}'(x) \rightarrow \exists e [x \text{ bought two sausages in } e]]$

b.  $\forall e [\text{relevant}'(e) \rightarrow \exists e' [e' \text{ is related to } e \& \text{ the boys bought 2 sausages in } e']]$

In this section, it will be shown that the two readings of (29) are derived from different syntactic surface structures. This claim is captured by the hypothesis in (30)

(30)  The Syntactic Ambiguity Hypothesis:

Adverbial and adnominal *jeweils* are located in different syntactic positions.

The strongest argument for the hypothesis in (30) comes from the fact that both instances of *jeweils* can co-occur. If this happens, the first (and presumably higher) occurrence of *jeweils* must be interpreted adverbially, the second adnominally.

(31)  Die Jungen haben jeweils jeweils zwei Würstchen gekauft.

the boys have each.time each two sausages bought

‘Each time, the boys have bought two sausages each.’

Furthermore, it is possible to isolate occurrences of *jeweils* that only give rise to the adverbial reading, and others which only give rise to the adnominal reading. These occurrences can be shown to differ in syntactic structure. In other words, there are configurations in which *jeweils* can only be interpreted adverbially, and configurations in which it can only be interpreted adnominally. It follows that the ambiguity of *jeweils* cannot simply be lexical in nature, but that its syntactic position plays a role.

Due to the ambiguous nature of *jeweils*, it is often difficult to decide if a certain reading is present or absent in a given configuration. In order to control for the readings, we will make use of some semantic constraints on *jeweils*. In section 1.5, adnominal readings were shown to be impossible without a plural DistKey and/or an indefinite
DistShare. This is the case in (32a). Adverbial readings, on the other hand, are impossible in the presence of the imperfectivity marker gerade (cf.32b).\(^{14}\)

    Peter loves each this woman
 b. *Peter niest (gerade jeweils) / (jeweils gerade) heftig.
    Peter sneezes just each.time / each.time just loudly

The restrictions on adnominal and adverbial jeweils allow for the predictions in (33):

(33)  i. In the presence of gerade ‘just’, only the adnominal reading is possible (if at all).
    ii. In the absence of a plural DistKey and/or an indefinite DistShare, only the adverbial reading is possible (if at all).

In what follows, I will use the two diagnostics in (33) in order to control for the presence or absence of adverbial and adnominal reading.

2.1 Adverbial Jeweils

Using the diagnostics in (33i,ii) as controlling factors, the following observations can be made. First, adverbial readings are possible if jeweils can be construed as being attached to VP. As a result, adverbial readings are possible with jeweils in intransitive sentences.

(34)   Peter hat jeweils \[VP heftig geniest\].
    Peter has each.time strongly sneezed
    ‘Each time, Peter sneezed strongly.’

The absence of an object DP in (33) leaves no choice but to treat jeweils as an adverb adjoined to VP (see also the discussion of the syntactic position of quantifying adverbs in chapter III.1).

Conversely, adverbial readings are absent if it is impossible to construe jeweils as being adjoined to VP, e.g. if jeweils is embedded deep inside another DP. This is illustrated in (35a), which differs in meaning from (35b). (35a) only allows for the adnominal reading, while (35b) must be interpreted under the adverbial reading (as witnessed by the ungrammaticality with gerade).

(35)  a. Es werden (gerade) \[DP die Mütter von jeweils zwei Söhnen\] geehrt.
    It are just the mothers of each two sons honoured.
    ‘Mothers that have two sons each are (being) honoured.’

\(^{14}\) The ungrammaticality of (32a) suggests that the use of stative verbs such as liebt ‘loves’ also blocks the adverbial reading, and could therefore be utilised as a possible control factor for adnominal readings. However, the use of stative verbs is not reliable as a diagnostic as the imperfectivity marker gerade. For instance, the blocking effect of the stative verb liebt ‘loves’ in (32a) evaporates as soon as we replace the definite object with an indefinite one, and change the tense to past (ia). In contrast, the blocking effect with gerade ‘just’ remains robust (ib).

(i) a. Peter liebte jeweils eine Frau.
    Peter loved each.time a woman
 b. *Peter liebte gerade jeweils eine Frau.
    Peter loved just each.time a woman
   It are just each time the mothers of two sons honoured.
   ‘Each time, the mothers of two sons are (*being) honoured.’

That (35a) only allows for the adnominal reading becomes clearer if we substitute *die Mütter ‘the mothers’ with the singular *die Mutter, as in the ungrammatical (36a).

       It is just the mother of each two sons honoured.
       It is just each time the mother of two sons honoured.
   ‘Each time, the mother of two sons is (*being) honoured.’

Since adnominal *jeweils requires a plural expression as DistKey, the adnominal reading is impossible for (36a). The adverbial reading is impossible as well because *jeweils is not in a position adjoined to VP. In this respect, (36b) differs from (36a) because *jeweils is outside the DP and free to adjoin to VP. As a result, the adverbial reading is possible in (36b).

Analogous facts are observed with respect to the relative order of *jeweils and prepositions. In (37a), *jeweils occurs embedded inside a directional PP, and the sentence is ungrammatical. In (37b), *jeweils occurs outside the PP and is free to adjoin to VP, and the sentence is grammatical:

(37)  a. *Der Papst fuhr [PP nach jeweils Armenien].
       the Pope went to each time Armenia
   b. Der Papst fuhr jeweils [PP nach Armenien].
       the Pope went each time to Armenia

The data in (35)-(37) show, then, that *jeweils cannot be interpreted adverbially if it is embedded inside an (object) DP, or if it is embedded inside a PP. The adverbial reading is possible only if *jeweils is in a position in which it can be adjoined to VP. This state of affairs is summarised in (38):

(38)  Syntactic Restriction on Adverbial Readings with Jeweils:
      Adverbial readings are possible only if *jeweils can be adjoined to VP.

2.2  Adnominal Jeweils

Turning to adnominal *jeweils, the obligatory presence of an indefinite DistShare expression suggests that this instance of *jeweils stands in a close semantic and syntactic relation to this expression. Indeed, the data in (39) suggest that adnominal *jeweils must be adjacent to the DistShare. In (39a) *jeweils is adjacent to a direct object, in (39b) to an indirect object, in (39c) to a prepositional object, in (39d) to a subject. Notice that all sentences allow for insertion of the imperfectivity marker gerade ‘just’, showing that the adnominal reading is present.

(39)  a. Die Jungen haben jeweils zwei Würstchen gegessen.
       the boys have each two sausages eaten
       ‘The boys have eaten two sausages each.’
b. Die Jungen haben jeweils zwei Mädchen Blumen geschenkt.
   ‘The boys have given flowers to two girls each.’

c. Der Richter hat die Angeklagten zu jeweils zwei Jahren Haft verurteilt.
   ‘The judge has sentenced the defendants to two years each.’

d. Jeweils zwei Verehrer verfolgen die einzelnen Diven.
   Each two admirers stalk the individual divas
   ‘The individual divas are being stalked by two admirers each.’

(40) presents the adjacency restriction on adnominal jeweils.

Adjacency Condition on Adnominal Readings with jeweils:
Adnominal reading with jeweils are possible only if jeweils is adjacent to the DistShare expression.

(40) correctly rules in the adnominal readings for (39a-d) as well as for (35a) above. It correctly rules out the adnominal reading for (41), which only has the adverbial reading.

(41) …, weil Peter jeweils den Mädchen zwei Würstchen gekauft hat.15
   because Peter each the girls two sausages bought has
   a. ‘…because Peter has bought the girls two sausages each.’
   b. ‘…because each time, Peter bought the girls two sausages.

(40) also rules out the adnominal reading for (42a), in which jeweils is separated from its DistShare by the exhaustivity marker alle, which marks the left edge of VP (cf. Brisson 1998).16 (42b), which meets the adjacency condition, allows for the adnominal reading.

15 (39d) shows that the DistKey does not need to c-command adnominal jeweils at surface structure. In 2.3, it is shown that adnominal jeweils can sometimes overtly move away from its DistShare. This is impossible in (41), for such movement would result in a Principle C-violation (Chomsky 1981). Under the plausible assumption that jeweils and the potential DistKey expression den Mädchen ‘the girlsDAT’ are co-indexed, the R-expression den Mädchen would be incorrectly bound by jeweils.

16 For Brisson (1998), the contribution of ‘floated’ alle/alle to the meaning of a sentence is pragmatic rather than semantic in nature. Presence of alle adds an exhaustivity requirement that ensures that every single member of the pluralic group denoted by the subject-NP takes part in the action/achievement expressed by the VP (a ‘tight fit’ in Brisson’s terms). Without presence of alle, a sentence is judged felicitous even if one (or more) member(s) of the subject-group do not take part (‘loose fit’). Consider the mini discourses in (iab), assuming that the group of boys comprises at least 10 members. (ia) without alle is fine, whereas presence of alle in (ib) requires all the boys to have jumped into the lake, without exception.

(i) a. The boys jumped into the lake. Except for John, who was ill.
   b. The boys all jumped into the lake. Except for John, who was ill.

Without going into the details of Brisson’s account, it should be noted that analysing ‘floated’ alle/alle as a modifier (and not as a quantifier proper) explains the compatibility of alle/alle with adnominal jeweils in (42b). jeweils is responsible for the distributive effect, while alle makes sure that the distribution goes over every single element of the subject denotation – without exception. If both elements were quantifiers, they would compete for the same restriction, and (42b) should be as ill-formed as (i):

(i) *Die Jungen haben gerade jeder jeweils zwei Würstchen gekauft.
   the boys have just each each two sausages bought
   ‘The boys have each bought two sausages each.’
As predicted, (42a), which only allows for the adverbial reading is incompatible with the imperfectivity marker *gerade* ‘just’. (42b) remains grammatical in the presence of *gerade*.

I conclude that (42ab) provide strong evidence for the adjacency restriction on adnominal *jeweils*.

### 2.3 Some Problems

Unfortunately, the picture is not always as clear as one would like it to be. The clear distinction between adverbial and adnominal *jeweils* is often blurred, for various reasons.

The first problem concerns the practice of using elements that are located at the left edge of VP in order to determine if an element is inside or outside of the VP. Above, I have employed the exhaustivity marker *alle* ‘all’ to this purpose. While it is true that elements to the left of such markers are certainly outside the VP, it cannot be established with certainty that elements to the right of them are located within the VP. This follows from the fact that markers of the left edge of VP in German appear to be able to freely adjoin to any VP-projection. Therefore, they can also adjoin above *jeweils* if *jeweils* is adjoined to VP itself. I assume that this is the case in (43a) where *jeweils* has an adverbial reading although it occurs to the right of the exhaustivity marker *jeweils*. The syntactic structure of (43a) is given in (43b).

\[(43)\]
\[
\begin{align*}
\text{(a)} & \quad \ldots \text{weil die Jungen alle jeweils laut geniest haben.} \\
& \quad \text{because the boys all each time loudly sneezed have} \\
& \quad \text{‘…because the boys have all sneezed loudly each time.’} \\
\text{(b)} & \quad \ldots \text{weil die Jungen \[VP alle \[VP jeweils \[VP t_t \text{ laut geniest haben}]\]}]]
\]

It follows that VP-edge markers are not a reliable diagnostic for showing that an instance of *jeweils* is not adjoined to VP. The only way to make sure that *jeweils* is not adjoined to VP is therefore to embed it inside another constituent, e.g. a DP (cf.35a), or a PP (cf.37a).

The second problem arises from an apparent violation of the adjacency condition on adnominal *jeweils*. There are instances of *jeweils* which are non-adjacent to the DistShare, but which give rise to an adnominal reading nevertheless. The availability of the adnominal reading with (44) is confirmed by the compatibility of *jeweils* with *gerade* ‘just’. Small caps on *jeweils* show that it carries main stress.

\[(44)\]
\[
\begin{align*}
\text{(a)} & \quad \text{Die Jungen haben JEWEILS gerade zwei Würstchen_{DistShare} gegessen.} \\
& \quad \text{the boys have each just two sausages eaten} \\
\text{(b)} & \quad \text{Die Jungen haben gerade JEWEILS Maria drei Blumen_{DistShare} geschenkt.} \\
& \quad \text{the boys have just each Maria three flowers given}
\]

The grammaticality of (42b) therefore supports Brisson’s analysis of ‘floated’ *alle* as an exhaustivity marker.

17 This practise was established by Diesing (1992), where, drawing on data from Hentschel (1986), the German particle *ja...doch* is used in order to determine whether a bare subject is inside or outside the VP.
Although the data in (44) appear not to be in line with the adjacency condition on adnominal jeweils at first sight, I would like to argue that this is only apparently so. First, the main stress on jeweils in (44ab) argues for a prominent discourse status of jeweils. Such prominent discourse status is often the result of overt scrambling, which I assume must have taken place in (44ab). The structures of (44ab) are shown in (45ab), where the trace of jeweils is adjacent to the DistShare.

(45)  

a. ... jeweils₁ gerade [t₁ drei Würstchen\textsubscript{DistShare}] gegessen  
b. ... gerade jeweils₁ Maria [ t₁ drei Blumen\textsubscript{DistShare}] geschenkt.

The adjacency condition must be weakened accordingly. The revised version is found in (46).

(46)  

\textit{Adjacency Condition on Adnominal Readings (revised version):}  
Adnominal readings with jeweils are possible only if jeweils or its trace is adjacent to the DistShare.

(46) accounts for the fact that adnominal jeweils can move away from its DistShare, just like dative possessors “which run away from home” in Hungarian (Szabolcsi 1983). The syntactic analysis of adnominal jeweils developed in chapter III. predicts the possibility of such movement of jeweils.

If movement lies at the heart of the superficial non-adjacency of adnominal jeweils and the DistShare, the adnominal reading should not be available if a syntactic barrier, which would block movement, separates jeweils and a potential DistShare. This prediction is borne out, as witnessed by the ungrammaticality of (47ab). In order to give rise to an adnominal reading, jeweils would have to move out of a complex noun phrase in (47a), and out of a coordinate structure in (47b), both islands for movement (Ross 1967).

(47)  

a. * Die Wachen leugnen gerade JEWEILS die Tatsache, dass zwei Gauner geflohen sind.  
   *’The guards are denying the fact that two bandits each have fled.’  

b. ??Die Jungen haben JEWEILS gerade zwei Popstars und ET gesehen.  
   ?’The boys have just seen two popstars each and ET.’

The third problem concerns the fact that under certain conditions adnominal jeweils can distribute over a contextually given set of events as well. In (48), jeweils gives rise to what looks like an adverbial reading.

(48)  

Der Papst ist in jeweils drei Länder gefahren.  
‘The Pope has travelled to three countries each.’

\footnote{(47b) may be acceptable to some speakers. I surmise that in this case the conjoined object DP is interpreted as an indefinite DP denoting unspecified groups that contain two unspecified popstars plus ET.}
What is curious about (48) is that its grammaticality depends on the presence of an indefinite DP inside the PP. Without an indefinite DP, the ‘adverbial’ reading is unavailable, and the sentence is ungrammatical. This was shown in (37a) above. The obligatory presence of an indefinite DistShare gives rise to the suspicion that the reading of (48) is really an adnominal reading in disguise. In section 1.8, it was shown that adnominal jeweils is able to distribute over pluralities of events as well as over pluralities of concrete individuals. I assume that this is what happens in (48), in the absence of an overt plural DistKey expression. Chapter V will discuss more cases of the kind illustrated in (48).

Summing up, the discussion of problematic cases has brought to light two things: First, one has to be careful with the diagnostics one employs. Second, apparent violations of the generalisations forwarded in 2.1 and 2.2, turn out to constitute no violation on closer inspection. The section as a whole may also serve to sharpen the reader’s attention regarding the various subtleties and empirical problems that may arise when investigating the syntactic and semantic nature of jeweils.19

2.4 Summary
In this section, it was shown that there are two syntactic instances of jeweils, adnominal and adverbial jeweils, which come along with their own readings. The main findings concerning the syntactic distribution of jeweils are summarised in the generalisation in (49).

(49) The Interpretation of Jeweils:
   i. If jeweils is adjoined to VP, it is interpreted adverbially.
   ii. If jeweils or its trace is adjacent to a DistShareNP, it is interpreted adnominally.

From (49) it follows that the two readings of (29), repeated as (50a), must be derived from different syntactic surface structures. (50a) is structurally ambiguous. The two structures are given in (50bc). (50b) is interpreted adverbially. (50c) is interpreted adnominally.

(50) a. Die Jungen haben jeweils zwei Würstchen gekauft.
       the boys have each two sausages bought
   b. Die Jungen haben [VP jeweils [VP t₁ [zwei Würstchen] gekauft]].
   c. Die Jungen haben [VP t₁ [jeweils zwei Würstchen] gekauft].

The structural ambiguity of jeweils will be subject to further scrutiny in chapter III, which explores the syntactic structure of adnominal jeweils (and to a certain extent adverbial jeweils) in more detail. The syntactic analysis proposed for adnominal jeweils provides the basis for the semantic analysis in chapter IV. The semantic analysis assigns adverbial and adnominal jeweils the same underlying meaning. Given this, the difference in interpretation is exclusively due to the difference in syntactic position of the two instances of jeweils.

19 Another problem arises from the fact that some speakers display a tendency to interpret jeweils as floated ‘jeder’ when it occurs in adverbial position, but when the adverbial reading is blocked for independent reasons (e.g. in the presence of the imperfective marker gerade). I have tried to exclude this possibility when possible.
In the following section, I show that this particular instance of structural ambiguity is not restricted to *jeweils*. In German, there are several other expressions that resemble *jeweils* morphologically, and that exhibit the same kind of ambiguity.

3  *s*-Expressions

This section shows that the syntactic and semantic properties of *jeweils* are shared by a (closed) number of expressions, which resemble *jeweils* morphologically. Therefore, the syntactic and semantic analysis to be developed may not only account for the specific case of *jeweils*, but for these other expressions as well. The expressions in question all share with *jeweils* the properties of being morphologically complex, of being ambiguous between an adverbial and an adnominal reading, and of being marked for genitive with an *s*-suffix (see fn.5). I will therefore refer to them as *s*-expressions. Examples are given in (51).

(51)  a. mindesten-*s* ‘at least’  b. wenigsten-*s* ‘at least’  c. höchsten-*s* ‘at most’

The ambiguity of *s*-expressions is illustrated for *wenigstens* in (52abc).

(52)  a. Peter hat wenigsten-*s* angerufen. (adverbi al)  
    Peter has at least called  
    ‘At least, Peter has called.’
  b. Peter hat mit wenigsten-*s* zwei Freunden gesprochen. (adnominal)  
    Peter hat with at least two friends spoken  
    ‘Peter has spoken to at least two friends.’
  c. Peter hat wenigsten-*s* zwei Bücher gelesen. (ambiguous)  
    Peter has at least two books read  
    i. ‘At least, Peter has read two books.’
    ii. ‘Peter has read at least two books.’

The structural correspondence with the *jeweils*-cases is clear. In (52a), *wenigstens* can only be construed as adjoined to VP, giving rise to the adverbi al reading. In (52b), *wenigstens* is adjacent to a DP and cannot be construed as adjacent to VP. The sentence only has an adnominal reading. In (52c), *wenigstens* can be construed as belonging to the object DP, or as being adjoined to VP, and the sentence is ambiguous. Similar facts hold for *mindestens* ‘at least’ and *höchstens* ‘at most’.

Interestingly, the same ambiguity is found with the English counterparts of *s*-expressions, which have the categorial status of PP. The PP-status of the English counterparts will be of some importance to the syntactic analysis of *jeweils* and other *s*-expressions in chapter III.

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20 This is not to say that the other *s*-expressions share all properties of *jeweils*. For instance, their adnominal instances do not need a plural antecedent (cf. 52b) or an indefinite DP to combine with (cf. i.).

(i) Peter hat wenigstens den Bürgermeister eingeladen.  
    Peter has at least the mayor invited  
    ‘Peter has invited at least the mayor.’

In addition, the other *s*-expressions can also occur with APs and PPs (cf. ii.).

(ii) a. Maria ist wenigstens rotblond.  b. Maria ist wenigstens bis Wittenberg gewandert.  
    Maria is at least reddish (if not red)  
    Maria has at least as far as Wittenberg hiked
The parallel syntactic and semantic behaviour of jeweils and other s-expressions suggests that the same syntactic process has formed these elements. The restricted number of s-expressions indicates that this process may not be productive any longer. At the same time, the existence of other s-expressions tells us that the behaviour of jeweils is not an idiosyncrasy in German, but the result of a general process, even if this process is not active any longer. By this, the analysis of jeweils achieves a greater degree of explanatory power and generality.

4 Distance-Distributivity Across Languages

This section aims at placing the discussion of jeweils, in particular of adnominal jeweils, within a wider, cross-linguistic context. In section 1.3, it was shown that adnominal jeweils has the properties of a distance-distributive element. It appears to form a constituent not with its restriction (the DistKey), but with its DistShare, thus posing a challenge for compositionality. As it happens, distance-distributive elements are attested not only in English and German, but also in a variety of languages from different language families. This suggests that we are not dealing with a language-specific peculiarity in the case of adnominal jeweils, but with a general phenomenon that ideally should be accounted for in a cross-linguistically unifying manner. Ideally, the analysis of adnominal jeweils should be extendable to distance-distributive elements cross-linguistically. One of the objectives of this thesis is to explore whether and how this is possible.

This section presents a range of data from related and unrelated languages and discusses cross-linguistic similarities and differences in the grammatical encoding of distance-distributivity. As will emerge, the differences appear to be systematic in nature (though problems remain). The systematic nature of the differences argues for a cross-linguistic analysis of distance-distributivity that will be undertaken in chapter III.5 (regarding the syntax), and in chapters IV.6 and V.3 (regarding the semantics). The picture to emerge may serve as a first step towards a proper and exhaustive typology of distance-distributivity.

The structure of this section is as follows. In section 4.1, I will introduce a sample list of languages that also display distance-distributivity. In 4.2, I will discuss similarities and differences in the grammatical encoding of distance-distributivity in these languages. Regarding the differences, the languages under discussion seem to fall into different classes, with some grammatical properties following from others. Section 4.3 provides a brief summary of the cross-linguistic overview on distance-distributivity.

21 This assumption is confirmed by the fact that wenigstens and jeweils seem to have developed in the same period. As pointed out in fn. 5, the first occurrences of the genitive form wenigstens ‘at least’ are attested for the 17th century. Interestingly, jeweils shows up in the same period. It is used in Grimmelshausen’s Simplicissimus from 1668 (cf. Gebrüder Grimm 1871:2362):

(i) …doch waren diese jeweils lustiger als jene, daneben aber auch trotzig, tyrannisch, mehrenteils gottlos, …

‘yet were these each merrier than those, but apart from that also more defiant, despotic, mostly ungodly…’

The almost simultaneous emergence of jeweils and other s-expressions suggests that all these genitive expressions have resulted from the same process, and should therefore receive a unified analysis.
4.1 Languages Exhibiting Distance-Distributivity

In section 1.4, the term ‘distance-distributivity’ was introduced as a descriptive term, referring to the fact that a distributive element appears to combine with the DistShare, instead of the DistKey (its restriction). I will restrict myself here to distance-distributivity in the narrow sense, i.e. distance-distributivity markers that are expressed adnominally on the DistShare.22 The list in (53) gives a non-exhaustive sample of languages that exhibit distance-distributivity in the narrow sense. Gil (1982a:18-19) lists more examples of adnominal distance-distributivity from Tagalog (Austronesian), Hindi (Indo-European), Nubian (Eastern Sudanic, Nilo-Saharan), Bura (Chadic, Afroasiatic), and Ga (Kwa, Niger-Congo). Most of these languages express distance-distributivity by reduplication of the numeral, i.e. like in Hungarian (54n) or in Georgian (54p). The wide range of languages exhibiting distance-distributivity lets it appear possible that distance-distributivity is a universal feature of human language.

(53) i. German, English, Dutch (West Germanic, Indo-European)
ii. Norwegian, Icelandic (Scandinavian, Indo-European)
iii. French, Italian, Romanian (Romance, Indo-European)
iv. Russian, Czech, Bulgarian (Slavic, Indo-European)
v. Japanese, Korean (East Asian, Altaic?)
vi. Irish (Celtic, Indo-European)
vii. Hungarian (Finno-Ugric)
viii. Turkish (Turkic, Altaic)
ix. Georgian (Caucasian)

Examples for each language are given in (54a–p). Note that all sentences in (54a-p) must be interpreted distributively due to the presence of the distance-distributivity marker.

(54) a. The boys have read two books\textsubscript{DistShare} each. [English]
   
   b. De jongens hebben \textit{elk} twee boeken\textsubscript{DistShare} gelezen. [Dutch]
   ‘The boys have read two books each.’
   
   c. Guttene har kjøpt to \textit{sine} pølser \textsubscript{DistShare}. [Norwegian]23
   ‘The boys have bought two sausages each’ (Vangsnes, p.c.)

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22 See Gil (1982a) for a discussion of distance-distributivity in a broader sense, which includes any instance of universal (i.e. distributive) quantification which is not syntactically expressed on the DistKey, but elsewhere in the clause, be it on the DistShare NP, or be it on a verbal form as e.g. in the native American language Maricopa (see Gil 1982a:339ff.). The reader is referred to Gil’s work as one of the earliest discussions of distance-distributivity with a wide empirical coverage.

23 There is an alternative way of expressing distance-distributivity in Norwegian (Vangsnes, p.c.). In (i), the distance-distributive element \textit{hver} occurs prenominally together with a reflexive possessive pronoun which agrees with the DistShare.

(i) Guttene har kjøpt hver \textit{sine} to pølser\textsubscript{DistShare}. [Norwegian]
‘The boys have bought each their-REFL two sausages’

The difference does not seem to be dialectal, since both (54c) and (i) are acceptable to the same speakers (Vangsnes, p.c.). I will refer to this pattern of expressing distance-distributivity as Norwegian II.
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d. Strákarnir keyptytu tvær pylsur hvor hver. [Icelandic]
   boys-the bought two sausages each, each (Hrafn, p.c.)

24 Icelandic (Hrafn, p.c.) also has an alternative strategy to express distance-distributivity (= Icelandic II). It resembles Norwegian II (see fn.23) in that the distributive element hvor/hver also occurs in prenominal position together with a possessive pronoun.

   (i) Sinn hvor tveggja bláamanna tóku viðtöl við stjórnalamennina. [Icelandic]
       POSS each two journalistsGEN interviewed with politicians-the
       ‘The politicians were interviewed by two journalists each.’

   Icelandic differs from Norwegian, in that there seems to be no free variation between the two alternatives. Instead, the Icelandic II-pattern is found in contexts from which Icelandic I is excluded for semantic reasons. See chapter III.5.4.2 and 5.4.3 for discussion of this point.

e. Les professeurs ont lu deux livres chacun. [French]
   the professors have read two books each
   (Tellier & Valois 1993:574, ex.1a)

f. I ragazzi compraronon un libro ciascuno.
   the boys bought a book each
   (Burzio 1986:198, ex.50b)

g. Doi oameni au cărat cîtrei valize.
   two men have carried each three suitcases
   ‘Two men have carried three suitcases each.’ (Gil 1982a:19, ex.1f)

h. Mal’chiki kupili (po) dv e sosiski kazhdyj.
   boys NOM bought two sausages each
   ‘The boys bought two sausages each.’ (Borik, p.c.)

i. Chlapci koupili po dvou párcich / párkách.
   boys bought each two sausages-LOC
   ‘The boys bought two sausages each.’ (Filip, p.c.)

j. John i Mary kupicha po edna tetradka.
   John and Mary bought each one notebook
   ‘John and Mary bought a notebook each.’ (Petrova 2000)

k. Otoko=tati-ga so rezeore huta=ri-no zyosei-o aisi teiru] koto. [Jap.]
   men =pl-nom each two=cl-g en women-acc love-asp fact
   ‘The men love two women each.’ (Sakaguchi 1998:115, ex.1)

l. ai-tul-i phwungsen-hana-ssik-
   children-PL-ACC balloon one each ACC
   bought
   ‘The children bought one balloon each.’ (Choe 1987:49, ex.13)

Data in Choe (1987), quoted from Pesetsky (1982:69-74), show that Russian also has an alternative strategy for expressing distance-distributivity, which is structurally identical to the Czech (54i) and Bulgarian (54j) pattern:

(i) Ja dal mal’či kamen po jablkâ.
   I gave boys masc, dat, pl each apple neut, dat, sg
   ‘I gave the boys an apple each.’ (ex. from Pesetsky 1982:69-74)

The existence of the pattern in (i) in other Slavic languages could mean that the difference is dialectal in nature. I will refer to the second pattern of distance-distributivity in Russian as ‘Russian II’.
m. Chosuugh na tilhe dh’e ch’eod mile puutDistShare an ceann. [Irish]
   ‘The houses cost two hundred thousand pounds each.’ (McCloskey, p.c.)

n. A gyerekek hoztak egy-egy könyvetDistShare-
   ‘The children bought a book each.’ (Farkas 1997:260, ex.36)

o. Iki adam üçer bavulDistShare taşidi. [Turkish]
   ‘Two men carried three suitcases each.’ (Gil 1982a:18, ex.1d)

p. Orma k’acma sam-sami čantaDistShare c’aiyo. [Georgian]
   ‘Two men carried three suitcases each.’ (Gil 1982a:18, ex.1c)

The distance-distributive element (henceforth ‘DD’) is adjacent to the DistShare expression in all the languages exemplified in (54). Apart from this similarity, two important differences meet the eye directly. These are the relative order of DD and DistShare, which may vary from language to language, and the morphological shape of the DD. These and other differences will be the subject of further scrutiny in the next section. In what follows, I restrict my attention to the languages listed in (53i-v).

4.2 Similarities and Differences Across Languages

The following properties are shared by the distance-distributive constructions in all the languages under discussion. To begin with, a functional element (or an expression containing a functional element), namely the DD, occurs adjacent to an indefinite nominal constituent that acts as the DistShare of the distributive relation. Together they seem to form a constituent. A second similarity is that the indefiniteness condition on DistShare seems to be active in all languages. Third, the plurality constraint on DistKey seems to be observed in all languages. Fourth, the clausemate constraint seems to be active in all languages.26

Besides these similarities, the sample of languages under discussion exhibits the following differences regarding the ways distance-distributivity is encoded.

(55) Cross-linguistic Differences in Distance-Distributive Constructions:
   i. Differences in the relative word order of DD and DistShare
   ii. Differences in the morphological shape of the DD
   iii. Differences in the range of possible DistKeys for the DD
   iv. Differences in syntactic distribution

(55i) concerns the question of whether the DD precedes or follows the DistShare. (55ii) concerns the question of whether or not the DD is formally identical to the distributive determiner quantifier (henceforth D-quantifier), which forms a constituent with the DistKey. (55iii) concerns the question of whether the DD can distribute over the denotations of non-DPs, e.g. over (implicit) sets of events. (55iv) concerns the possibility

or impossibility of the DD to occur with the underlying subject of a clause. We will look at each difference in turn.\textsuperscript{27}

### 4.2.1 The Relative Order of DD and DistShare

The difference in word order (cf. 55i) is illustrated by a comparison between German (56a) and English (56b).\textsuperscript{28}

(56) a. Die Jungen haben jeweils zwei Würstchen gekauft. DD>>DistShare
    the boys have each two sausages bought

b. The boys have bought two sausages each. DistShare>>DD

Other languages in which the DD precedes the DistShare are Dutch (54b), Romanian (54g), Japanese (54k), and the Slavic languages Czech and Bulgarian (54ij). Other languages in which the DD follows the DistShare are the Scandinavian languages Norwegian and Icelandic (54cd), French (54e), Italian (54f), and Korean (54l). In chapter III.5, it will be argued that the difference in relative word order between languages follows from a general difference in their DP-syntax.

Things are not quite that simple, though. On closer inspection, it shows that some languages allow for an optional occurrence of the DD before or after the DistShare. To these belong French (Tellier & Valois 1993, Junker 1995), Italian (d’Allessandro, p.c.), Russian (Borik, p.c.), Dutch, and German. This means that in French, Italian, and Russian, the DD can optionally precede the DistShare (57a-c), whereas in German and Dutch it optionally follows the DistShare (58ab).\textsuperscript{29}

(57) a. Les professeurs ont lu chacun deux livres. DistShare
    the professors have each two books

b. I ragazzi hanno comprato ciascuno due salsicce. DistShare
    the boys have bought each two sausages

c. Mal’chiki kupili kazhdyj (po) dve sosiski. DistShare
    boys bought each two sausages

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\textsuperscript{27} I neglect another difference that has to do with the fact that some languages allow for universal QPs as DistKey antecedents. (iab) are examples from Bulgarian (Petrova 2000) and Korean (Choe 1987:12) respectively.

(i) a. Vsyako dete izyade po edna yabulka.
    every child ate each one apple
    *Every child ate one apple each.’

    man-pl each woman-one-cl-each-with dance-past
    *Each man danced with a woman each.’

Structures as in (iab), in which a universal QP is the DistKey for the DD, are ungrammatical in English and German. Choe (1987:12,fn.5) puts this fact down to varying degrees of tolerance that languages exhibit with respect to the double expression of distributivity. On this line of reasoning, Korean and Bulgarian would be more ‘tolerant’ than English. Another possibility is that the difference has to do with the varying ability of distributive QPs in different languages to introduce a plural discourse referent by means of the semantic process of ‘abstraction’ (cf. Kamp & Reyle 1993:309ff.). I leave the question open because it does not have a direct bearing on the discussion.

\textsuperscript{28} Notice that, for the time being, I will focus exclusively on the adnominal use of jeweils.

\textsuperscript{29} As shown in fn.s 23 and 24, the DD can optionally precede the DistShare in Norwegian II and Icelandic II. In this case it must be accompanied by a pronoun. According to Tomioka (p.c.), Japanese sorezore can also optionally follow the DistShare.
(58)  a. Die Jungen haben ZWEI Würstchen jeweils gekauft. [German]
    the boys have two sausages each bought

b. De jongens kochten twee worstjes elk. [Dutch]
    the boys bought two sausages each (den Besten, p.c.)

At least in German, the different word order comes along with stress on the DistShare. This together with the fact that optionality in word order is often triggered by discourse requirements suggests that the discourse structure plays a role in determining the relative order of DD and DistShare, at least in some languages. Chapter III.5.3 will show this suspicion to be justified.

4.2.2 The Morphological Form of the DD

The second difference in (55) pertains to the morphological form of the DD. There are two possibilities: (i.) the DD is formally identical to the distributive D-quantifier, or (ii.) it is not. In the latter case, the DD can take on various forms. The first possibility is realised by English, Dutch, Norwegian, Icelandic, French, Italian, and Russian. Compare the DDs in (54a-f, h), with their D-quantifier counterparts in (59):

(59)  a. Each boy has read two books
    b. Elk jonge heeft twee boeken gelezen. [Dutch]
    c. Hver gutt har kjøpt to pølsere. [Norw.]
    d. Hver strákur keypti tvær pylsur [Icelandic]
    e. Chaque professeur a lu deux livres. [French]
    f. Ciascun cazzo ha comprato due salsci. [Italian]
    g. Kazhdyj mal’chik kupil dve sosiski. [Russian]

In all cases, D-quantifier and DD are formally identical.

Languages in which DD and D-quantifier differ formally are German, Czech, Bulgarian, Korean, as well as Japanese. Compare (50a), and (54i-l) from above with the D-quantifier examples in (60):

(60)  a. Jeder Junge hat zwei Würstchen gekauft. jeder vs. jeweils [German]
    each boy has two sausages bought

I follow Grevisse (1980) and Junker (1995) and treat the two French forms chacun(e) and chaque as formally identical. According to Grevisse (1980), chaque is a regressive form of chacun. This is confirmed by the fact that chacun occurs in the (prenominal determiner) position of chaque in Old and Classic French (cf. ia). Conversely, chaque can occur in place of distance-distributive chacun in spoken French (cf. ib).

(i) a. Entre chacune tour estoit espace de trois cents douze pas.
    between each tower was distance of three hundred twelve steps
    (Rabelais, Gargantua, 53; Junker 1995:32)

b. Prènez trois jetons chaque!
    take three jetons each!
b. *Každ chlapec koupil dva párky.* *každ vs. po* [Czech]
   each boy bought two sausages (Filip, p.c.)

c. *Vsjako momche kupi dve jabulki.* *vsjako vs. po* [Bulgarian]
   each boy bought two sausages (Petrova, p.c.)

d. *Sonyen-mata chayk-ul twu kwen-ssik sa-(a)tt-ta.* *–mata vs –ssik* [Korean]
   boy-each book-ACC two cl-DIST buy-PAST-DEC
   ‘Every boy bought two books.’ (Kim, p.c.)

e. *Dono gakusei-mo soosezi-o hutatu katta.* *wh…mo vs sorezore* [Japanese]
   which student-MO sausage-ACC two-cl bought
   ‘Every student bought two sausages.’ (Tomioka, p.c.)

Distance-distributive elements that are not formally identical to a D-quantifier can come in different forms. In German, a quantificational morpheme *je*- combines with a noun – *weil*- and a genitive marker. In Bulgarian, Czech, (as well as in Polish), the DD has the shape of a preposition which is independently attested (cf.61a). Sakaguchi (1998:115) points out that the Japanese form *sorezore* can occur as a case-marked argument (cf.61b). The case marking indicates that *sorezore* is a nominal constituent like *jeweil*- (which is equally case-marked).

(61)  a. *On shel po doroge* [Russian]
   he went on/along road
   ‘He was going along the road.’

   b. [Huta-ri no musume]-ga [sorezore-ga tadasii to] iiha-tta] koto] [Japanese]
   two-CL GEN daughter NOM each-NOM right cp insist-pst fact
   ‘The fact that the two daughters insisted that each of them was right.’
   (Sakaguchi 1998:115, ex.3)

Finally, Korean –ssik- is treated as a particle, or postposition in Korean reference grammars (Martin 1992:196). It seems that –ssik- is restricted to the position and function of a distance-distributive element.

In chapter III.5, it will be shown that German and Bulgarian or Czech distance-distributive constructions are not so very different (nor are the distance-distributive constructions in the other languages under discussion). There it will be argued that German *jeweils* contains a covert prepositional head. Therefore, a difference between the German and the ‘Slavic’ pattern of distance-distributivity lies in the fact which part (P or Q) is realized overtly. This position is confirmed by the parallel existence of prepositional distance-distributive constructions in English (cf. Choe 1987:135ff.) and German, illustrated in (62ab). Both languages employ a loan preposition from Latin for this purpose.

(62)  a. The boys bought a balloon per person.
   b. *Die Jungen kauften einen Ballon pro Person* [German]

The existence of PP-paraphrases that behave – for all matters and purposes – alike to DD-constructions supports the analysis of DDs as involving a preposition also in those languages where the preposition is not realised overtly.
4.2.3 The Range of Possible DistKeys for DD

In section 1.8, it was shown that German adnominal *jeweils* can distribute over pluralities of entities that are not denoted by a DP-argument, and that therefore are not sets of concrete individuals. The relevant example was presented in (18b), repeated as (63). In (63), *jeweils* distributes over the denotation of a conjoined verb cluster.

(63) Peter kritisierte und lobte Maria aus jeweils zwei Gründen.
Peter criticised and praised Maria for each two reasons

‘Peter criticised and praised Maria for two reasons respectively.’

The same is impossible with DDs in English (64a), Dutch (64b), French (64c), Italian (64d), Icelandic (64e), Norwegian (64f), and Russian (64g). Note that the inability to distribute over other than DP-denotations manifests itself with those DDs that are formally identical to the distributive D-quantifier in their language.

(64) a. *Peter criticised and praised Mary for two reasons each.
   b. *Piet heeft Marie om elk twee redenen bekritiseerd en geprezen.  [Dutch]
      P. has M. for each two reasons criticised en praised
   c. *Peter a adulé et critiqué Marie pour deux raisons chacun/e.  [French]
      Peter has praised and criticized Mary for two reasons each
   d. *Peter ha apprezzato e criticato Maria per due ragioni ciascuno/a.  [Ital.]
      Peter has praised and criticized Mary for two reasons each
   e. *Pétur lofaði og gagnrýndi Maríu af ástæðu hver.      [Icel.]
      Peter praised and criticised Mary of reason each
   f. *Peter roste og kritiserte Maria av to grunner hver.    [Norw.]
      Peter praised and criticized Mary of two reasons each
   g. *Petja hvalil i kritikoval Mashu po kazhdym dvum prichinam. [Russ.]
      Peter praised and criticized Mary PREP each two reasons

Instead of a DD-construction, these languages use different strategies in order to express the proposition in (63). 31

Given their inability to distribute over events, it should come as no surprise that the distributive quantifying expressions in (64) cannot be used adverbially. For instance, they cannot be used in order to distribute over an implicit, but contextually salient set of events. In such a case, the D-quantifier has to select an overt proform that is semantically specified to range over events, situations, or point of times.

(65) a. Each *(time), two boys laughed
   b. Elk *(keer) zijn twee jongens gekomen.  [Dutch]
      each time have two boys come

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31 Some languages, such as Italian, pattern like English and use an adverbial corresponding to respectively (ia). Others, like Norwegian employ an adjective meaning different (ib).

(i) a. Peter ha apprezzato e criticato Maria per due ragioni rispettivamente.  [Italian]
     Peter has praised and criticised Maria for two reasons respectively (d’Allessandro, p.c.)
   b. Peter roste og kritiserte Maria av to forskjellige grunner.  [Norwegian]
     Peter praised and criticized Maria of two different reasons (Vangsnes, p.c.)

The Icelandic II-pattern from fn.24 (with a definite DistShare) is also grammatical in this construction.

(ii) Pétur lofaði og gagnrýndi Maríu af sitt livori ástæðunni.    [Icelandic II]
     Peter praised and criticised Mary of POSS each reason-the (Hrafn, p.c.)

For a discussion of (ii), see chapter III.5.4.1, in particular fn.96.
c. Peter a gagné chaque *(fois) / *chac-un(e)(fois). [French]
Peter has won each time (Roy, p.c.)
d. Peter ha vinto ogni *(volta) / *ciascuno/a (volta). [Italian]
Peter has won each time (d’Allessandro, p.c.)
e. Petja kazhdyj *(raz) vyigryval           [Russian]
Peter each time won.
‘Each time, Peter won.’ (Borik, p.c.)
f. Peter vant hver *(gang).          [Norw.]
Peter won each time (Vangsnes, p.c.)

In contrast, DDs in Korean, Czech and Bulgarian can – like German jeweils - distribute over events that are denoted by non-DPs or left implicit. Note that the DDs in these languages are not formally identical to the D-quantifier.\

I TOP balloon one- each-ACC bought
‘I bought a balloon (each time/ each day/ at each store).’ (Choe 1987:52,ex.18)
b. Po třech ženách vstupovalo3 do místnosti. [Czech]
each threeLOC womenLOC entered3sg into room
‘(Each time/ ten minutes), three women entered the room.’ (Filip, p.c.)
c. Mary byaga po 5 mili predi zakuska. [Bulgarian]
Mary runs each 5 miles before breakfast
‘Mary runs 5 miles before breakfast (every morning).’ (Petrova 2000:ex.3b)

In Korean (66a), the DD –ssik- takes a contextually salient plurality (time, event, place) as its DistKey in the absence of a plural expression within the clause. In Czech (66b), po also distributes over an implicit but salient set of events. The same holds for Bulgarian (66c).

The foregoing observations could give the false impression that the different behaviour of DDs in different languages is due to a sortal restriction on the DistKey. It looks as if those DDs that are formally identical to D-quantifiers are restricted to distribute over groups of concrete individuals, whereas DDs that differ formally are not restricted in this respect and can consequently distribute over groups of events as well. The English example in (67) shows that this explanation cannot be correct.

(67) The accident and the hailstorm caused five casualties each.

In (67), each distributes over a group of events consisting of an accident and a hailstorm. The difference between (67) and (64a) lies solely in the syntactic category of the DistKey expression. In (64a), it is a verb conjunction. In (67), it is a DP. This shows that languages of the each-type are sensitive to the syntactic category of the DistKey expression, not to the ontological nature of its denotation. More to the point, a DD seems to be sensitive to the presence of D-features in the DistKey in languages in which it is formally identical to the distributive D-quantifier. In contrast, the DD is insensitive to the presence of D-features in the DistKey in languages of the jeweils-type, in which DD and distributive D-quantifier differ formally. As a result, DDs in these languages are free to choose any
plural expression as their DistKey. In fact, they can even distribute over an implicit set of events (cf. 66).

Summing up this section, it was shown that in some languages the DD can distribute over pluralities (of events) that are not expressed by a clausal mate DP. In others, this was shown to be impossible. As a first approximation, it seems that distribution over the denotation of non-DPs is possible in precisely those languages in which the DD is not formally identical with the distributive D-quantifier.

4.2.4 DDs with Underlying Subjects

In 1.6, it was shown that German jeweils can occur with underlying subjects. The example is repeated as (68).

(68) jeweils ein Offizier begleitete die Ballerinen nach Haus.

‘Each ballerina was accompanied home by one officer.’

In (68), the subject denotation is distributed backwards over the denotation of the object DP. However, jeweils in underlying subject position allows for a second reading on which it distributes over a contextually salient group of events (cf. 69).

(69) jeweils zwei Offiziere kamen herein.

‘Two officers came in each time.’

In (69), jeweils gives rise to what looks like an adverbial reading. Chapter V will deal with adverbial-like readings of adnominal elements in greater detail. There, it will be demonstrated that jeweils in (69) is really an instance of adnominal jeweils. Postponing the discussion until then, it can be observed that some languages allow the DD to occur with an underlying subject (on one or both of the uses exemplified in (68) and (69)), while others do not.

Languages in which the DD can occur with an underlying subject are (apart from German) Korean (70a), Czech (70b), and Bulgarian (70cd).

(70) a. [hyengsa-twu-myeng-ssik]-i [yonguicha-tul]-ul ccoch-ko-iss-ta [Korean]
detective-two-CL-each -NOM suspect-pl-ACC chase-PROG

‘The suspects are chased by two detectives each (time).’ (Choe 1987:50, ex.15)

b. Po třech ženách vstupovalo¹ do místnosti. (= 66b) [Czech]
each three-LOC women-LOC entered into room

‘(Each time / each ten minutes), three women entered the room.’

c. Po edin student pomogna na vseki profesor. [Bulgarian]
each one student helped to every professor.

‘(All) the professors were helped by one student each.’ (Petrova 2000: ex.6b)

d. Po edna yabulka beshe izgnila. [Bulgarian]
each one apple was rotten

‘(Each time / in each basket), one apple was rotten.’ (Petrova, p.c.)
In all these languages, the DD differs from the distributive D-quantifier in form.\(^{33}\)

Languages in which the DD cannot occur in underlying subject position are English, Dutch, French, Italian, Russian, Icelandic, and Norwegian. Examples are given in (71a-f).\(^{34}\)

(71)  
\begin{itemize}
  \item a. *One journalist each interviewed the politicians.
  \item b. *Elk een journalist heeft de politici geïnterviewd. [Dutch]
  \item c. *Un journaliste chacun a interviewé les politiciens. [French]
  \item d. *Uno giornalista ciascuno ha intervistato parlamentari. [Italian]
  \item e. *Kazhdye dva zhurnalista vzjali intervju u politikov. [Russian]
  \item f. *Tveggja blaðamanna hvor, tóku viðtöl við stjórnmálamennina. [Icel.]
\end{itemize}

In all these languages, the DD is formally identical to the distributive D-quantifier.

The following data from English show that the exclusion of DDs from (underlying) subject position does not only hold for matrix subjects, but also for embedded subjects of any sort.

(72)  
\begin{itemize}
  \item a. *One journalist each interviewed the politicians.
  \item b. *The journalists considered one politician each stupid.
  \item c. *The journalists said that one politician each was stupid.
\end{itemize}

In (72a), \textit{each} occurs with the underlying subject of a matrix clause. There is no (c-commanding) plural DP that could be a potential DistKey antecedent. In (72b), \textit{each} occurs in the subject position of a small clause. It has a potential DistKey antecedent in form of the matrix subject. In (73c), \textit{each} is in subject position of a (finite) embedded clause with a potential DistKey antecedent in the matrix clause. All three sentences are ungrammatical. The data in (72) provide crucial evidence for the approach to distance-distributivity taken in this thesis. In the course of chapters III, IV, and V, it will emerge that the three sentences in (72) are ungrammatical for different reasons. (72a) is excluded for purely syntactic reasons. (72bc) are ruled out by semantic and syntactic factors in combination, albeit of a different kind.

In this section, it was shown that some languages allow the DD to occur with an underlying subject, while others do not. A cursory glance at the data suggests that the set of languages that do not allow for DDs in underlying subject position matches (with the

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\(^{33}\) There are two exceptions: First, Sakaguchi (1998:122) points out that Japanese \textit{sorezore} ‘each’ cannot occur with underlying subjects. This is witnessed by (i), a variation on Sakaguchi’s ex. 8a.

(i) *Sorezore [hito-ni-no gakusha]-ga [huta-ni-no gakusei]-o osie-ta.
    each one-cl-GEN scholar-NOM two-cl-GEN student-ACC teach-PAST

*‘One scholar each taught two students.’

Second, Icelandic DDs can occur in underlying subject position if they are realised in the Icelandic II pattern. See chapter III.5.4.3 for more details.

\(^{34}\) The possibility of the DD \textit{each} with the derived subject of passives in English shows that the restriction holds for underlying subjects only (see Burzio 1986:201).

(i) [One interpreter each], was assigned t, to the visiting diplomats.
exception of Japanese, see fn.33) the set of languages in which DD and distributive D-quantifier are identical in form.

4.3 Organising the Differences

The cross-linguistic differences and similarities between DDs that were observed in sections 4.2.1 to 4.2.4 are summarised in table 2.

Table 2: The patterns of adnominal distance-distributivity

<table>
<thead>
<tr>
<th>i. relative word order</th>
<th>DD &gt;&gt; DistShare</th>
<th>DistShare &gt;&gt; DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>German, Dutch, (French), (Italian), Czech, Bulgarian, Romanian, Japanese, (Russian)</td>
<td>English, Korean, French, Italian, (Dutch), (German), Icelandic, Norwegian, Russian</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ii. morphological form DD</th>
<th>= D-quantifier</th>
<th>≠ D-quantifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>English, Dutch, French, Italian, Icelandic, Norwegian, Russian</td>
<td>German, Korean, Bulgarian, Czech, Romanian, Japanese</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>iii. category DistKey</th>
<th>+DP</th>
<th>unspecified</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>English, Dutch, French, Italian, Icelandic, Norwegian, Russian, Japanese</td>
<td>German, Korean, Bulgarian, Czech</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>iv. DD with underlying subject</th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>English, Dutch, French, Italian, Icelandic, Norwegian, Russian, Japanese</td>
<td>German, Korean, Bulgarian, Czech</td>
</tr>
</tbody>
</table>

The most remarkable result of this survey is that the cells in rows (ii) to (iv) contain the same languages, suggesting that there may be a deeper connection between the properties in (ii) to (iv). If correct, certain predictions concerning the syntactic and semantic behaviour of a DD in a given language can be made on the base of its morphological form.

In chapters III and IV, the first impression will be shown to be correct. It will be argued that the morphological shape of the DD in a given language (presumably the result of grammaticalisation) reflects its morphosyntactic properties. These properties (encoded in the form of features) determine its behaviour regarding the properties in row (iii) and – partly - in row (iv). That is, I argue that the behaviour of a DD with regard to (iii) and (iv) is predictable on the base of its morphological form. The relevant factor here is whether the DD contains syntactic D-features (as in English), or not (as in German). Let us parametrise this difference as [+/- D-features]. Chapter III.5.4 lays out how the cross-linguistic differences between DDs in (iii) and (iv) can be derived on the base of this distinction.

An apparent exception is Japanese sorezore which is found in the right-hand cell in row (ii), but in the left-hand cells in rows (iii) and (iv). In chapter III.5.4.4, it will be argued that Japanese nonetheless fits into the general pattern laid out in the main text. That is, in Japanese, too, the syntactic distribution of sorezore is predictable on the base of its syntactic feature content, even though sorezore is not formally identical to the distributive D-quantifier.

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35 An apparent exception is Japanese sorezore which is found in the right-hand cell in row (ii), but in the left-hand cells in rows (iii) and (iv). In chapter III.5.4.4, it will be argued that Japanese nonetheless fits into the general pattern laid out in the main text. That is, in Japanese, too, the syntactic distribution of sorezore is predictable on the base of its syntactic feature content, even though sorezore is not formally identical to the distributive D-quantifier.
The difference in word order can be captured descriptively by postulating a second parameter, [+/- DP-internal movement]. This parameter determines whether or not the DD can occur before the DistShare. In III.5.3, this (so far only descriptive) parameter is shown to capture an independent grammatical property of the languages under discussion, namely whether or not they allow for overt DP-internal fronting. There, it will emerge that a positive specification of the parameter [+/- DP-internal movement] actually subsumes different kinds of DP-internal movement operations that apply for different reasons. Nevertheless, they all lead to the same result, namely that the DD shows up in prenominal position.

In general, the systematic pattern observed in table 2 lets a cross-linguistic, parametrised analysis seem feasible and welcome. The two independent parameters [+/- D-feature] and [+/- DP-internal movement] are expected to interact in forming a 4-way classification of language types. As will be shown in chapter III.5, all language types are attested. Naturally, an analysis that gives a unified account of the different DD-patterns observed in languages is preferable over any language-particular analysis. In chapter III.5, I will propose a unified analysis of distance-distributive constructions for the languages in the sample. I will argue that distance-distributive constructions in all these languages have the same underlying structure. The observable differences will be derived from the factors discussed above. However, at the end of chapter III.5, it will also become apparent that the restricted distribution of DDs in languages of the English type, i.e. their absence form underlying subject position, cannot be entirely syntactic in nature. The absence from some syntactic positions does not follow from syntactic factors alone, but from the interaction of syntactic and semantic factors. This will be discussed in chapters IV.6 and V.3.

5 Previous Studies of Distance-Distributivity

In this section, I give a brief overview over existent work on the topic of distance-distributivity. In addition, I discuss two syntactic analyses of distance-distributive (=binominal) *each* in more detail. These are the analyses in Burzio (1986) and in Safir & Stowell (1988), which have proven quite influential for the discussion of distance-distributivity in generative studies. Burzio (1986) accounts for the restricted distribution of *each* in terms of syntactic binding. Safir & Stowell (1988) account for the restricted distribution of *each* in terms of LF-extraction. Both accounts are syntactic in nature. The main purpose of the following discussion is to embed the present analysis in its historical context, and to show that purely syntactic analyses cannot account for the distribution of *each* in isolation, nor for the behaviour of distance-distributive elements in other languages. The section ends with a plea for an integrated syntactic and semantic account.

5.1 An Overview

Not surprisingly, the phenomenon of distance-distributivity has been the topic of earlier studies, a few of which are listed in the following. The list makes no claim as to completeness. The earliest discussion of distance-distributivity in the generative tradition seems to be Postal (1975) (see references therein and in Gil 1982a for earlier references). The - to my knowledge - typologically widest array of data concerning distance-distributivity in the broad sense (see fn.22) is found in Gil (1982a). In general, research on distance-distributivity in the generative tradition has focussed on English distance-distributive *each* (cf. e.g. Postal 1975, Burzio 1986, Choe 1987, Stowell & Safir 1988, Sakaguchi 1998). In addition, there are some studies of distance-distributive elements in

The existing studies are mostly case studies that focus on the similarities and differences of distance-distributive constructions between two languages. To my knowledge, no comprehensive unified analysis of distance-distributive constructions in a wider range of languages exists to date. The present study tries to make a few initial steps in this direction.

Perhaps the two most influential analyses of distance-distributive *each* are those found in Burzio (1986) and Safir & Stowell (1988). For this reason, they deserve some closer scrutiny. The following discussion briefly points out the merits and weaknesses of each analysis. It will also bring to light that the analyses do not extend to German *jeweils*. Therefore, they are no good candidates for a cross-linguistically unifying analysis of distance-distributivity.

5.2 Burzio (1986): DDs as Anaphors

Burzio (1986) observes the impossibility of English *each* and Italian *ciascuno/a* with underlying subjects (cf.73a). Based on this observation, he (ibid.:199) concludes that these elements must be syntactic anaphors and must be licensed under c-command, as is the case with other syntactic anaphors (cf.73b).

(73)  a. *One journalist each interviewed the politicians.

The suspicion that *each* and *ciascuno/a* are anaphors is strengthened by the fact that the same elements are absent from other positions forbidden for syntactic anaphors, e.g. from the subject position of an embedded tensed clause. Compare the presence of *each* in (74a) with (74b), which contains a syntactic anaphor.

(74)  a. *We expected that one student each would call.
     b. *John expected that himself would win.

Burzio’s analysis is convincing at first sight, and can account for a range of data including the relative acceptability of *each* and *ciascuno/a* with derived subjects (cf.75a), or topicalised objects (75b). According to Burzio (1986:201), the fronted phrases in (75) reconstruct to their base-position at LF, in which case the distance-distributive element is licensed (exs. from Burzio 1986:200, 57a & 60a).

(75)  a. ?*[One interpreter each]*1 was assigned ti1 to the visitors.
     b. ?*[Un evaso ciascuno]*1 si consegnerà ti1 a quei carabinieri.
     one escapee each si will.turn.in to those policemen
     ‘We will turn in one escapee to each of those policemen.’

Finally, the clausemate condition from section 1.7 follows directly on the assumption that anaphors must be locally bound.

Nevertheless, the analysis faces two serious problems. First, the analysis of distance-distributive elements as anaphors does not apply to German. The possibility of adnominal *jeweils* with underlying subjects shows that it cannot be a syntactic anaphor. The fact that
adnominal jeweils can occur with non-DP antecedents shows the same. In light of these facts, the clausemate condition – which holds for both each and jeweils - cannot really have to do with anaphoricity. The second problem concerns the adequacy of the analysis for English. Burzio (1986:213, fn.21) acknowledges that distance-distributive each is excluded from positions where syntactic anaphors are possible (see Junker 1995:65 for the same point). These are the subject positions of ECM-constructions and small clauses (see also (72b) above).

(76)  a. *We, expected one student each, to call.
   b. *We, considered one student each, guilty.
(77)  a. John, expected himself, to win.
   b. John, considered himself, guilty.

The contrast between (76ab) and (77ab) makes the analysis of distance-distributive each as an anaphor appear highly problematic. In chapter III, each and (likewise ciascuno/a) are not treated as syntactic anaphors in the analysis of distance-distributive elements. Instead, their undeniable anaphoric traits (e.g. the non-occurrence in underlying subject position in (73a)) are derived from the fact that they contain D-features which must be checked under c-command. The ungrammaticality of (76ab) will be shown to follow from independent reasons in chapter IV.6.

5.3 Safir & Stowell (1988): An LF-Movement Account

In response to the problem encountered by Burzio’s analysis, Safir & Stowell propose an analysis in terms of LF-movement. They maintain Burzio’s anaphor account of each, but introduce stronger licensing conditions for it. According to their analysis, the distance-distributive element each projects a QP that is right-adjoined to the DistShareNP. Each selects an anaphoric empty category (co-indexed with the DistKey) as complement, and a PRO (co-indexed with the DistShare) as specifier. The anaphoric empty category must be licensed by the co-indexed DistKey in a local configuration (adjacency at LF). This configuration is created through LF-movement of the eachQP out of its embedding DP, followed by adjunction to IP. This movement is followed by a second movement operation on the part of the DistKey antecedent. As a result of this movement, the DistKey will c-command each at LF. For illustration, consider the LF-structure of (78a) in (78b).

(78)  a. [IP The boys, bought [DP two sausages [QP PRO, each e]]].
   b. [IP The boys,2 [IP [QP PRO, each e,1] [IP t2 bought two sausages t1]]].

The strength of the LF-movement analysis lies in the fact that it provides a unified analysis for the impossibility of each in any underlying subject position (see the paradigm in (72)). Since subjects are syntactic islands for subextraction out of them (Huang 1982), the eachQP cannot subextract out of the subjects in (76ab). As a result, (76ab) are ungrammatical. This gives the LF-movement analysis a certain edge over Burzio’s analysis. In addition, the clausemate condition can be derived on the assumption that LF-movement of each is an instance of Quantifier Raising (QR). Since QR is generally taken to be clausebound at least with universal (strong) QPs (see Reinhart 1997 for discussion), the eachQP can never enter into a local relationship with a DistKey expression in a higher clause. At first sight, then, the LF-movement analysis seems to give an adequate account of the syntactic behaviour of distance-distributive each. This may also explain why the
LF-movement analysis has found follow-ups in the form of Sakaguchi’s (1998) and Sauerland’s (2001) analyses, which also heavily rely on LF-movement of the distance-distributive element.

A closer look at the details reveals that the LF-movement analysis also faces certain problems. Like the anaphor analysis, it cannot explain why German adnominal jeweils can occur in underlying subject position, and why adnominal jeweils can occur without DP-antecedents. The LF-analysis therefore does not provide a uniform explanation for distance-distributive elements in both English and German. Given the otherwise very similar behaviour of the two elements, this state of affairs is very unfortunate. A second and more serious problem arises from the possibility of distance-distributive each inside adjuncts. Safir & Stowell (1988) would predict the sentences in (79ab) to be ungrammatical, contrary to fact.

(79)  a. The men, cut the salami with one knife each. (Safir & Stowell 1988:447)
     b. The boys, bought books in two shops each.

Adjuncts have the same status as subjects regarding subextraction. According to Huang (1982), subextraction from adjuncts is ruled out generally. The grammaticality of (79ab) would therefore be unexpected if each had to LF-raise to its DistKey antecedent. It seems, then, that Safir & Stowell’s analysis can account for a certain set of data that are problematic for Burzio (cf. 76ab). At the same time, the analysis fails with regard to another set of data (79ab). This shows that LF-movement analyses à la Safir & Stowell are not without problems, and should therefore be reconsidered. In chapter III.4.3, I provide (more) syntactic evidence against an LF-movement analysis of DDs. In chapter IV, I show that LF-movement is not required for semantic reasons. From this, I conclude that distance-distributive constructions should not be analysed in terms of LF-movement.

5.4 What About Semantics?
The two analyses in 5.1 and 5.2 approach the phenomenon of distance-distributivity from a purely syntactic perspective. Neither of them is a fully adequate account for English each, nor can they be applied to German jeweils or other distance-distributive elements that are licensed in subject position. Given this state of affairs, it is unclear what a purely syntactic account of distance-distributive elements should look like if the two basic tools of syntactic analysis – an analysis in terms of binding and an analysis in terms of extraction – do not work.

One may wonder if an integrated syntactic and semantic account would not produce better results, especially in light of the peculiar semantic behaviour of distance-distributive elements.

The special semantic behaviour of distance-distributive elements in various languages has been analysed in Choe (1987), Junker (1995), Link (1998), and Moltmann (1991, 1997). These analyses will be discussed in chapter IV.3. Unfortunately, the above studies (with the exception of Moltmann 1997 perhaps) do not pay much attention to surface compositionality. Nor do they aim at providing a unified cross-linguistic analysis of distance-distributive elements that would shed light on their different syntactic distribution in different languages.

In chapter III to V, I attempt to fill this gap. I will provide a unified analysis for distance-distributive constructions in a variety of languages. All constructions are argued to share one underlying structure, and all constructions are argued to be interpretable from
surface structure. The observable cross-linguistic differences in distribution are derived from three independent factors: (i) differences in the grammatical properties of the distance-distributive element itself (this is reminiscent of Burzio’s anaphor account); (ii) general syntactic differences between languages; and (iii) the interaction of semantic operations involved in interpreting distance-distributive constructions with syntactic factors, which may cause the semantic derivation to crash. It will be argued that a complete and accurate account of the behaviour of distance-distributive elements, both within one language and cross-linguistically, is possible only by taking into account all three factors.

6 Conclusion

This introductory chapter on jeweils in particular, and on distance-distributivity in general has brought to light the following facts:

(80) i. *Jeweils* is ambiguous between an adverbial and an adnominal reading.
    ii. The two readings of *jeweils* correspond to two different syntactic positions: *Jeweils* is interpreted adverbially when it can be construed as being adjoined to VP. *Jeweils* is interpreted adnominally when it (or its trace) is adjacent to a numeral or indefinite expression, the DistShare (and when the semantic requirements are satisfied).
    iii. Some of the properties of *jeweils* are found back with a number of formally related expressions, the so-called s-expressions, arguing for a unified analysis.
    iv. Adnominal *jeweils* is not a floated quantifier, but a distance-distributive element.
    v. Distributive elements with similar properties are attested in a variety of languages, including Italian, French, Dutch, Icelandic, Norwegian, Russian, Czech, Bulgarian, Korean and Japanese.
    vi. Observable cross-linguistic differences in the expression of distance-distributivity arguably follow from the values of two parameters: [+/- D-features] and [+/- DP-internal movement].
    vii. The discussion of Burzio (1986) and Safir & Stowell (1988) on distance-distributive (= binominal) *each* has shown that a purely syntactic analysis does not give a satisfactory account of the phenomenon. This argues for an integrated syntactic and semantic account.

Chapter III presents the syntactic analysis of *jeweils* in particular, and of distance-distributivity in general. The two parameters in (80vi) will be motivated and their application will be discussed in detail. Chapter IV presents the semantic analysis of distance-distributivity. It will be shown that a surface compositional interpretation of distance-distributive constructions is possible.

36 Precursors of this analysis are found in Lipták & Zimmermann (2000) and Zimmermann (to appear, a).
Chapter III  The Syntax of Distance-Distributivity

The main results of chapter II are the following. There are two instances of the distributive element **jeweils**: **Jeweils** can occur both in adverbial and in adnominal position. The difference in syntactic position is accompanied by a difference in interpretation. Furthermore, adnominal **jeweils** was shown to behave like a distance-distributive quantifier. As such, it poses a problem for compositionality. Finally, it was shown that distance-distributive quantifiers occur in a variety of languages in systematic fashion. This fact calls for a unified explanation.

The objectives of this chapter are threefold. The first objective is to present a complete syntactic analysis of both instances of **jeweils**. The syntactic analysis identifies the syntactic structures that will be interpreted in chapter IV.

The second objective is to shed more light on the syntactic nature of the phenomenon of distance-distributivity in German and other languages. Of course, this enterprise goes hand in hand with providing a general syntactic account of adnominal **jeweils**. It will emerge that **jeweils**-DPs exhibit characteristic properties of so-called ‘Inverse Linking Constructions’ (henceforth ILCs), illustrated in (1):

(1) \[ DP \text{One apple [pp in [QP every basket]]] is rotten.} \]

‘In every basket, there is rotten apple.’

The syntactic analysis of ILCs will then form the basis for the syntactic analysis of adnominal **jeweils**. The upshot of the discussion will be that adnominal **jeweils** involves a regular QP that is embedded inside a complex DP. The quantifier Q syntactically combines with its restriction (in line with compositionality). This restriction is realised as an overt or covert proform which is co-indexed (hence co-referent) with the DistKey antecedent.

The third objective of chapter III is to provide an explanation for the cross-linguistic variation observed with distance-distributive elements (DDs). The discussion, which is based on relatively few, mostly Indo-European languages, is intended merely as laying the basis for a more comprehensive typology of distance-distributivity. The languages under discussion will be shown to differ regarding two parameters. This leads to a cross-classification into four potential language types.

The first parameter concerns the possibility of DP-internal (predicate) fronting for information structure reasons. It turns out that the DD can occur in prenominal position in languages that allow for such DP-internal fronting (e.g. German, Dutch, French, Slavic, Japanese, Romanian). The DD follows the DistShare in languages that disallow discourse-driven DP-internal movement (e.g. English). This way, the relative order of DD and DistShare is reduced to a general syntactic property of the languages under discussion.

The second parameter concerns the morphological shape of the DD, which I take to reflect its feature content overtly. It turns out that those DDs that contain D-features, and that for this reason are formally identical with regular D-quantifiers, cannot distribute over non-DD antecedents (e.g. pluralities of events as denoted by verb conjunction), nor can they occur with underlying subjects. This is the case in English, Dutch, Norwegian, Icelandic,
Russian, and the Romance languages. The impossibility to occur with underlying subjects will be attributed to the obligatory checking of D-features (between the DistKey and the DD) under agreement, which is subject to c-command in line with Chomsky (1998). DDs in underlying subject position are not c-commanded by the DistKey, and are consequently excluded from this position in languages where D-feature checking is obligatory. In contrast, DDs that do not contain D-features can distribute over any pluralic entity expressed in the clause. Furthermore, they can appear in subject position for they do not have D-features to check under agreement.

The structure of chapter III is as follows. In section 1, I present the syntactic analysis of adverbial jeweils. In section 2, we will take the first steps towards a syntactic analysis of adnominal jeweils, the more interesting case because of the compositionality problem. More arguments for the constituency of jeweils and the DistShare expression are provided. This constituent is argued to form a complex DP syntactically. Section 3 discusses the syntax of ILCs in form of an interlude. In 4, we turn back to the syntactic analysis of adnominal jeweils, which will be based on the syntactic analysis of ILCs. In section 5, the analysis is extended to other languages. There, d-distributivity is approached from a cross-linguistic perspective along the lines sketched in the preceding paragraph. The chapter concludes in section 6.

1 The Syntax of Adverbial Jeweils

This section discusses the syntax of adverbial jeweils. In 1.1, I present evidence for the analysis of adverbial jeweils as an adverbial quantifier. In 1.2, I propose that the base position of adverbial jeweils is adjoined to VP, as with all adverbial quantifiers. I briefly compare the VP-adjunction analysis with Cinque’s (1999) analysis, which treats all adverbials as located in the specifier of a functional projection.

1.1 Adverbial Jeweils and Adverbial Quantifiers

The claim that adverbial jeweils is an adverbial quantifier is based on the observation that it has the same syntactic distribution as other adverbial quantifiers, e.g. oft ‘often’, manchmal ‘sometimes’, selten ‘seldom’, or nie ‘never’.

First, adverbial jeweils occurs in all and only those positions where other adverbial quantifiers occur. Jeweils can occur as the sole constituent before the finite verb in V2 (cf.2). It can occur between complementiser (or finite verb) and the subject (cf.3). It can occur between subject and object in transitive clauses (cf.4). And it can occur between direct object and Vfinal in transitive clauses with direct objects (cf.5).

(2) a. Jeweils hat Peter als Erstes aufgegeben.
    Each.time has Peter as first given up
    ‘Each time, Peter was the first to give up.’

   b. Oft / manchmal/ selten / nie haben die Russen gewonnen.
      often/ sometimes/ seldom/ never have the Russians won
      ‘The Russians often/ sometimes/ seldom/ never won.’

(3) a. ..., weil jeweils die Russen gewonnen haben.
    because each.time the Russians won have
    ‘...because the Russians won each time.’
(4) a. …, weil Peter jeweils Maria geküsst hat.
   because Peter each time Maria kissed has
   ‘…because Peter kissed Maria each time.’

   b. …, weil Peter oft/ manchmal/ selten/ nie Maria geküsst hat.
   because Peter often/ sometimes/ seldom/ never Maria kissed has
   ‘…because Peter often/ sometimes/ seldom/ never kissed Maria.’

(5) a. …, weil Peter Maria jeweils geküsst hat.
   because Peter Maria each time kissed has
   ‘…because Peter kissed Maria each time.’

   b. …, weil Peter Maria oft/ manchmal/ selten/ nie geküsst hat.
   because Peter Maria often/ sometimes/ seldom/ never kissed has
   ‘…because Peter often/ sometimes/ seldom/ never kissed Maria.’

On the other hand, adverbial jeweils is impossible between a non-specific object DP and Vfinal in embedded clauses (cf.6a). The same holds for other adverbial quantifiers (cf.6b).

(6) a. *…, weil Peter keine Leute jeweils angerufen hat.
   because Peter no people each time called has
   ‘…because Peter has often/ sometimes/ seldom/ never called has

   b. *…, weil Peter keine Leute oft/ manchmal/ selten/ nie angerufen hat.
   because Peter no people often/ sometimes/ seldom/ never called has

Notice directly that (5a) and (6a) together argue for a position of jeweils at the left edge of VP. In German (as in Dutch), specific objects are generally assumed to scramble out of the VP at surface structure (cf. e.g. deHoop 1992, Diesing 1992), while non-specific objects stay behind in their base position as sister to the verb. Given this assumption, the ungrammaticality of (6a) shows that jeweils is not base-generated inside the VP between the base position of the object and the verb. (5a) shows that the base-position of jeweils is located between the surface position of the specific object (outside VP) and its trace (inside VP), i.e. at the left edge of VP.

The second argument for the status of adverbial jeweils as an adverbial quantifier comes from the fact that it cannot easily co-occur with other adverbial quantifiers (cf.7ab). Co-occurrence (no matter in which order) leads to considerable semantic complexity. The semantic effect is also visible in the English paraphrases. What is relevant here is that the same effect is observed when two other adverbial quantifiers co-occur. This is shown in (8).

(7) a. ?…, weil Peter oft/ manchmal/ selten/ nie jeweils gewonnen hat.
   because Peter often/ sometimes/ seldom/ never each time won has
   ‘…because Peter has often/ sometimes/ seldom/ never won each time.’

   b. ?…, weil Peter jeweils oft/ manchmal/ selten/ nie gewonnen hat.
   because Peter each time often/ sometimes/ seldom/ never won has
   ‘…because each time, Peter has won often/ sometimes/ seldom/ never.’
(8) weil Peter machmal nie gewonnen hat.
   because Peter sometimes never won has

‘…because Peter sometimes never won.’

(7ab) and (8) can only be interpreted as opening up a secondary time or event frame. The sentences are about different event levels, e.g. a round of games (quantified over by the lower quantifier) that is played repeatedly (and quantified over by the higher quantifier). A plausible explanation for this phenomenon is that both elements are adverbial quantifiers over events. Since both elements compete for the same event argument, a second event layer is introduced in order to save the structure from violating the ban on ‘vacuous quantification’ (cf. Chomsky 1981, Kratzer 1995). See the discussion of event semantics in chapter IV.1 for details.

A third argument for treating adverbial jeweils alike with other adverbial quantifiers is that they all show the same relative order with respect to other adverbials. They must precede manner adverbials (9ab). The reverse order is impossible on a neutral intonation.1

(9) jeweils AND Advquant >> manner adverbials
   a. … weil Peter jeweils langsam geschwommen ist.
      because Peter each.time slowly swum is
      ‘…because Peter swam slowly each time.’
   b. … weil Peter oft langsam geschwommen ist.
      because Peter often slowly swum is
      ‘…because Peter often swam slowly.’

(10) a. *?… weil Peter langsam jeweils geschwommen ist.
    because Peter slowly each.time swum is
    b. *?… weil Peter langsam oft geschwommen ist.
    because Peter slowly often swum is

The data in (9) and (10) find a natural explanation if manner adverbs are located inside the VP (see Ernst 1998:130, where manner adverbs are treated as ad-Vs), whereas jeweils and other adverbial quantifiers are located at the edge of VP.

Adverbial jeweils and other adverbial quantifiers also precede event-modifying adverbials, such as the time and place adverbials in (11ab). The reverse order is distinctly odd (12ab).2

(11) jeweils AND Advquant >> (event) modifying adverbials
   a. … weil Peter jeweils am Tag geschlafen hat.
      because Peter each.time on.the day slept has
      ‘…because Peter slept during the day each time.’

1 The reverse order is only possible with contrastive focus stress on the manner adverb, indicating that it has moved for information structural reasons.
2 (12b) is possible if the temporal adverbial does not modify the event, but denotes the restriction of the adverbial quantifier oft ‘often’. This reading is excluded for adverbial jeweils because jeweils needs a plural antecedent to distribute over. As expected, (12a) improves if a plural temporal expression is substituted:
   (i) … weil Peter an den Tagen jeweils geschlafen hat.
      because Peter on the days each.time slept has
      ‘…because Peter has slept on each of those days.’
b. ... weil Peter oft am Tag geschlafen hat.
   because Peter often on.the day slept has
   ‘...because Peter often slept during the day.’

(12) a. *... weil Peter am Tag jeweils geschlafen hat.
   because Peter on.the day each.time slept has
b. ?... weil Peter am Tag oft geschlafen hat.
   because Peter on.the day often slept has

Speaker-oriented adverbs precede adverbial quantifiers and adverbial jeweils (cf.13ab). In the reverse case, the speaker-oriented reading is impossible (14ab). In (14ab), the adverb following the adverbial quantifier must be interpreted as a manner adverb.

(13) Speaker-oriented adverbs >> jeweils AND Advquant
    a. ... weil Peter glücklicherweise jeweils gewonnen hat.
       because Peter fortunately each.time won has
       ‘...because Peter fortunately won each time.’
    b. ... weil Peter glücklicherweise oft gewonnen hat.
       because Peter fortunately often won has
       ‘...because Peter fortunately won often.’

(14) a. ... weil Peter jeweils glücklicherweise gewonnen hat.
    because Peter each.time fortunately won has
    ‘...because, each time, Peter won with luck.’
    b. ... weil Peter oft glücklicherweise gewonnen hat.
    because Peter often fortunately won has
    ‘...because Peter often won with luck.’

Finally, modal adverbs precede adverbial jeweils and adverbial quantifiers (cf. 15ab). The reverse order is odd, if not ungrammatical (cf. 16ab). It is not clear to me what a plausible reading for (16ab) would be.

(15) modal adverbs >> jeweils AND Advquant
    a. ... weil Peter möglicherweise jeweils gewonnen hat.
       because Peter possibly each.time won has
       ‘...because Peter possibly won each time.’
    b. ... weil Peter möglicherweise oft gewonnen hat.
       because Peter possibly often won has
       ‘...because Peter possibly won often.’

(16) a. ??... weil Peter jeweils möglicherweise gewonnen hat.
    because Peter each.time possibly won has
b. ??... weil Peter oft möglicherweise gewonnen hat.
    because Peter often possibly won has

To conclude, I have shown (i.) that adverbial jeweils and adverbial quantifiers have the same syntactic distribution; (ii.) that they give rise to the same semantic effects when co-occurring with other adverbial quantifiers; and (iii.) that they have the same relative order with respect to other adverbs. All this leads to the conclusion that adverbial jeweils is an adverbial quantifier. The quantificational nature of jeweils is supported by the fact that
jeweils, like other adverbial quantifiers, cannot be used as a predicate over propositions (17b). 3

    that you me kissed has was here/ in the evening/ necessary/ fortunate
    ‘That you have kissed me was here / in the evening/ necessary/ fortunate.’

    that you me kissed has was each time/ often
    **‘That you have kissed me was each time/ often.’

The reader is referred to chapter IV.2 for the semantic analysis of the adverbial quantifier jeweils.

1.2 The Syntactic Position of Adverbial Jeweils

In this section, I forward the claim that adverbial jeweils is base-generated in a position adjoined to VP (section 1.2.1). The adjunction analysis of adverbials follows the syntactic analyses of adverbials found e.g. in Jackendoff (1972) and Ernst (1998). It clashes with a recent proposal by Cinque (1999), where all (classes of) adverbials are treated as located in the specifier of some functional projection, i.e. in a fixed position created specifically for them. Cinque’s proposal is sketched in 1.2.2. Following this, I briefly state my reasons for keeping with the adjunction analysis.

1.2.1 The VP-Adjunction Analysis

The central claim regarding the syntax of adverbial jeweils is that it is adjoined to VP. Notice that an adoption of the VP-internal subject hypothesis obviates the need to postulate different adjunction sites for different classes of non-manner adverbs. 4 Since the subject trace is located inside the VP, adverbials that take scope over the entire proposition including the subject need no longer be assumed to occur higher than IP (the surface position of the subject). For the semantics, it is sufficient that the adverb occurs higher than the subject’s trace, whose presence turns the VP into a proposition-denoting expression. This requirement is met if the adverb is adjoined to VP. As a result, adverbials that operate over entire propositions (e.g. speaker-oriented adverbs), or sets of events (adverbial quantifiers), can occur adjoined to VP.

If all adverbs (except for manner adverbs inside the VP) are adjoined to VP in their base-position, we expect them to be freely interchangeable. The question arises, then, of how to account for the restrictions on the relative order of different (semantic) classes of adverbials that were observed in the previous section. Following Jackendoff (1972:90) and Ernst (1998), I assume that the relative order of adverbials is syntactically free, but that the order restrictions follow from semantic considerations. Only certain orders of adverbials are interpretable, while others lead to semantic gibberish. Consider the relative order between the adverbial quantifiers and the event-modifying time or place adverbials in (11) and (12) above. In chapter IV.1, it will be argued that VPs denote sets of events, just as NPs denote sets of individuals. Such a set of events can be ascribed a place or time of occurrence (an event property) by an event-modifying adverbial, just as a set of

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3 This test for classifying adverbs is found in Bartosch (1976).

4 In the literature, adverbs are grouped into different classes according to differences in their syntactic distribution and interpretation. Modal and speaker-oriented adverbs are treated e.g. as sentence, or IP-adverbials. Other adverbials are treated as VP-adverbials (cf. e.g. Jackendoff 1972, Ernst 1998)
individuals (denoted by an NP) can be ascribed certain properties by a modifying adjective. Once a set of events is described in all its relevant properties, an adverbial quantifier can quantify over it, thus closing off the VP-denotation to further modification. A parallel situation is found in the nominal domain where quantifying expressions must also precede modifying expressions within the DP. The parallel order of quantifiers and modifiers in VPs and DPs is schematised in (18).

(18)  a. adverbial quantifier >> event-modifying adverbial >> VP
     j eweils ‘each time’ am Tag ‘during the day’ geschlafen ‘slept’

 b. adnominal quantifier >> NP-modifying adjective >> NP
     jedes ‘each’ weiße ‘white’ Haus ‘house’

When a time or place adverbial precedes an adverbial quantifier in violation of the scheme in (18a), it loses its modifying function because the adverbial quantifier has closed off the domain of modification. As a consequence, the adverbial cannot be interpreted at all (cf.12a), or it must receive an alternative interpretation. This happens in (12b), where the time adverbial denotes the restriction of the adverbial quantifier.

Similar arguments can be made concerning the other restrictions on the relative order of adverbials. From this, it follows that there is no need to fix the linear order of adverbs in the syntactic component. This conclusion is in line with an analysis which treats all (non-manner) adverbials as adjoined to VP, no matter what their specific semantic class, and which fixes their relative order by filtering out the non-interpretable orders in the semantic component. The interested reader is referred to chapter IV.1 for a further discussion of the semantics of events and event-quantifying adverbials.

1.2.2 The Specifier Analysis

The VP-adjunction analysis disagrees with Cinque’s (1999) proposal concerning the syntax of adverbs. Cinque suggests that the order of adverbial is not governed by semantic requirements, but fixed in the syntactic component. In Cinque’s feature-based ‘specifier analysis’, adverbs of different semantic classes occupy the specifier position of different functional heads against which they can check their mood, modal, or aspectual features.

Apart from the functional projections in (19b), Cinque assumes many more functional projections, each of which hosts its own class of adverbials in the specifier position. The “at first sight, outrageously rich” (Cinque 1999:106) functional architecture of the clause is indicated in (20).

(19)  a. Frankly, Peter has fortunately always won the game.
     b. [MOODspeech-aux Frankly F0, Peter has [MOODevaluative fortunately F0 [ASPfrequentative(I)
 always F0 [VP won the game]]]]

Apart from the functional projections in (19b), Cinque assumes many more functional projections, each of which hosts its own class of adverbials in the specifier position. The “at first sight, outrageously rich” (Cinque 1999:106) functional architecture of the clause is indicated in (20).

5 For instance, adverbials that operate over propositions (speaker-oriented adverbs: glücklicherweise ‘fortunately’, modal adverbs: möglicherweise ‘possibly’) take scope over the adverbial quantifier for the latter forms part of the proposition. Therefore, they are free to adjoin to the left of adverbial quantifiers.
Cinque’s analysis is based on the cross-linguistic observation that not all languages convey adverbial meanings by means of free adverbial forms. Many languages express the same meanings by way of suffixes that are incorporated in the verb. Now, the striking fact is that the order of these suffixes is the mirror image of the order of the corresponding adverbs in ‘adverb languages’. Based on Baker’s (1988) ‘Mirror Principle’, Cinque concludes that these suffixes are heads of functional projections underlyingly, which are picked up by the verb on its way to I (or T in his terminology). On the strong hypothesis that the same inventory of functional projections is present in all languages, it follows that (20) is also the functional structure of a language like English. With the structure present anyway (because of universality), there is no additional cost involved in placing the respective adverbials in the specifier of their functional projection. This way, we arrive at the structure in (19b). In addition, the observed restrictions on the relative order between adverbials and between adverbials and other functional heads fall out for free. The order of adverbials follows directly on the hierarchy of functional projections in (20).

The chief merit of Cinque’s analysis is that it derives the order of adverbs in adverb languages and the order of suffixes in non-adverb languages from a universal underlying structure. It establishes a plausible connection between two - at first sight – disparate phenomena. As such, it is a very strong hypothesis about the position of adverbs (or elements with adverbial readings) across languages, which furthermore seems to maintain the autonomy of syntax.

In contrast, the VP-adjunction analysis does not say anything directly about the conspicuous mirror image of the order of adverbs in adverb languages and the order of suffixes in non-adverb languages. However, on the plausible assumption that the semantic content of an ‘adverbial suffix’ matches that of its corresponding free adverb, the fixed relative (mirror) order of suffixes is due to the same reason as it is with free adverbials. Alternative orders of suffixes are uninterpretable and therefore ruled out for semantic reasons.6

More generally, the combined options of free base-generation and movement (for discourse reasons) make the VP-adjunction analysis somewhat weaker in its empirical predictions than Cinque’s. The VP-adjunction analysis predicts a more graded, less clear picture of the relative order of adverbs. The only restriction is that the resulting structure must be interpretable.

Pending a decisive answer as to which analysis is more adequate, I will assume the VP-adjunction analysis for adverbial jeweils (and other adverbials). I do so for the simple reasons:

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6 A potential problem arises in connection with propositional suffixes that attach to the verb (which normally does not denote a proposition). In order to solve this problem, one could assume that the verb has already incorporated its arguments in form of pronominal affixes before combining with the propositional suffix. This is possible in so-called ‘pronominal-argument languages’ (see Jelinek 1984, 1995, Faltz 1995). In this connection, it would be interesting to investigate to what extent the set of pronominal-argument languages overlaps with the set of non-adverb languages.
reason that the VP-adjunction analysis does the job for the purpose at hand. It captures the fact that adverbial quantifiers are located somewhere at the left edge of VP. Since this thesis is not mainly concerned with the syntactic position of adverbs, this is all that is required.

Finally, observe that an account which excludes certain relative orders of adverbs on the base of semantic considerations is in line with one of the basic assumptions of the thesis, namely that interpretive requirements can have an effect on syntactic structure, e.g. in the form of a semantic filter which rules out certain structures as uninterpretable.\footnote{See Fox(2000) for a proposal along these lines in the framework of the Minimalist Program.} Therefore, the order of adverbs can be derived at no additional cost in the present framework. There is no need, then, to encode the order of adverbs in the syntactic component.

1.3 Summary
In this section, I have shown that adverbial jeweils has the same syntactic distribution as adverbial quantifiers. On the base of this, adverbial jeweils is analysed as an adverbial quantifier, in a position adjoined to VP (above modifying adverbials). This is in contrast to Cinque’s specifier analysis, which would locate jeweils in the specifier position of a frequentative aspectual head.

2 The Syntax of Adnominal Jeweils: First Steps
With the syntactic analysis of adverbial jeweils accomplished, it is now time to turn to the central topic of this chapter, namely the syntactic analysis of adnominal jeweils. As a first approximation, I will show in section 2.1 that adnominal jeweils and the DistShare form a constituent, which has the categorial status of DP. This conclusion accounts for the generalisation that adnominal jeweils must stand adjacent to the DistShare (see chapter II.2). Section 2.2 looks at the internal structure of ‘jeweils-DPs’ in more detail. I argue that adnominal jeweils is a maximal projection at the left edge of DP. This raises a number of questions, such as where adnominal jeweils is base-generated, and what its exact position is inside the DP (2.3). These questions are difficult to answer for jeweils-DPs in isolation. For this reason, I present a number of syntactic constructions with analogous properties in 2.4., arguing that a unified analysis of these constructions and adnominal jeweils is desirable.

2.1 The Constituency of Adnominal Jeweils and DistShare
The claim to be defended in this section is that adnominal jeweils and the DistShare form a constituent. The constituency of jeweils and the following DistShare is supported by a number of standard constituency tests.

2.1.1 Applying the Constituency Tests
The complex expression formed by adnominal jeweils and a DistShare satisfies standard constituency tests. To begin with, the elements can be displaced together, both under A-movement (passivisation) in (21a) and under A’-movement (topicalisation) in (21b).
CHAPTER III

(21) **Displacement Test:**

a. \[\text{[XP Jeweils zwei Geschenke],} \] werden den Kindern \( t_1 \) gerade gegeben.
   
   ‘Each of the children is being given two presents.’

b. \[\text{[XP Jeweils einen Artikel],} \] haben die Gutachter \( t_1 \) bewertet.
   
   ‘One article each, the reviewers have evaluated.’

The paraphrase of (21b) shows that English each and its DistShare also form a constituent.

Second, adnominal jeweils and DistShare occur together in pseudocleft (22a) and it-cleft structures (22b) (Pollard & Sag 1994:111). The paraphrases confirm the constituency of each and DistShare in English.

(22) **Occurrence in Pseudocleft and It-Cleft Structures:**

a. Was die Jungen \( t_1 \) kaufen, sind jeweils zwei Würstchen.
   
   ‘What the boys are buying, are two sausages each.’

b. Es sind jeweils zwei Würstchen, was die Jungen \( t_1 \) kaufen.
   
   ‘It is two sausages each what the boys are buying.’

Third, the V2-requirement, which is normally strictly observed in modern German\(^9\), argues for the constituency of adnominal jeweils and the DistShare in subject position.

(23) **Jeweils zwei Bewunderer** verfolgen die Diven.
   
   ‘Each of the divas is stalked by two admirers.’

Fourth, jeweils and the DistShare can be co-ordinated with other nominal expressions (more on this in section 2.1.3):

(24) **Coordination Test:**

Die Jungen kauften \[\text{[Fritten] und jeweils zwei Currywürste].} \]

‘The boys bought chips and two curry sausages each.’

\(^8\) Displacement test (ia) and clefting test (ib) also confirm the constituency of distance-distributive chacun and the DistShare in French (Junker 1995:69):

(i) a. Combien de filles chacun ont-ils vu?
   
   ‘How many girls each have they seen’

b. C’est trois filles chacun que les garçons ont vues.
   
   ‘That’s three girls each that the boys have seen’

\(^9\) But see Büring & Hartmann (2001), who argue that the focus particle nur ‘only’ in the initial position of root clauses such as (i) is adjoined to CP, leading to a V3-structure.

(i) Nur die Harten kommen in den Garten.

‘Only the hard come into the garden.’

Büring & Hartmann restrict the capacity to violate the V2-requirement to focus particles. Since adnominal jeweils does not have the typical properties of focus particles, we expect it to comply with the V2 requirement.
Fifth, the string composed of *jeweils* and DistShare can be used to answer *wh*-questions. This shows that a single constituent, the question word, can replace the string. Again, this test also applies to English *each*.

(25) **Question Test:**
A: Was kaufen die Jungen gerade?  B: Jeweils zwei Bücher.
‘What buy the boys just each two books’

In light of the empirical evidence, I conclude that adnominal *jeweils* and DistShare form a constituent. This claim is at odds with Link’s (1986/98) treatment of *je(weils)* as a distributivity operator. This seems to be the appropriate place, then, for showing that Link’s analysis does not account for the properties of adnominal *je(weils)*.

2.1.2 **Adnominal Jeweils ≠ Distributivity Operator**

Link (1986/98) argues that the short form *je* is an overt spell out of, or indicator for the presence of the usually covert distributivity operator Dist. Presence of Dist is often postulated in order to account for the existence of distributive readings with plural subjects in the absence of overt distributive material. On this analysis, the two readings of (26) differ in that the distributive reading in (26b) involves the presence of an additional operator Dist. This operator is adjoined to the VP, as shown in (27).

(26) The boys carried the table.
   a. The boys carried the table together.  ➞ collective reading
   b. The boys carried the table individually.  ➞ distributive reading

(27) The boys [VP Dist [VP carried the table]].

The precise semantics of Dist have been a matter of dispute (cf. Link 1991, Schwarzschild 1996), but all accounts assume that Dist attaches to a property-denoting expression (the VP), and applies this predicate to parts of a plural individual, usually denoted by the subject. This can be formalised as follows (cf. Link 1991):

(28) \[ [[\text{Dist}]] = \lambda P \lambda x. \forall x' [x' II x \Rightarrow P(x')] \]  \((II = \text{the individual part-of relation})\)

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10 A similar analysis for English binominal *each* can be found in Roberts (1987).

11 See e.g. Link (1991), Schwarzschild (1996), and Lasersohn (1998). Lasersohn proposes a generalised version of the distributivity operator that can also account for distribution over plural objects and other plural arguments in the clause.

12 The crucial difference between the analyses in Link (1991) and Schwarzschild (1996) is that Dist distributes over atomic parts of the plural individual on the former analysis, whereas Schwarzschild claims that Dist (or in his terminology: Part) can also distribute over a set of subsets, a so-called *cover*, of this individual. The value of the cover is determined by the context. Schwarzschild bases his cover-account of so-called ‘generalized distributivity operators’ on data like (i) where the preferred reading of (i) involves distribution over the two subsets of cows and sheep and not over individual animals.

(i) The cows and the sheep were separated.

For our purposes, it does not matter which analysis is more adequate, since the objections against treating *jeweils* as an overt instance of Dist hold for both.
(28) reads as ‘DIST takes a property P and a plural individual x, such that each (atomic) i-part x’ of x has the property P. In the case of the distributive reading of (26), this means that each individual boy has the property of having carried the table.

For Link (1986/98), je in (29a) distributes over the subject denotation just like the covert operator DIST in (29b). Both yield a distributive reading.

(29)  a. Die Jungen haben je einen Tisch getragen.  
    the boys  have each one table carried  
    ‘The boys carried one table each.’

    b. The boys [VP DIST [VP carried one table]].
    ‘The boys each carried one table.’

Strictly speaking, Link makes no claim that this analysis applies to the long form jeweils as well. Nevertheless, an extension of his proposal to adnominal jeweils seems legitimate, since we can substitute jeweils for je in (29a) without a change in meaning (ignoring, for the time being, the additional adverbial reading), and because je was shown to be a short form of adnominal jeweils in chapter II.1.9.

(30)  Die Jungen haben jeweils einen Tisch getragen.  
    the boys  have each one table carried  
    ‘The boys have carried one table each.’

A Link-style analysis of jeweils or je in terms of the distributivity operator DIST is problematic for the following reasons. First, DIST is not subject to the indefiniteness restriction on DistShare (cf. 31a). It does not even require a nominal argument for well-formedness, and can occur with intransitive verbs (cf. 32a). The respective variants with je in the (b)-sentences are ungrammatical, the variants with jeweils only allow for the adverbial reading.

(31)  a. Die Jungen haben [VP DIST [VP den Tisch getragen]].
    the boys  have the table carried   
    ‘The boys have each carried the table.’

    b. Die Jungen haben *je / jeweils [VP den Tisch getragen]].
    the boys  have each / each.time the table carried  
    ‘The boys have carried the table each time.’

(32)  a. Die Jungen sind [VP DIST [VP gegangen]].
    The boys  are left  
    ‘The boys have each left.’

    b. Die Jungen sind *je / jeweils [VP gegangen].
    the boys  are each / each.time went  
    ‘The boys have left each time.’

Second, adnominal jeweils (or je) in subject position licenses backwards distribution of the subject over the object when occurring in subject position. This has been shown in

13 Link (1986/98:128) notes that jeweils “introduces a much stronger temporal connotation”. Clearly, this remark pertains to adverbial instances of jeweils.
chapter II.1.6 and in example (24), repeated as (33a). In contrast, the DIST-operator does not easily give rise to backwards distribution over an object denotation, as witnessed by the absence of such a reading for (33b). Presumably, the asymmetry between subject- and object-distributive readings with DIST is due to the syntactic position of DIST, which is adjoined to VP.

(33)  a. *Je jeweils zwei Verehrer verfolgen die Diven. $\rightarrow$ backwards distribution each two admirers chase the divas
   'For each of the divas x, there are two admirers who chase x.'

   b. Zwei Verehrer verfolgen die Diven. $\rightarrow$ no backwards distribution two admirers chased the divas
   i. 'There are two admirers x,y that chase (together) the divas.'
   ii. **'For each of the divas x, there are two admirers who chase x.'

The third problem arises in connection with compositionality and is acknowledged by Link (1986/98:131). Any analysis of adnominal jeweils or je as (indicating) an overt distributivity operator DIST, which is adjoined to and modifies VP, disregards the syntactic constituency of jeweils/je with the DistShare expression. This constituency was convincingly shown to exist in section 2.1.1. On the other hand, there is an instance of jeweils (though not of je) which adjoins to VP, but this adverbial jeweils gives rise to the adverbial reading (distributing over pluralities of events), not to the adnominal reading (distributing over subjects). The question arises, then, why adnominal jeweils, or je should be considered to be operators on VP if they clearly belong to a nominal constituent inside VP.14,15 I conclude that neither adnominal jeweils nor its short form je are overt instantiations of the distributive VP-operator DIST. We will now continue the discussion of the syntax of adnominal jeweils.

---

15 This argument extends to proposals (Sakaguchi 1998, Stowell 1999) that treat each as an operator on VP in a structure analogous to that proposed by Kayne (1998) for only VPs (cf. ia). On these proposals, movement into the specifier of each, followed by remnant movement of the "emptied" VP to a higher specifier position, licenses the DistShare. This accounts for the postnominal occurrence of each in (ib).

16 Apart from the constituency problem, there is yet another empirical problem, which has to do with the occurrence of d-distributive each in prepositional constructions (thanks to Hans den Besten for pointing this out to me). An analysis of (ii) in the spirit of Kayne is presented in (iiiia-c).

(ii)  The men talked to two persons each.

   (iia)  a. the boys [XP each [VP bought two sausages]]
   b. the boys [FP[VP bought t1]2 [eachP two sausages1 each t2]]

   Apart from the constituency problem, there is yet another empirical problem, which has to do with the occurrence of d-distributive each in prepositional constructions (thanks to Hans den Besten for pointing this out to me). An analysis of (ii) in the spirit of Kayne is presented in (iiiia-c).

   (iii)  a. each [VP talk to two person]    b. [XP two persons; each [VP talk to t1]]
   c. [VP talk to t1]2 [XP two persons; each t2]

   The relevant step is (iiiib), in which the preposition is stranded by the DistShare. Since stranding of the preposition is vital for deriving the correct word order, we expect structures like (ii) to be ungrammatical in languages that do not allow for preposition stranding. This expectation is not borne out, as witnessed by the following examples from French, which are grammatical (Ferret, p.c.).

   (iv) a. Les hommes ont parlé à deux personnes chac-un.
   b. Les hommes ont parlé chac-un a deux personnes.

   Since French does not allow for preposition stranding, I conclude that the derivation of (iva) and (ivb) cannot proceed along the lines in (iii). Given the additional constituency facts, I conclude that the analysis in (ii) is incorrect for English as well.
2.1.3 The DP-Status of Jeweils and DistShare

In section 2.1.1, adnominal jeweils and its DistShare were shown to form part of a nominal constituent. In this section, I argue that this nominal constituent is a complex DP (henceforth: jeweils-DP), as shown in (34).

\[(34) \quad [\text{DP jeweils DistShare}]\]

The categorial status as DP follows from the assumption that all nominal arguments have the syntactic status of DP (see Szabolcsi 1989, 1994, Stowell 1989, 1991 and the discussion in chapter I.2.4). Since the constituent formed by adnominal jeweils and DistShare occurs in subject and object position, both prototypical argument positions, it follows that the complex constituent must be a DP.

Furthermore, the entire constituent can be coordinated with full DPs (cf. Link 1986/98:124, where the same is shown for the short form je):

\[(35) \quad \text{Die siegreichen Jungen erhielten [DP[DP den Pokal] und [ jeweils eine Medaille ]].}\]

The victorious boys received the cup and each one medal

‘The victorious boys received the cup and one medal each.’

The DP-status of the second conjunct in (35) follows on the common assumption that constituents must be of the same syntactic category in order to be coordinated. Notice that (35) does not involve the deletion of subject and verb under gapping (Ross 1970), as indicated in (36).

\[(36) \quad \text{[Die siegreichen Jungen erhielten [DP den Pokal]] und [die siegreichen Jungen erhielten [XP jeweils eine Medaille]].}\]

This can be seen from the fact that the coordinated DP in (35) can be topicalised:

\[(37) \quad \text{[Den Pokal und jeweils eine Medaille] erhielten die siegreichen Jungen t}.\]

‘As for the cup and one medal each, the victorious boys received them.’

If (36) was the underlying structure of (35), such topicalisation would be impossible because the fronted element in (37) does not form a constituent in (36).

The final argument that the constituent formed by adnominal jeweils and DistShare is a DP has to do with A-movement taking place for case reasons. In chapter I.2.4, it was argued that the D-head of a nominal argument is the locus of case features. It follows that the full DP must undergo A-movement (e.g. passivisation) if it cannot be assigned case in its base position. If this assumption is valid, the following contrast is telling. (38) shows

\[\text{The argument from fronting gets additional support from the fact that fronting is impossible with structures that unmistakably are the result of gapping (Hans den Besten, p.c.). Presence of the temporal adverbial gestern ‘yesterday’ in the second conjunct in (i) signals that this conjunct is a reduced (independent) clause with its own temporal reference.}\]

\[(i) \quad \text{Die siegreichen Jungen erhielten den Pokal und gestern auch noch eine Medaille.}\]

\[\text{the victorious boys received the cup and yesterday as well a medal}\

As expected, fronting of the italicised string, which does not form a constituent, leads to ungrammaticality:

\[(ii) \quad *\text{Den Pokal und gestern auch noch eine Medaille erhielten die siegreichen Jungen.}\]

\[\text{the cup and yesterday as well a medal received the victorious boys}\]
the basic word order of a transitive sentence. Following Diesing (1992), the particle *ja doch* ‘after all’ is used to mark the left edge of VP. (39a) shows that topicalisation of the jeweils-DP is possible (see also (21b) above). (39b) shows that topicalisation of the DistShare alone, stranding jeweils inside the VP, is also possible.\(^ {17}\)

(38)  Peter hat den Kindern ja doch gerade [jeweils zwei Geschenke] gegeben.
       Peter hat den Kindern PART just each two presents given
       ‘Peter has given the children two presents each after all.’

(39)  a. [Jeweils zwei Geschenke], hat Peter den Kindern ja doch gerade t₁ gegeben.
       each two presents has Peter the children PART just given
       [Zwei Geschenke], hat Peter den Kindern ja doch gerade [jeweils t₁] gegeben.
       two presents has Peter the children PART just each given

Looking at passivisation (i.e. movement for case reasons), an interesting asymmetry emerges even though intuitions are subtle. In (21a), it was shown that A-movement of the entire jeweils-DP to SpecIP, followed by A’-movement to SpecCP is possible. (40a) illustrates the same point. In contrast, the sentence becomes degraded if only the DistShare moves, leaving jeweils behind in its base position inside the VP (40b).

(40)  a. [Jeweils zwei G.], sind t₁ den Kindern ja doch gerade t₁ gegeben worden.
       each two presents have the children PART just given been
       ‘The children have received two presents each after all.’
       b*?[Zwei G.], sind t₁ den Kindern ja doch gerade [jeweils t₁] gegeben worden.
       two presents have the children PART just each given been

Since extraction of the DistShare out of the jeweils-DP is possible in principle, as shown by (39b), the reason for the degraded status of (40b) must lie elsewhere. I would like to suggest that (40b) is ungrammatical because the remnant DP formed by jeweils and the trace of the DistShare remains in its base position inside the VP. In contrast, the DistShare zwei Geschenke ‘two presents’ moves out of the DP. It is plausible to assume that the DistShare moves through SpecIP on its way to SpecCP, just as the full jeweils-DP does in (40a). This means that the DistShare moves through a position in which it can be assigned NOM case (presumably this would involve re-analysing the DistShare as a full DP with an empty determiner). Given that NOM is assigned only once, the remnant DP inside VP cannot be assigned case, leading to a violation of the case filter. Again, if the constituent containing jeweils and the trace of DistShare in (40b) were not a DP, it would not need to be assigned case and the structure should be well-formed, contrary to fact.\(^ {18}\)

---

\(^ {17}\) The question what licenses extraction of the DistShare out of DP is discussed in chapter III.4.5.

\(^ {18}\) Possibly, (40b) is outright ungrammatical because there is a derivation for (40b) which complies with the requirement that the entire DP move to SpecIP. Recall from the discussion in chapter II.2 that left-edge markers of VP never show with absolute certainty that an element to the right of them is really VP-internal. This is because the VP-edge-markers can scramble themselves across material that has been moved outside the VP for certain discourse reasons. Later in this chapter, it will be argued that it is possible for jeweils to raise out of its embedding DP. Therefore, jeweils in (40b) could have moved out of DP and VP on its own, followed by scrambling of the particle, and by remnant movement of the entire DP, which contains the trace of jeweils, to SpecIP (for case) and onwards to SpecCP. The resulting structure is given in (i) (I ignore the exact position of the indirect object for reasons of transparency):
I conclude that there are both theoretical and empirical reasons to assume that the constituent formed by jeweils and the DistShare is a DP. In the next step, we will turn to the internal structure of this DP.

2.2 The Internal Structure of Jeweils-DPs

I would like to argue that the internal structure of jeweils-DPs is as shown in (41):

(41)

<table>
<thead>
<tr>
<th>DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP</td>
</tr>
<tr>
<td>jeweils</td>
</tr>
<tr>
<td>zwei Bücher</td>
</tr>
</tbody>
</table>

In (41), jeweils is a maximal projection that occurs in the left periphery of a DP. The covert functional head D of the DP selects for a DistShareNP as complement.

The above claim entails that the structure of jeweils-DPs is not as in (42a-c).

(42) a. DP b. DP c. DP

<table>
<thead>
<tr>
<th>D</th>
<th>NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>jeweils</td>
<td>zwei Bücher</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D</th>
<th>NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>jeweils</td>
<td>zwei Bücher</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AP</th>
<th>NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>zwei</td>
<td>Bücher</td>
</tr>
</tbody>
</table>

In (42a), jeweils is the head of the DP and takes a DistShareNP as its complement. In (42b), jeweils forms a complex D-head with the numeral zwei 'two'. In (42c), jeweils is a maximal projection adjoined to the adjectival numeral zwei 'two'.

At first sight, the syntactic structures in (42b) and (42c) seem plausible. Analogous structures have been proposed for the morphologically related s-expressions wenigstens 'at least' and höchstens 'at most' (more on these in section 4.4). Keenan & Stavi (1986:262) analyse the corresponding English phrases at least two, at most two etc. as complex determiner heads, i.e. as in (42b). Link (1987) takes at least and at most (and presumably their German counterpart as well) to be adverbial modifiers of an adjectival numeral (cf. 42c). Furthermore, a treatment of adnominal jeweils along the lines in (42b) or (42c) would formally assimilate d-distributive constructions in German to those in

(i) *[t₁ Zwei Geschenke], sind den Kindern [VP ja doch [VP gerade [VP jeweils, [VP t₁ t₂ gegeben worden]]]].

two presents have the children PART just each been

The massive involvement of scrambling operations (which are triggered by special discourse requirements) may be responsible for the degraded status of (40b).

Of course, the argument in the main text is only valid as long as there is no other way for the VP-internal remnant DP to receive NOM, say by means of case transfer (under co-indexation) from the intermediate trace, or even a covert expletive in SpecIP.

The structures in (41) and (42a-c) are formulated in the traditional X-bar-format of GB-theory. However, the four-way distinction can be reduplicated in alternative frameworks, e.g. Chomsky’s (1995) ‘Bare Phrase Structure’. The corresponding representations would be [zwei Bücher, [jeweils, zwei Bücher]] (41), [jeweils, [jeweils, zwei Bücher]] (42a), [{zwei, [jeweils, zwei]}, Bücher] (42b), and {Bücher, [{zwei, [jeweils, zwei]}, Bücher]} (42c) respectively.
languages which express d-distributivity by reduplicating the numeral. (43) repeats an example from Hungarian from chapter II.4.

(43) A gyerekek hoztak egy-egy könyvet. \[Hungarian\]
the children bought a-a book
‘The children bought a book each.’

On the assumption that reduplication affects the numeral itself, the structure of (43) would be very similar to those in (42bc).

Nonetheless, I would like to maintain that the structure of jeweils-DPs is not that in (42b) or (42c).\(^{20}\) Evidence for this claim comes in form of the extraction data from the previous section. The grammaticality of (39b), repeated as (44), shows that the DistShare can be extracted out of the jeweils-DP, leaving jeweils behind.

(44) [Zwei Geschenke] hat Peter den Kindern ja doch gerade [jeweils t\(_1\)] gegeben.
two presents has Peter the children PART just each given

Such an extraction is predicted to be impossible by (42b) and (42c). In these structures, the numeral zwei ‘two’ and the plural NP Bücher ‘books’ do not form a constituent to the exclusion of jeweils. The extraction facts clearly show, then, that jeweils does not form a constituent with the numeral. Instead, the numeral seems to form a constituent with the plural NP (henceforth ‘DistShareNP’). This conclusion is corroborated by the observation that an extraction as in (44) is impossible with genuine numeral modifiers. In (45a), the modifier genau ‘exactly’ cannot stay behind when the numeral NP zwei Würstchen ‘two sausages’ moves. This fact supports the underlying syntactic structure in (45b).\(^{21}\)

(45) a. *Zwei Würstchen haben sie gerade genau \(t_1\) gekauft.
b. Sie haben gerade [genau zwei Würstchen] gekauft.

The contrast between (44) and (45a) argues against adopting (42b) or (42c) as syntactic structures for jeweils-DPs.

This conclusion is supported by the fact that adnominal jeweils can combine with a complex DistShareNP in form of two conjoined numeral NPs, as in (46).\(^{22}\)

(46) Peter schuldet seinen Großvätern jeweils 200 Euro und fünf Konzertkarten.
Peter owes his grandfathers each 200 Euro and five concert tickets
‘Peter owes his grandfathers 200 Euro and five concert tickets each.’

Since only constituents can be co-ordinated, (46) shows that numeral and NP form a constituent, and that the structure of jeweils-DPs cannot be as in (42bc).

At the same time, there is reason to doubt that jeweils is the head of the jeweils-DP, as in (42a). To begin with, unlike other overt D-heads in German\(^ {23}\), jeweils does not inflect

\(^{20}\) In chapter V.4.4, I offer a speculation to the effect that the structure of the Hungarian (43) is not as in (42bc) either. There, (43) is assigned the structure in (43a), and is therefore parallel to German jeweils-DPs.
\(^{21}\) The structure in (45b) is supported by semantic considerations. Unlike the non-modified NP zwei Bücher ‘two books’, the modified structure genau zwei Bücher ‘exactly two books’ is best interpreted as a generalised quantifier with the complex head genau zwei ‘exactly two’ as the quantificational D-head of the structure.
\(^{22}\) Thanks to Daniel Büring (p.c.) for providing this piece of evidence.
for number or gender of the DP. Also unlike other D-heads, *jeweils* does not inflect for external case. As argued in chapter II.1.3, *jeweils* is invariably case marked for genitive, no matter if the *jeweils*-DP occurs in a nominative, accusative, or dative environment. All this casts doubt on the assumption that the D-features of the DP (case, number, gender) are represented on *jeweils*, as they should if *jeweils* was the head of the DP.

Second, the genitive marking on *jeweils* argues against its head status since case is usually assigned to maximal projections. A final argument against the head of *jeweils* comes from the optional occurrence of *jeweils* in postnominal position. This was discussed in chapter II.4.2.1, and is illustrated again in (47a).

\[(47)\]
\[
\begin{align*}
\text{a. } & [\text{DREI Würstchen } \text{*jeweils}] \text{ haben die Jungen gegessen.} \\
& \text{three sausages each have the boys eaten}
\\
\text{b. } & [\text{Jeweils drei Würstchen}] \text{ haben die Jungen gegessen.}
\end{align*}
\]

If *jeweils* were the head of the DP, the optional positioning of *jeweils* in (47ab) would force us to assume that this head is able to occur to the left and to the right of its complement, a behaviour quite untypical of heads. Of course, it is conceivable that the NP *drei Würstchen* ‘three sausages’ in (47a) has moved overtly around the D-head to SpecDP. Unlike in Scandinavian languages, where the definite determiner often follows its (NP)-complement (e.g. in Swedish *hus-et* ‘house-the neut,sg’), NP-complements in German generally do not precede their D-head (e.g. *drei Jungen die* ‘three boys the’). It would be peculiar if *jeweils*-DPs were the only instance of such a configuration in German. Also notice that NP-movement to SpecDP in the Scandinavian languages is obligatory, whereas NP-movement around *jeweils* would be optional. I conclude that *jeweils* is not the head of the DP, and that (42a) is not the structure of *jeweils*-DPs.

By way of exclusion, we therefore arrive at the conclusion that *jeweils* is a maximal projection which forms part of a larger nominal constituent, a *jeweils*-DP, together with the DistShareNP. The discussion is summarised by means of the structure in (48).

\[(48)\]
\[
\text{The Structure of Jeweils-DPs:} \\
[\text{DP } \ldots \{\text{VP jeweils}\} \ldots \{\text{NP DistShare}\}] \\
\]

Adnominal *jeweils* is usually located in the left periphery of the *jeweils*-DP, but it can also follow the DistShareNP in particular contexts.

### 2.3 The Problem of Multiple Analyses and a Way Out

Having established the structure in (48), a number of questions about the syntactic structure of *jeweils*-DPs remain. The open questions are listed in (49).

\[(49)\]
\[
\begin{align*}
\text{i. } & \text{What is the exact position of *jeweils* in (48)? Is it a specifier (in SpecDP), or an } \\
& \text{adjunct to DP?}\text{24} \\
\text{ii. } & \text{Is *jeweils* base generated in this position, or has it moved there?} \\
\text{iii. } & \text{If movement has applied, what is the base position of *jeweils*?} \\
\text{iv. } & \text{What is the internal syntactic structure of *jeweils* (a maximal projection)?}
\end{align*}
\]


24 This question is irrelevant in Kayne’s (1994) framework of ‘antisymmetry’, in which all specifiers are adjuncts to a maximal projection.
v. What is the categorial status of jeweils?

Finding answers to the questions in (49) is the objective of sections 3 and 4. The search for these answers is complicated by the fact that it appears impossible to give definite answers to all the questions in (49) by looking at jeweils-DPs in isolation. Many different analyses are in line with the general structure in (48). In response to the ‘problem of multiple analyses’, I suggest the following approach to the analysis of jeweils-DPs.

Whenever it is hard or impossible to answer a question in (49) by looking at jeweils-DPs in isolation, we will look for related constructions, both in German and cross-linguistically, which share characteristic properties with jeweils-DPs, and which provide us with more overt clues about their syntactic structure. This approach is based on the assumption that identical properties of two constructions follow from an identical underlying structure (possibly forced by identical underlying semantic requirements). For instance, if jeweils has moved to its surface position in (48), we expect to find corresponding structures without movement in other languages, or in related German constructions. Obvious candidates in question are distance-distributive constructions in languages in which the distance-distributive element occurs after the DistShareNP, as e.g. in English. Regarding related constructions in German, it will be argued that ‘inverse linking constructions’ (cf. May 1985) and what I call ‘jeNP-constructions’ have the same underlying structure as jeweils-DPs. Looking at these related structures, then, will help to answer the questions in (49ii) and (49iii). In addition, looking at inverse linking and jeNP-constructions (and at distance-distributive constructions in other languages) will provide us with clues concerning the internal structure and categorial status of jeweils itself (cf.49iv,v). As will be demonstrated in sections 4 and 5, the same underlying analysis can be postulated for all these constructions as well as for jeweils-DPs.

Instead of postulating individual analyses for a number of – at first sight – disparate constructions in German and cross-linguistically, the present account aims at a unified analysis for all of them. A uniform analysis is warranted by the set of properties shared in common by the different constructions. The analysis to be proposed is unifying in two ways. It is unifying cross-linguistically, accounting for both syntactic similarities and differences between distance-distributive constructions across languages. And it is unifying intra-linguistically, accounting for identical properties of three nominal constructions in German that appear to be unrelated at first sight. Its high degree of generality is taken to be a virtue of the analysis proposed. It also motivates the use of evidence from other syntactic structures in our search for the correct analysis of jeweils-DPs.

In the following section, I introduce the related syntactic constructions that will assist us in formulating an adequate syntactic analysis of jeweils-DPs.

2.4 Related Structures

As discussed in the preceding section, the syntactic analysis of jeweils-DPs makes use of the following principle: What we cannot find out by looking at jeweils-DPs in isolation, we may find out by looking at constructions which are related syntactically and semantically. At the end of the discussion, a unified analysis of jeweils-DPs and related constructions will have emerged. This section is devoted to a brief presentation of the

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25 There is also direct evidence from jeweils-DPs concerning (49ii) and (49iii). In (47ab), it was observed that jeweils can optionally occur in postnominal position. A movement analysis can account for the optional positioning of jeweils by assuming optional movement (e.g. for discourse reasons).
relevant constructions which have a bearing on the analysis of jeweils-DPs. Section 2.4.1 recapitulates distance-distributive constructions from languages in which the distance-distributive element follows the DistShareNP. Section 2.4.2 presents inverse linking and jeNP-constructions in German, and shows that they share some characteristic properties with jeweils-DPs. In section 2.4.3, I highlight the differences between the constructions that a unified analysis must account for.

2.4.1 Postnominal Distance-Distributive Elements

As discussed in greater detail in chapter II.4.2.1, the distance-distributive element (henceforth ‘DD’) follows the DistShareNP in a number of languages (including, optionally, German). Here, I will concentrate on English and Korean, where the DD follows the DistShareNP. As pointed out in chapter II.4.2, languages with postnominal DDs share a number of properties with jeweils-DPs. First, they form a constituent with the DistShareNP. The constituent can be displaced as a whole (cf. 50ab).

(50) a. [One interpreter each]1 was assigned t1 to the visiting diplomats.
    b. [noray-han-kok-ssik-ul]1 sonim-motwu-ka t1 pwul-ess-ta
       song one CL each-ACC guest-all -NOM sing-PST
       ‘The guests a song each.’ (Choe 1987:48, ex.12; from Kim 1985:107-126)

Second, the DistShareNP must be indefinite (Safir & Stowell 1988:428).

(51) a. The boys adore two / some/ many / at least five / more than five pop stars each.
    b.* The boys adore the / every pop star each.

       child-pl-NOM balloon one ACC bought
       The children bought one balloon each.’(Choe 1987:49,ex.13)
    b. *Sonyen-tul-un ku chayk-ssik-(ul) ilk-et-ta.    (S. Kim, p.c.)
       boy-PL-TOP the book-each-ACC read-PAST-DEC/IND

Third, their DistKey must be a plural expression (Safir & Stowell 1988:428, Choe 1987:58). Korean sentences with no over plural antecedent are grammatical, but must be interpreted as distributing over an implicit pluralic entity in the context (cf.53c):

(53) a. The boys/ Peter and Paul / All the boys / Two boys bought two sausages each.
    b.* Paul/ the boy bought two sausages each.
    c. na-nun phwungsen-hana-ssik-ul sa-ess-ta.     [Korean]
       I-TOP balloon one ACC bought
       ‘I bought a balloon each time / on each occasion.’ (Choe 1987:52, ex.18)

Fourth, DistKey and DD must be clausemates. The DD cannot distribute over a DistKey in a higher clause (Safir & Stowell 1988:446, Choe 1987:55-57).

(54) a. *The store clerks, said that John had bought a balloon each, from Mary.

26 The indefiniteness restriction is subject to the same qualifications as in chapter II.1.5, fn.8. In particular, the DistShareNP must denote a count noun expression, not a mass term:

(i) *The boys bought sugar each.
b. chemwen-tul-i [John-i Mary-hantheyse phwungsen-hana-ssik-ul
clerk-pl- NOM John- NOM Mary-from balloon one each- ACC
sa-ess-ta]-ko malha-ess-ta
bought said
*‘Each store clerk said that John had bought a different balloon from Mary.’

(50)-(54) show that the postnominal DDs in English and Korean have the characteristic properties of adnominal jeweils. On the null hypothesis, these shared properties are the reflex of a shared underlying structure. This implies that either the German surface order is derived from the English and Korean surface order, or vice versa. Taking up proposals made in Lipták & Zimmermann (2000) and Zimmermann (to appear, a), I propose the hypothesis in (55).

(55)  Adnominal jeweils in German jeweils-DPs is base-generated in postnominal position and moves overtly to DP-initial position (in the unmarked case).

The same holds for DDs in the other languages in which they occur before the DistShare in DP-initial position (see chapter II.4.2.1 for details). In languages like English and Korean, on the other hand, the DD never moves overtly, but remains in its base position. The decision to take the English word order as basic is supported by theoretical considerations (movement is mostly to the left, universally\(^2\)). In addition, there are two German constructions that somewhat resemble distance-distributive constructions to a certain extent, and that exhibit the English word order as their unmarked “basic” word order. The assumption of the English word order as basic allows for an extension of the analysis to these constructions as well.

2.4.2 Related DP-Constructions in German

There are two German DP-constructions that exhibit the underlying (English) word order overtly. These are inverse linking constructions (henceforth: ILCs) and jeNP-constructions.\(^2\) ILCs occur in English and German, whereas jeNP-constructions are confined to German. The English equivalent of the jeNP-construction is the perNP-construction, as shown in the gloss of (56b).

The interesting observation is that ILCs and jeNP-constructions behave like jeweils-DPs in a number of respects despite surface differences in their syntactic structure. Consider (56a) with a jeweils-DP, (56b) with a jeNP-construction, and (56c) with an ILC (all in italics)

(56) a. Der Direktor hat den Gefangenen jeweils drei Bewacher bereitgestellt.
   the director has the inmates DAT each three guards assigned

b. Der Direktor hat drei Bewacher je Gefangenen bereitgestellt
   the director has three guards per inmate DAT assigned

c. Der Direktor hat drei Bewacher für jeden Gefangenen bereitgestellt
   the director has three guards for each inmate ACC assigned
   ‘The director has assigned the inmates three guards each.’

\(^2\) For Kayne (1994), all movement is to the left without exception.

\(^2\) The DP-status of these constructions is inferred from the fact that they occur in argument position.
Before we look at the similarities, it is worth pointing out three differences between the jeweils-DP in (56a) and the constructions in (56bc). First, on the unmarked word order, the universally quantified expression precedes the DistShareNP drei Bewacher ‘three guards’ in (56a), but follows it in (56bc). Second, the structures in (56bc) differ from jeweils-DPs in that they both contain an NP (Gefangenen) which restricts the universal quantifier semantically, and which appears to be its complement syntactically. In contrast, the restricting NP (the DistKey) of the jeweils-DP in (56a) appears to form an independent constituent. Finally, (56c) differs from (56ab) in that the ILC contains an overt preposition. I will come back to these differences shortly, observing that a unified analysis will have to account for them.

Turning to the similarities, the first observation is that jeweils-DPs, jeNP-constructions, and ILCs can be substituted for one another without a change in meaning. (56a-c) are synonymous. In all three sentences, the universal quantifier takes scope over the numeral expression. On the null hypothesis, this synonymy is the result of a shared underlying structure. Assuming that the universally quantified expression is base-generated in postnominal position (in line with the cross-linguistic considerations above), it follows that the prenominal position of jeweils in (56a) is derived from an underlying postnominal position by movement.

The three constructions share more properties in common, supporting the assumption that they have the same underlying structure. In all three constructions, the quantified phrase forms a constituent with the DistShareNP. For jeweils-DPs, this was shown in 2.1.1. For jeNP-constructions and ILCs, this is shown in (57ab), where the two elements topicalise together.

(57)a. jeNP-Construction:

\[
\text{[Drei Bewacher je Gefangenen], hat der Direktor t\textsubscript{1} bereitgestellt.}
\]
three guards per inmate\textsubscript{DAT} has the director \textsubscript{DAT} assigned

‘It was three guards per inmate that the director has assigned.’

b. ILC:

\[
\text{[Drei Bewacher für jeden Gefangenen], hat der Direktor t\textsubscript{1} bereitgestellt.}
\]
three guards for each inmate\textsubscript{ACC} has the director assigned

‘It was three guards to each inmate that the director has assigned.’

Second, jeNP-constructions and inverse linking constructions show optional movement of the quantified phrase to DP-initial position. To make sure that this movement is indeed DP-internal (and not, say, an instance of middle field-internal scrambling out of the embedding DP), this is shown for topicalised DPs in sentence initial position.

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29 This is the only reading for (56a) and (56b). (56c) has an additional ‘surface’ reading on which the numeral expression takes scope over the universal quantifier. This reading is irrelevant for our present purposes because ILCs on the surface reading do not behave like jeweils-DPs. In section 3, I show that the two readings are derived from different surface structures. Of these, only the structure for the reading in the main text, the ‘inverse reading’, is of interest here. In what follows, whenever I talk about ‘the parallel behaviour of jeweils-DPs and ILCs’, this should be read as ‘the parallel behaviour of jeweils-DPs and ILCs on the inverse reading’. See section 3 for further discussion.

30 The moved constituent is actually a PP in the ILC in (58b). This could be attributed to pied-piping. However, in section 3 it will be argued that the PP in (58b) is re-interpreted as a quantified expression for semantic reasons. Therefore, the generalisation in the main text that a quantified phrase moves is accurate.
(58)a. jeNP-Construction:

\[ \text{Je GEFANGENEN}_1 \text{ drei Bewacher } t_1 \text{ hat der Direktor bereitgestellt} \]
per inmate\_DAT three guards has the director assigned

‘It was three guards per inmate that the director has assigned.’

b. ILC:

\[ \text{Für jeden GEFANGENEN}_1 \text{ drei Bewacher } t_1 \text{ hat der Direktor bereitgestellt} \]
foreach inmate\_ACC three guards has the director assigned

‘It was three guards to each inmate that the prison director has assigned.’

The small caps on the fronted constituent indicate that movement in (58ab) is triggered by discourse requirements (see section 4.4.1). Later, it will be shown that fronting of jeweils also takes place for discourse reasons.

Semantically, the indefiniteness restriction on the DistShare, which was observed for jeweils-DPs in chapter II.1.5, also holds for jeNP-constructions and ILCs. Compare the grammatical (56bc) from above with the ungrammatical (59ab), where the DistShare expression is definite. Again, DPs in sentence internal position are used in order to exclude the possibility that we deal with two independent DPs.\(^{31}\)

(59)a. jeNP-Construction:

\[ \text{den Bewacher je Gefangenen} \text{ hat der Direktor bereitgestellt} \]
the guard per inmate\_DAT has the director assigned

‘The director has assigned the guard per inmate.’

b. ILC:

\[ \text{den Bewacher für jeden Gefangenen} \text{ hat der Direktor bereitgestellt} \]
the guard for each inmate\_DAT has the director assigned

‘The director has assigned the guard to each inmate.’

Finally, the three constructions behave alike regarding extraction from them. All allow for extraction of the quantified phrase, as witnessed by (60a-c).

(60)a. jeweils\_1 has der Direktor den Gefangenen\_1 drei Bewacher bereitgestellt.
each\_DAT has the director the inmates\_DAT three guards assigned

b. Je Gefangenen\_1 hat der Direktor drei Bewacher\_1 bereitgestellt.
per inmate\_DAT has the director three guards assigned

c. Für jeden Gefangenen\_1 has der Direktor drei Bewacher\_1 bereitgestellt.\(^{32}\)
for each inmate\_ACC has the director three guards assigned

‘The director has assigned the inmates three guards each.’

And all of them allow for extraction of the DistShareNP, as witnessed by (61a-c).

(61)a. Drei Bewacher\_1 hat der Direktor den Gefangenen jeweils\_1 bereitgestellt.
three guards has the director the inmates\_DAT each assigned

\[^{31}\text{For instance, sentence (i) with a definite direct object and a prepositional object in the middle field is grammatical:}\]

\[(i) \text{Der Gefängnisdirektor hat den Bewacher für jeden Gefangenen bereitgestellt.}\]
the prison director has the guard for each inmate provided

‘The prison director has provided the same guard for each inmate.’

\[^{32}\text{For (60c), it is impossible to tell if the fronted PP has extracted out of an object DP, or if we simply have to do with a fronted prepositional object as in (i) in fn.31. The same caveat holds for (61c) below.}\]
b. Drei Bewacher hat der Direktor t₁ je Gefangenen bereitgestellt.
three guards has the director per inmate Assigned

Drei Bewacher hat der Direktor t₁ für jeden Gefangenen bereitgestellt.
three guards has the director for each inmate Assigned

‘The director has assigned the inmates three guards each.’

Concluding this section, it was shown that jeweils-DPs, jeNP-constructions, and ILCs behave alike in a number of respects. Semantically, all constructions give rise to the same interpretation, and all exert an indefiniteness restriction on the DistShareNP. Syntactically, all constructions consist of a quantifying expression and an indefinite NP, all of them allow for movement of the quantified phrase to DP-initial position, and all of them allow for extraction of quantified phrase and DistShareNP respectively. The semantic and syntactic parallels suggest that the three DP-constructions have the same underlying structure.

2.4.3 Differences between DP-Constructions and Consequences for Jeweils-DPs
Below (56), it was pointed out that the various DP-constructions under discussion exhibit a number of differences. These differences concern the presence or absence of a restricting NP for the universal quantifier inside the DP, the (unmarked) relative word order between quantified phrase and DistShareNP, and the presence or absence of an overt preposition. ILCs and jeNP-constructions contain a full NP as restriction of the quantifier, whereas jeweils-DPs require an antecedent DistKey expression. With ILCs and jeNPs, the quantified expression usually does not move, whereas jeweils usually moves to DP-initial position. Finally, ILCs contain an overt preposition.

Since a unified analysis assumes a single underlying structure for all three constructions, the following questions arise regarding the structure of jeweils-DPs.

(62) i. Do jeweils-DPs contain a restricting expression for the universal quantifier like jeNPs and ILCs? If so, what is the nature and position of this restricting expression?
ii. Why do jeweils-DPs normally co-occur with a DistKey antecedent, whereas ILCs and jeNPs do not?
iii. Do jeweils-DPs contain a prepositional phrase like ILCs?
iv. Why does jeweils move to DP-initial position in the unmarked case, and why does the quantified expression normally stay behind with ILCs and jeNPs?

The upcoming discussion in sections 3 to 5 provides answers to the questions in (62). Anticipating the results of the discussion, (63) shows the internal structure of jeweils-DPs that will be argued for.

(63)
In (63), the distance-distributive element *jeweils* is analysed as a PP which consists of three parts: an empty P-head (licensed by overt genitive morphology on its complement), a universal quantifier *je*, and a - what I will call - NP-proform *-weil-*, which is a proform for lexical NPs. Being an NP-proform, *-weil-* ranges over sets of entities and can provide the universal quantifier with its restriction. *Weil-* receives its value through co-indexation with a DistKey antecedent. The PP ([P⁰ jeweils]) is base-generated in postnominal position, where it is adjoined to the DistShareNP. From there, it moves to the specifier of DP, triggered by discourse requirements (hence the contextually restricted option to stay behind).

2.5 Conclusion and Preview of Things to Come

This section has presented the first steps towards a syntactic analysis of adnominal *jeweils*. The distance-distributive element *jeweils* and the DistShareNP have been shown to form a constituent, which is a DP. Furthermore, it was shown that *jeweils* is a maximal projection located in the left periphery of the DP. Finally, a first comparison with related constructions from other languages and from German has led to the formulation of the hypotheses in (64).

(64)

i. Adnominal *jeweils* is base-generated in postnominal position inside the *jeweils*-DP.

ii. English exhibits the universal underlying structure of DD-constructions overtly.

iii. Adnominal *jeweils* moves overtly to SpecDP for discourse reasons.

iv. *Jeweils* is syntactically complex. It is a maximal projection with the categorial status of a PP. The PP is headed by a covert preposition P⁰ that is licensed by genitive case on its NP-complement.

v. The NP-complement consists of the universal quantifier *je* and its restriction, the proform *-weil-*. The latter is co-indexed with a DistKey expression.

The last point is of particular interest. If correct, it shows that distance-distributive elements behave like regular quantifiers after all. They take their semantic restriction as syntactic complement. They differ from other adnominal quantifiers in that the restriction is not provided by a lexical NP, but by a proform which receives its value from an element in the linguistic context under co-indexation.

In the following sections, I lay out the syntactic analysis of adnominal *jeweils* in detail. I will start with a discussion of the syntax of ILCs because these have received considerable attention in the literature. I will argue that the surface structure of ILCs is different from what is commonly assumed in the literature (May 1977, 1985, Larson 1985a, Heim & Kratzer 1998). Based on the assumption that ILCs, jeNP-constructions and *jeweils*-DPs have the same underlying structure, the analysis is extended to the latter two constructions in section 4. Section 4 forms the central part of the chapter. It introduces and defends the syntactic structure of adnominal *jeweils*. In section 5, the syntactic analysis of adnominal *jeweils* is extended to distance-distributive constructions in other languages. These are argued to have the same syntactic structure. Differences between languages are shown to derive from general cross-linguistic syntactic differences, and from the morphosyntactic feature content of the distance-distributive elements themselves.
CHAPTER III

3 The Structure of Inverse Linking Constructions (ILCs)

This section presents the syntactic analysis of ILCs, which provides the basis for the analysis of jeweils-DPs in section 4. In section 3.1, I discuss the characteristic properties of ILCs as illustrated in (65ab).

(65)  a. [DP Ein Apfel [PP in [QP jedem Korb]]] ist faul.
     b. [DP One apple [PP in [QP every basket]]] is rotten.

Since ILCs in English and German behave alike syntactically and semantically, the discussion is based on English examples. All points raised apply equally well to ILCs in German. In 3.2, I present the standard account of ILCs as found (with variations) in May (1977, 1985), Larson (1985a) and Heim & Kratzer (1998). In 3.3, I raise some problems for the standard account that motivate a revised analysis of the structure of ILCs. The revised analysis is presented in 3.4. The central claim of the revised analysis is that the postnominal PP in (65) is not base-generated below the numeral one – as commonly assumed –, but above it. In particular, it is right-adjointed to an NP consisting of numeral and head noun. 3.5 shows how the properties of ILCs follow on the revised analysis. Finally, I briefly discuss an alternative version of the revised analysis that does without right-adjunction in 3.6. The purpose of this section is to show that the revised analysis is not contingent on the possibility of right-adjunction, which is in some frameworks excluded on general grounds.

3.1 The Properties of ILCs

ILCs, illustrated again in (66ab), are first discussed in May (1977):

(66)  a. [DP One apple in [QP every basket]] is rotten.
     b. [DP Some man from [QP every city]] despises it.

ILCs are DPs that contain a quantified NP (QP) that is selected by a preposition. ILCs have three characteristic properties. First, they are ambiguous between the surface scope (henceforth: ‘surface’) reading and an inverse scope (henceforth: ‘inverse’) reading (cf. 67a-b). On the inverse reading, the embedded QP takes scope over the indefinite or numeral expression. It is on their inverse reading that ILCs show a behaviour parallel to that of jeweils-DPs. Therefore, the syntactic structure that gives rise to this inverse reading will be of particular interest to us. Second, on the inverse reading, the DP-internal QP can bind a pronoun outside the ILC (cf.68a). 33 Third, ILCs are restricted to non-specific DPs (Fiengo & Higginbotham 1981). 34 The inverse reading is impossible with specific DPs, as shown in (69).

33 This bound-variable reading is not available for all speakers. See chapter V.4.1 for more discussion. The use of “*” and “#” in (67a) and (68a) reflects the different status of the two readings. The reading in (68a) is generally impossible, whereas ‘surface’ readings as in (67a) are possible in principle, but can be excluded on pragmatic grounds (Pafel 1997:177). (i) is an example of an ILC with a plausible surface reading.

(i) Some trip to every city was fantastic.

   "There was a trip which led to every city and which was fantastic."

34 As pointed out in chapter II.1.5, fn.8, the indefiniteness condition on adnominal jeweils is really a non-specificity condition (see also chapter IV.5). This way, the parallelism between ILCs and jeweils-DPs can be maintained.
One apple in every basket is rotten.
   a. #There is one apple which is in every basket and which is rotten.
   b. In every basket, there is one apple that is rotten.

Some man from every city despises it.
   a. *There is a specific man from every city who despises it.
   b. For every city y, some man from y despises y.

This picture of everybody is now on sale.
   *For everybody y, this picture of y is on sale.

The properties of ILCs are frequently attributed to the application of LF-movement (May 1977, 1985, Fiengo & Higginbotham 1981, Heim & Kratzer 1998, Fox 2000). LF-movement raises the embedded QP to a position from where it can take scope over the numeral/indefinite expression, and from where it can bind a variable outside the ILC. I summarise these analyses under the label ‘LF-movement analysis’.

3.2 The LF-Movement Analysis
May (1977, 1985) and Heim & Kratzer (1998) assume the surface structures in (70) for the ILCs in (66):

(70)  a. [DP One [NP apple [PP in [QP every basket]]]] is rotten.
   #‘There is one apple which is in every basket and which is rotten.’
   b. [DP Some [NP man [PP from [QP every city]]]] despises it.
   #‘There is some man who is from every city and who despises it.’

The surface structures in (70) can be targeted by LF-movement. Since LF-movement for interpretive reasons (e.g. scope) is optional (Fox 2000), it need not apply. In this case, the QP remains in situ. It takes surface scope under the numeral/indefinite expression (cf.70ab), and is unable to bind a variable outside the ILC (cf.70b). If LF-movement applies, the QP raises across the indefinite/numeral expression. In May (1977), the QP is extracted from the embedding DP. In May (1985) and Larson (1985a), it only adjoins to the embedding DP. The latter option is illustrated in (71ab). (71ab) show that the raised QP takes scope over the indefinite/numeral expression at LF, and it is able to bind a variable outside the ILC, arguably under c-command.35

(71)  a. [DP [QP every basket]1 [DP one apple [PP in t1]]] is rotten.
   b. [DP [QP every city]1 [DP some man [PP from t1]]] despises it1.

3.3 Problems for the LF-Movement Analysis
The LF-movement analysis is convincing at first sight. It seems to account for the characteristic properties in an elegant and systematic fashion, and it is in line with standard assumptions about the workings of the syntactic component. Nonetheless, there are a number of problems for the LF-movement analysis, raising the question if there is no better analysis available. In addition, the analysis rests heavily on the assumption of LF-movement. Since one of the methodological principles of this thesis is to avoid LF-movement where possible, I propose to look for an analysis of ILCs that does without LF-movement.

35 At least under Kayne’s (1994) definition of c-command, according to which elements left-adjointed to maximal projections always c-command out of these because the latter do not dominate them.
There are three kinds of problems for the LF-movement analysis of ILCs. The first problem arises in connection with contradictory evidence regarding the landing site of the raised QP. An analysis without LF-movement would avoid such a contradiction. Second, cross-linguistic considerations argue against an LF-analysis of ILCs. An analysis without LF-movement would make possible a unified treatment of English and German ILCs, where LF-movement is not so readily available. Third, there is evidence that the surface structure of ILCs on their inverse reading is not as indicated in (70ab). The QP seems to be structurally higher than the numeral/indefinite expression at surface structure already, making LF-movement (for scope reasons) obsolete.

3.3.1 Contradictory Evidence Concerning the Landing Site

May (1985) and Larson (1985a) present empirical evidence that shows that the QP in ILCs does not extract from the embedding DP. Larson shows that certain inverse readings that would result from extraction of the QP out of the DP are not attested. I illustrate his argument using the somewhat simpler example in (72).

(72) One apple on every plate is too much.

(72) means that it is too much that every plate is such that there is one apple on it (while it is OK for some plates to have an apple on them). The reading of (72) indicates that the universal QP takes scope over the numeral. It does not extract from the DP, however, for such movement would result in the LF-structure in (73a), with the unattested reading in (73b).

(73) a. [every plate] [IP [DP one apple on t₁] is too much.]
   b. *'Every plate x is such that one apple on x is too much.'

That is, there should be no apple on any plate. The existence of sentences like (72), and a general ban on subextraction from subject DPs (cf. Huang 1982, May 1985), illustrated in (74), provide empirical evidence in favour of an analysis that does not assume extraction of the QP from the embedding DP.

(74) *Who did [the teacher of t₁] call?

On the other hand, Fiengo & Higginbotham (1981) assume extraction of the QP from the embedding DP. For them, the non-specificity of ILCs (cf.69) follows from the fact that specific DPs form a barrier for extraction. This is illustrated in (75).

(75) *Whom did he read this book of t₁?

The claim that ILCs are restricted to non-specific DPs because these do not form barriers for extraction seems to imply that extraction of the QP out of the DP is what is at stake in ILCs.

In conclusion, assuming LF-movement for ILCs leads to contradictory assumptions about the landing site of such movement. Extraction of QP from the embedding DP accounts for one set of data (the specificity effect). Adjunction of QP to DP accounts for another set (the unattested reading in (73)). In light of this contradiction, it appears promising to look for an analysis that accounts for the observed facts without assuming LF-movement of the QP.
3.3.2. Cross-Linguistic Considerations

The second problem arises from cross-linguistic considerations. (65a), repeated as (76), shows that ILCs in German are syntactically and semantically parallel to their English counterparts. The only plausible reading for (76) is the inverse scope reading. However, German shows at best weak evidence for scope driven LF-movement elsewhere in the grammar. There seems to be general agreement in the literature (cf. Frey 1993, Sæbø 1995, Pafel 1997, Krifka 1998) that sentences such as (77) lack an inverse scope reading on a neutral intonation.

(76) [Ein Apfel in jedem Korb] ist faul.
    one apple in every basket is rotten
    ‘For every basket z, one apple in z is rotten.’

(77) Ein Arzt behandelte jeden Patienten.
    A/some doctor treated every patient
    *‘For every patient, there was a (different) doctor who treated him.’

The absence of an inverse scope reading for (77) can be taken as an argument against scope-driven LF-movement in German. The question arises, then, why scope-driven LF-movement in German should apply only with ILCs. 36

Concluding, the parallel structural and interpretive behaviour of English and German ILCs calls for a unified analysis. On the other hand, German provides little evidence for the application of LF-movement in other syntactic configurations. For this reason, a unified analysis in terms of surface structure is to be preferred.

3.3.3 Evidence for a Different Surface Structure

Even if the first two problems should turn out to be solvable, there is another set of data which – to my knowledge – has not been previously discussed, and which suggests that something is amiss with the LF-movement analysis. The data concern the surface structure of ILCs on the inverse reading, in particular the position of the postnominal PP. The LF-analysis assumes that the PP stands in sister position to the head noun, below the numeral/indefinite. This was shown in (70ab) above.

The problem comes in form of an unexpected asymmetry which shows up in the presence of other postnominal modifiers, e.g. relative clauses or other PPs. It turns out that inverse readings are possible if and only if the PP containing the QP (henceforth ‘QPP’) occurs in DP-final position (i.e. following all other postnominal material). In contrast, all non-final QPPs must be interpreted as PP-modifiers and can only give rise to surface readings.

Regarding the relative order of QPPs and relative clauses (‘RCs’), ILCs can have an inverse reading if and only if the QPP occurs in DP-final position (78a). If the QPP precedes the RC, the inverse reading is unavailable (78b).

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36 One has to be careful here. In chapter V.4.1, it will become apparent that LF-movement for semantic reasons in German is possible, and in a restricted number of cases even necessary. However, none of the cases discussed there involves (quantifier) scope-driven LF-movement. Rather, the triggers for LF-movement are type-mismatch and the need to move indexed expressions into a position where their index is visible to the semantic derivation. Nevertheless, the status of the problem in the main text depends on the (non-)availability of scope-driven LF-movement in German. If such movement should turn out to exist in German after all, the problem evaporates. If such movement does not exist, a surface analysis for German ILCs is both more adequate and in line with the general methodological principle of avoiding LF-movement when possible.
(78)  a. One person [RC who was famous] [QPP from every city] was invited.
   ‘Every city y is such that one famous person from y was invited.’
   #One person [QPP from every city] [RC who was famous] was invited.
   #‘One person who came from every city and who was famous was invited.’

The non-existence of an inverse reading for (78b) is unexpected on the LF-analysis, which presumably takes all postnominal PPs to be modifiers to the head noun. On the plausible assumption that all postnominal modifiers have the same syntactic status, it follows that LF-movement of the QPP should be equally good in (78ab), contrary to fact.37

Regarding the relative order of QPPs and other PP-modifiers, the same facts are observed. Ordinary PP-modifiers can occur in any order (79ab), while inverse readings with ILCs (with the prepositions in, on, from) are contingent on the DP-final occurrence of the QPP (80ab).

(79)  a. one slave [PP with good manners] [PP from Syria] was freed.
   b. one slave [PP from Syria] [PP with good manners] was freed.
(80)  a. one slave [PP with good manners] [QPP from every province] was freed.
   b. #one slave [QPP from every province][PP with good manners] was freed.

If QPPs on the inverse reading were ordinary PP-modifiers (right-adjoined to N’), the difference between (80a) and (80b) would receive no explanation. LF-movement should apply equally well to both QPPs, contrary to fact.

To conclude, I have shown that QPPs that give rise to inverse readings with ILCs differ syntactically from other postnominal modifiers. They cannot freely change places with other modifiers, but must be DP-final. This suggests that the surface structure of ILCs - on the inverse reading at least - is not that in (70ab). With a different surface structure for ILCs, however, we need not fall back on LF-movement in order to account for the wide scope of the embedded QP. The correct scopal relationship may hold at surface structure already. In the following, I argue that ILCs do not have ‘inverse’ readings in the literal sense.

3.4 The Surface Analysis of ILCs
In this section, I would like to contest the main reason for assuming LF-movement with ILCs, namely the assumption that the QPP in ILCs is always base-generated in a position

37 The contrast is reproduced in (iab) for the German counterparts of (78ab). (ia) with the QPP in final position is grammatical, if complex on the inverse reading. In contrast, (ib) is degraded.

   (i)  a. Ein Schauspieler, der berühmt war, aus jeder Stadt, wurde eingeladen.
       ‘One famous actor from every city was invited.’
   b. ??Ein Schauspieler aus jeder Stadt, der berühmt war, wurde eingeladen.
       ‘One person from every city who was famous was invited.’

An inverse reading for (ib) seems possible with an intonation break between QPP and RC. Since extraposition of restrictive RCs to the right is a possibility in German, the RC may be right-dislocated (indicated by intonation) from its base-position between head noun and QPP. The possibility of right-dislocation in German makes it difficult to come up with clear judgments for German. Other factors seem to play a role as well. For instance, (ii) seems not so bad on an inverse reading, even though the QPP precedes the RC.

   (ii) Ein Apfel in jedem Korb, der faul war, wurde ausgesortiert.
       ‘For every basket z, there was one rotten apple in z which was sorted out.’

I have no explanation for this fact.
lower than the indefinite/numeral expression. The structure of ILCs on this assumption is shown in (81).

(81)

```
DP
    one
  NP
    apple
      QPP
      in every basket
```

Given the surface structure in (81), the QPP must raise at LF in order to take scope over the indefinite or numeral. The need for assuming LF-movement would disappear, though, if the surface structure for the inverse reading were not as in (81), but rather as in (82).

(82)

```
DP
   D0
  NP
    one apple
      QPP
      in every basket
```

In chapter I.2.4.2, it was argued that numerals (and other indefinite expressions which are often characterised as weak or existential quantifiers) are not quantificational expressions in D, but rather cardinality adjectives. Like other prenominal adjectives, cardinal adjectives are adjoined to NP (Haider 1988). It follows that the postnominal QPP can adjoin to NP above the numeral in principle, especially since it is quantificational in nature.

Taking up this assumption, I propose a surface analysis for ILCs. In the spirit of Huang (1982), I assume that ILCs are structurally ambiguous at surface structure. The two readings of ILCs derive from the two surface structures in (81) and (82), which are string-identical. It follows that the labels ‘surface’ and ‘inverse’ reading are misnomers, since both are really surface readings. Nonetheless, I will retain the labels for ease of exposition. The two surface structures differ in the position of the postnominal QPP, which is determined by semantic factors. On the surface reading, the QPP is a regular modifier semantically. As such, it is adjoined to NP below the numeral/indefinite expression. On the ‘inverse’ reading, the entire QPP denotes a complex generalised quantifier, and as such must be adjoined above the numeral. The proposed analysis accounts for the characteristic properties of ILCs. In particular, it accounts for the DP-final occurrence of QPPs on the ‘inverse’ reading.

3.4.1 The Structure of ILCs on the ‘Surface’ Reading: Low NP-Adjunction

Regarding the ‘surface’ reading of ILCs, illustrated again in (83), nothing new must be said.

(83)  [One trip to every European capital] was fantastic.
      ‘There was one trip directed to every EC which was fantastic.’
I adopt the standard analysis of ‘surface’ readings, which is found e.g. in May (1985) and Heim & Kratzer (1998), and which was illustrated in (70ab) and (81) above. The PP to every European capital is analysed as a PP-modifier that occurs as sister to the NP trip. The numeral adjoins to NP above the postnominal QPP. Notice that I analyse all adnominal modifiers (pre- and postnominal) as being adjoined to NP.38

(84)  a. [DP \[NP one [NP trip [PP to [QP every European capital]]]]] was fantastic.
    b.       D P
      D 0       NP
        one   NP
          Q P P
            trip  P
              Q P
                to
                  every EC

Semantically, the ‘surface’ reading of ILCs is composed by means of a type-driven semantic derivation, as found in Heim & Kratzer (1998). The QP is type-raised from \(<et,t>\) to \(<<e<et>>,et>\), allowing for combining the values of QP and P in situ. The PP as a whole, being of type \(<e\), is a regular modifier to the head noun. It denotes the property of ‘being directed to every city’. This property combines by predicate modification with the property of ‘being a trip’ expressed by the head noun. At last, the result is modified by the numeral expression that determines the cardinality of the set of things with the properties of being a trip and being directed to every city.39 It is crucial for the analysis of (83) that the PP is a regular postnominal modifier. As such, it occurs below the numeral expression, as do all adnominal modifiers including other prenominal adjectives.

Since ILCs on their ‘surface’ reading do not behave like jeweils-DPs, the syntactic structure of ILCs on this reading will be of no further concern to us.

3.4.2 The Structure of ILCs on the ‘Inverse’ Reading: High NP-Adjunction

In section 2.4.2, it was pointed out that the behaviour of jeweils-DPs parallels that of ILCs on the ‘inverse’ reading. It follows that the syntactic structure that gives rise to this reading of ILCs is of particular interest to the analysis of jeweils-DPs. Below, it will be argued that the structure of ILCs on the ‘inverse’ reading is the underlying structure of both constructions.

38 See Hartmann & Zimmermann (2002), who distinguish between postnominal genitive complements to verb nominalisations (and other relational expressions), as in (ia), and postnominal genitive modifiers that are adjoined to NP, as in (ib):

    (i) a. die Zerstörung der Stadt  
        ‘the destruction of the city’
    b. der Verein des Präsidenten  
        ‘the team of the president’

The authors argue that a semantic and syntactic distinction into N-complements and NP-modifiers accounts for the observable differences between the constructions concerning their interpretation and distribution.

39 The derivation proceeds as follows:

    (i) a. [[on in every basket]] = \(\lambda x. \forall z \ [\text{basket}'(z) \rightarrow \text{in}'(x,z)]\)
    b. [[an apple in every basket]] = \(\lambda x. \text{apple}'(x) \land \forall z \ [\text{basket}'(z) \rightarrow \text{in}'(x,z)]\)
    c. [[or one apple in every basket]] = \(\lambda x. [\#1 \land \text{apple}'(x) \land \forall z \ [\text{basket}'(z) \rightarrow \text{in}'(x,z)]]\)
The full structure for the ‘inverse’ reading of ILCs is given in (85):

(85) a. \[ \text{DP} \text{D}^0 \text{[NP [NP one [NP apple]] [QPP in every basket]]} \]
   b. 

\[
\begin{array}{c}
\text{DP} \\
\text{D}^0 \\
\text{NP} \\
\text{one} \\
\text{NP} \\
\text{in every basket} \\
\text{apple}
\end{array}
\]

The structure in (85) differs from (84) in the adjunction site of the postnominal QPP. In (85), the QPP is adjoined higher than the numeral/indefinite expression and therefore takes scope over it at surface structure. No LF-movement is required for scope reasons (but see fn.36). Another important point is that the analysis in (85) treats the sequence of numeral one and NP apple as a single constituent, in contrast to the LF-movement analysis.

Above, it was argued that the difference in syntactic structure is semantically conditioned. A closer look at ILCs reveals that ‘inverse’ readings with ILCs predominantly show up with a restricted list of prepositions, among which we find in, from, and on. Typically, these prepositions do not allow for a sensible ‘surface’ reading, as witnessed by (86). What these prepositions have in common is that they specify the local position or origin of an entity. It lies in the nature of things that entities above the atomic level usually do not occur at more than one place simultaneously, or come from more than one place. It follows that surface readings of ILCs with these prepositions are perceived as strange. With prepositions that allow for a sensible ‘surface’ reading (e.g. with to or about), ‘inverse’ readings are hard, if not impossible, to get (cf.87).

(86) Some man from / in every city fell ill.
#Some man who came from / lived in every city fell ill.

(87) Some trip to every city was fantastic.
   a. ‘There was some trip directed to every city which was fantastic.’
   b. ‘? For every city x, there was some trip to x which was fantastic.’

The data in (86) and (87) suggest that the syntactic structure in (85) is freely generated only in those cases in which the modifier structure in (84) gives rise to an implausible interpretation.⁴⁰ In my view, the change in syntactic structure is effected by a change in the meaning of the postnominal QPP. The meaning change ensures the derivation of a meaningful interpretation after all. It turns the QPP in (85) from a property-denoting expression (here: the property of being in every basket) of type \(<\text{et},\text{t}>,\text{t}>\), into a generalised quantifier (cf. Barwise & Cooper 1981) over pluralities of type \(<<\text{et},\text{t}>,\text{t}>>\). The generalised quantifier denotes a property of sets, or the set of plural properties such that every basket contains an individual that has this property.⁴¹

⁴⁰ In contrast, the generation of the “inverse” structure must be licensed by additional discourse factors for ILCs with a meaningful “surface” reading. This accounts for the difficulty to get “inverse” readings with sentences such as (87).

⁴¹ It thus turns out that the label ‘QPP’ is not just a convenient abbreviation, but is meaningful at least in the case of “inverse” readings. The entire PP really denotes a generalised quantifier on these readings.
In order to see how this works, consider a situation with three baskets which all contain two apples, three pears, and one cucumber. In this scenario, the expression *in every basket* denotes the three properties of being a set of two apples, of being a set of three pears, and of being the singleton set of one cucumber. Each of these properties is instantiated by one individual in each basket in the situation indicated.

The generalised quantifier interpretation of QPPs in ILCs is formalised in (88).

\[(88) \quad \lbrack \text{in every basket} \rbrack = \lambda P \cdot \forall z \ [\text{basket}'(z) \rightarrow \exists X [P(X) \land \text{*in'}(X, z)]]\]

The expression in (88) takes the property of pluralities P denoted by the numeral NP as its semantic argument. The entire expression is true in a given situation if every basket in that situation contains an element from the set denoted by the numeral NP.\(^{42}\) Turning back to (85), the expression is true if every basket contains an element from the set of singleton sets of apples. Note that the expression in (88) introduces an additional existential quantifier in the nuclear scope (cf. Heim 1982) of the universal quantifier. The presence of this existential quantifier formally captures the fact that ILCs on their “inverse” readings often have the flavour of asserting the existence of an individual. This is made clear by the paraphrase of (85): *In every basket, there IS an apple such that…* We will encounter more instances of double quantification in chapter IV where the interpretation of *jeweils* is discussed.

Reinterpreting the QPP as a generalised quantifier over pluralities may look artificial at first sight, especially since the process of reinterpretation is not a compositional semantic operation. It is not possible to construe the quantifier meaning from the ‘basic’ meaning of the QPP, which is a property. The inclusion of a non-compositional procedure into the semantic component is a weakening of the semantic premise of strict compositionality from chapter I.3. However, there is independent evidence that supports the assumption that QPPs can be reinterpreted in the described manner. In English and German, semantic (or: variable) binding of a pronoun is possible with QPs that are embedded inside a PP. An example from English is given in (89a). The apparent structural configuration between semantic binder and semantic bindee is given in (89b).\(^{43}\)

\[(89) \quad \begin{align*}
\text{a. } & \text{In no city I have I found anybody who loves it.} \\
\text{b. } & \text{[PP in QPi] … it.}
\end{align*}\]

The problem is that the QP-binder does not c-command the pronoun in (89b), as it should if semantic binding is licensed under c-command only (Heim & Kratzer 1998:262ff.). The negative quantifier *no* was chosen in order to exclude the possibility of Quantifier Raising of the QP at LF. As argued in Beghelli (1995), negative QPs do not undergo such movement to take clausal scope at LF.\(^{44}\)

\(^{42}\) Observe that the semantic type of the NP is \(<t>\) on the revised analysis, i.e. the NP is assumed to denote a proposition. The existence of proposition-denoting nominal arguments is argued for in chapter IV.4.1.2. The semantic analysis of ILCs is sketched in chapter IV.7.

\(^{43}\) Notice that a blind application of the reinterpretation in (88) to the QPP in (89) gives the implausible result that in no city there is anything which is loved by somebody who I found. The difference between (89) and the basket-example above is due to the event modifying nature of the QPP in (89). See fn.46 on how to reinterpret event modifying QPPs.

\(^{44}\) As witnessed by the impossibility of inverse scope of the prepositional object over the direct object in (ia), and the impossibility to license a negative polarity item in a structurally higher position in (ib).

\[(i) \quad \begin{align*}
\text{a. } & \text{I showed something to nobody.} \\
\text{b. } & \text{*I showed anything to nobody.}
\end{align*}\]

\*There is nobody to which I showed anything.
In principle, there are two ways out of the dilemma. First, one could take the PP-layer to be invisible for c-command in this particular case (a syntactic stipulation). The fact that the phenomenon in (89) appears to hold for prepositions in general argues against this solution. The question arises why the otherwise strict conditions on c-command should be weakened to such an extent in the case of prepositions.

The second way out of the dilemma is to assume that the (quantified) PP is reinterpreted as a generalised quantifier and binds the pronoun under c-command as in (90).

\[(90) \text{QPP} \ldots \text{it}._\text{r}.\]

This is the solution advocated here. The prepositional phrase and its QP-complement are reinterpreted as a quantified prepositional phrase that can bind the pronoun under c-command. I take (89a) as independent evidence for the interpretation of PPs as quantifier expressions.

Given that the PP on the ‘inverse’ reading is interpreted as a quantified expression, its structural position as the topmost NP-adjunct follows directly. In general, modifying adjuncts do not change the semantic type of the modified constituent. Normally, modifiers combine with a set-denoting expression of type \(<et>\), say the head noun \textit{apple} in (85), giving a set-denoting expression of type \(<et>\). To give a concrete example, modification of the noun \textit{apple} with the modifying adjective \textit{red} is accompanied by a semantic mapping from the set of all apples to the set of red apples. Before and after modification, we have to do with sets of entities. Modification restricts the initial set to a subset. The same holds for modification with numerals. Modification of the plural noun \textit{apples} (type \(<et,t>\)) with the numeral adjective \textit{two} will restrict the set of all pluralities of apples (i.e. pluralities of two, three, four, five etc. apples) to the set which comprises only groups of two apples (type \(<et,t>\)). In any event, the resulting type is the same as the input type. In contrast, generalised quantifiers take expressions of type \(<et>\) or \(<et,t>\) (i.e. set-denoting expressions) as their input and map these onto truth-values (type \(<t>\)). It follows that the application of a generalised quantifier to a set-denoting expression bleeds the possibility of modification of this set at a later stage because expressions of the resulting type \(<t>\) are not of the right type to undergo further modification (the right type being \(<et>\) or \(<et,t>\)). It follows that expressions denoting a generalised quantifier will always be adjoined higher than modifier-denoting expressions, if both are adjoined to the same syntactic category.

Applying these considerations to the case of ILCs with ‘inverse’ readings, only the syntactic configuration in (91a) is interpretable. In (91b), application of the generalised quantifier before the numeral blocks the latter from combining with the NP-denotation.

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I thank Eddy Ruys for suggesting the choice of a negative quantifier.

45 This approach is taken by Giorgi & Longobardi (1991) in response to DP-internal PPs that seem to be transparent (i.e. no barriers) for c-command.

46 The presence of an event argument (see the discussion of events in chapter IV.1) forces the QPP to denote a function from relations into truth-values (type \(<\text{oet},\text{t}>\)). The value of the QPP in (89a) is given in (iia), that of the rest of the clause after \(\lambda\)-abstraction over the pronoun’s index in (ib). Functional application of (ia) to (ib) gives (ic), which adequately captures the truth-conditions of (89a):

\[(i)\]
\[a.\quad [[\text{in no city}]] = \lambda R. \neg \exists x [\text{city}'(x) \land \exists e R(x)(e) \land \text{in}'(e,x)]\]
\[b.\quad [[\text{have I found anybody who loves it}]] = \lambda y. \exists z [\text{I have found } z \text{ in } e \text{ and } z \text{ loves } y]\]
\[c.\quad [[\text{in no city have I found anybody who loves it}]] = \neg \exists x [\text{city}'(x) \land \exists e \exists z [\text{I have found } z \text{ in } e \text{ and } z \text{ loves } x] \land \text{in}'(e,x)]\]
This way, we have arrived at a semantic motivation for the structure in (85). The postnominal QPP in ILCs is adjoined above the numeral adjective because of its semantic status as a quantified expression.

### 3.5 Deriving the Properties of ILCs

The properties of ILCs follow on the revised analysis from the previous chapter. The observed ambiguity is due to structural ambiguity at the level of surface structure, not at the level of LF. ‘Surface’ and ‘inverse’ reading are derived from the (surface) structures in (84) and (85) respectively.

The restriction of ‘inverse’ readings to non-specific DPs follows from the fact that the definite or demonstrative determiner in specific DPs such as (69) is located in the D-head above the postnominal PP, as in (92).

From its position in D, the demonstrative will always take scope over the quantifier inside the PP, no matter where the PP combines with the (projection of the) picture noun. The analysis also accounts for the DP-final occurrence of QPPs on the ‘inverse’ reading of ILCs (see section 3.3.3). In the previous section, it was shown that the QPP must be the last element to adjoin to NP for an ‘inverse’ reading to arise. The reason for this was shown to be the fact that adjunction of a quantified QPP blocks the adjunction of additional modifying elements above the QPP. If the QPP does not occur in DP-final position, as in (78b, 80b), i.e. if the QPP is followed by a modifying expression adjoined above it, the QPP must be interpreted as a modifying expression. The interpretation as a PP-modifier gives rise to the ‘surface’ reading only, thus accounting for the pragmatic ill-formedness of (78b) and (80b).

Finally, the analysis captures the fact that ‘inverse’ readings for ILCs are easily available only with a restricted number of prepositions that do not allow for plausible surface readings. The implausibility of the ‘surface’ reading leads to a re-interpretation of the QPP as a generalised quantifier, which results in the alternative syntactic structure.

It still needs to be shown that the revised analysis allows for a correct derivation of the “inverse” reading of ILCs. This is done in chapter IV.7. Likewise, it has not yet been shown how the revised analysis derives bound variable readings with ILCs (on the “inverse” reading, cf. 68). The discussion of this point is postponed to chapter V.4.1, where it will be discussed in the context of other constructions with similar semantic properties.
Concluding, the revised analysis can account for the characteristic properties of ILCs by shifting the burden of their analysis from the syntactic component to the semantic component. Application of syntactic LF-movement is replaced by a semantic mechanism that changes the meaning of the postnominal QPP. Both analyses are equivalent in a lot of respects. However, the surface analysis proposed here fares better regarding the problems raised in section 3.3. In particular, the LF-movement analysis has nothing to say on the DP-final occurrence of QPP on the “inverse” reading of ILCs.

I therefore adopt the revised analysis of ILCs on their ‘inverse’ reading as the basis for the discussion to come. In particular, I adopt the syntactic surface structure in (85) as the basis for the syntactic analysis of jeNP-constructions and jeweils-DPs in section 4.

3.6 An Alternative Analysis: DP-Internal Small Clauses

Before we go on to discuss jeNP-constructions and jeweils-DPs, I would like to briefly discuss an alternative syntactic analysis for ILCs on their ‘inverse’ reading which is more in line with certain current assumptions. I refer to this alternative account as the ‘Small Clause Analysis’ (henceforth ‘SC-analysis’). The SC-analysis assumes two different surface structures for the two readings of ILCs as well. The structure for the ‘surface’ reading is identical to that in (84). The difference lies in the structure for the ‘inverse’ reading.

Two assumptions are crucial for the surface analysis of the “inverse” reading in 3.4.2: (i.) the QPP is right-adjoined to NP in topmost position; and (ii.) the topmost position is determined by semantic factors, namely the interpretation of the QPP. However, the possibility of right-adjunction has come under fire in the recent syntactic literature. Following Kayne (1994), right adjunction should be excluded on principled grounds. This gives rise to the question of whether there is no alternative analysis that accounts for the DP-final occurrence of QPPs on the “inverse” reading without assuming NP-adjunction.

The SC-analysis is such an analysis. It assigns the following syntactic structure to the ‘inverse’ reading of ILCs. The base-structure of ILCs is as in (93a), their surface structure is as in (93b), with ‘Pr(P)’ standing for ‘Predicate(Phrase)’ (cf. Bowers 1993).

\[
\begin{align*}
(93)a. & \quad \text{DP} \\
& \quad \text{D}^0 \text{PrP} \\
& \quad \text{NP} \quad \text{Pr}^+ \text{PP} \\
& \quad \text{one apple} \quad \text{on} \quad \text{every plate} \\
& \quad \text{P} \quad \text{QP} \\
(93)b. & \quad \text{DP} \\
& \quad \text{D}^0 \text{PrP} \\
& \quad \text{NP} \quad \text{Pr}^+ \text{QP} \\
& \quad \text{one apple} \quad \text{on} \quad \text{every plate} \\
& \quad \text{P} \quad \text{QP}
\end{align*}
\]

The structures in (93ab) have the following properties. To begin with, the PP on every plate is not adjoined to NP, but it is base-generated as the syntactic predicate of a small clause structure PrP. The PrP is selected by a phonetically empty operator in D. The NP one apple is the subject of PrP. Semantically, the predicate PP predicates a place of this subject.

The existence of DP-internal predication is independently motivated. DP-internal predicative small clauses that are selected by a functional head have been postulated by
Abney (1987) for gerundive constructions (*John singing the Marseillaise*), and by den Dikken (1998) for the N-of-a-N construction (*an idiot of a doctor*). Kayne’s (1994) analysis of DPs containing relative clauses as involving a D-head selecting a CP whose IP is the locus of DP-internal predication also fits here.

Finally, the P-head of the PP incorporates into the head of the small clause Pr, forming a complex predicate (Baker 1988). A similar process is found with applicatives and dative shift (Baker 1988), P-to-V incorporation in particle verb constructions, as well as incorporation of a dative P into copular *be* in possessive *have* constructions (den Dikken 1992).

The SC-analysis in (93) is fully compatible with current assumptions about the architecture of the syntactic component (Kayne 1994, Chomsky 1995). The structures in (93) are binary branching and do not involve right-adjunction. In addition, the postnominal PP need not take on a quantified reading. The additional semantic load is carried by the head of the small clause, Pr. This makes the syntactic structure less dependent on semantic factors than on the NP-adjunction analysis in 3.4.2, preserving a certain amount of autonomy for the syntactic component. At the same time, the SC-analysis accounts for the relevant properties of ILCs as well. The ambiguity is put down to two different surface structures (as in the NP-adjunction analysis). The impossibility of ‘inverse’ readings with specific DPs is attributed to the position of the specific determiner or demonstrative in D (as in the NP-adjunction analysis). Finally, the DP-final occurrence of the postnominal PP follows from its being the syntactic predicate of PrP. Concerning this aspect, the SC-analysis is empirically more adequate than the LF-movement analysis (as is the NP-adjunction analysis). I conclude that the SC-analysis gives an adequate account of the ‘inverse’ readings of ILCs, of course on the assumption that the SC can be appropriately interpreted.

The purpose of this section was to disperse potential doubts as to the revised analysis of ILCs. These doubts may concern the use of right-adjunction, which is often considered unattractive for conceptual reasons. It was shown that the basic assumptions of the revised analysis, structural ambiguity at surface structure, the DP-final position of the QPP on the inverse reading, and the constituency of numeral and head noun on the inverse reading, carry over to the SC-analysis, which does not rely on right-adjunction. This shows that there is no inherent connection between the revised analysis of ILCs and right-adjunction. Consequently, a rebuttal of right-adjunction need not lead to a rebuttal of the surface analysis of ILCs that is argued for here.

In what follows, I will not take a decision on the question of which analysis is more adequate. For practical reasons, I will go on to use the right-adjunction analysis. The reader should bear in mind, though, that all claims made below can be restated in the SC-format because the two analyses make identical predictions for the most part.

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47 Incorporation of the head of a small clause predicate into the head of the small clause is also found in den Dikken & Naess (1992). The incorporation in (93b) violates the Projection Principle and is not in line with Baker’s requirement that incorporation must preserve the categorial structure (but see Marantz 1984). However, there is no principled reason that would block the prepositional head P in (93b) from leaving behind a trace, preserving categorial structure. The trace could either be semantically empty, or it could denote the identity function.

48 See Zimmermann (to appear, b) for an interpretation of (93b) in terms of a Skolem function that maps each plate onto one apple being on it. The Skolem function is part of the denotation of Pr. For a taste of how this works, consider chapter IV.4.1.1, fn.47, where an analogous interpretation procedure is sketched for *jeweils*-DPs.
3.7 Summary
In this section, I have presented a revised analysis for ILCs in terms of surface structure ambiguity. Of particular interest was the structure for the ‘inverse’ reading of ILCs since it is only on this reading that ILCs show a parallel behaviour to jeweils-DPs. On the ‘inverse’ reading, the postnominal PP has been analysed as being right-adjoined to an NP consisting of a numeral/indefinite expression and the head noun. The revised surface analysis of ILCs was shown to account for all their characteristic properties. Finally, an alternative small clause analysis was sketched in order to show that the revised analysis of ILCs does not depend on the existence of right-adjunction.

4 The Syntax of jeweils-DPs
In this section, we return to the analysis of jeweils-DPs. Following a suggestion by Sauerland (2001), I show that the revised analysis of ILCs from section 3 extends to jeNP-constructions and jeweils-DPs. This makes jeNP-constructions and jeweils-DPs special instances of ILCs. If correct, all three constructions have the underlying structure in (94). (95) shows how the three constructions fit into the structure in (94).

\[(94)\]
\[
\begin{array}{c}
|D\rangle \\
|NP| \\
\end{array}
\begin{array}{c}
|NP| \\
\end{array}
\begin{array}{c}
|PP| \\
\end{array}
\begin{array}{c}
|QP| \\
\end{array}
\begin{array}{c}
|Q| \\
|NP| \\
\end{array}
\]

\[(95)\]
\begin{enumerate}
\item ILC: \(\text{zwei Bewacher für jeden Gefangenen}\)  
\[\text{two guards for each prisoner}\]
\item jeNP: \(\text{zwei Bewacher P^0 je Gefangenen}\)  
\[\text{two guards per prisoner}\]
\item jeweils-DP: \(\text{zwei Bewacher P^0 je jeweils}\)  
\[\text{two guards each while}\]
\end{enumerate}

In (94), a PP is right-adjoined to an NP-constituent consisting of a numeral (or another indefinite) expression and the head noun of DP. This constituent corresponds to the DistShare of d(distance)-distributive constructions. The prepositional head P of the PP takes a universal QP as complement. Finally, the entire NP is functionally selected by an empty D-head.

The structure in (94) does not differ much from that proposed by Safir & Stowell (1988) for English d-distributive each, and by Tellier & Valois (1993) and Junker (1995) for French d-distributive chac-un(e) (see chapter II.5). These analyses assume right-adjunction of a constituent to the DistShareNP as well. However, while all these analyses took the right-adjoined constituent to be a universal QP directly, the present analysis takes the adjoined constituent to be a PP embedding the QP. Since this is the major structural difference between the analyses, a great part of the discussion in this section is focused on
motivating the existence of an additional PP-layer. It turns out that German provides empirical evidence for the PP-layer in form of case marking.

The section is structured as follows. In 4.1, I extend the analysis of ILCs to jeNP-constructions, pointing out where the two constructions differ. Section 4.2 presents the analysis of jeweils-DPs as a special instance of both ILCs (on the “inverse” reading) and jeNP-constructions. Jeweils-DPs are shown to involve a regular universal quantifier that takes its restriction in form of an NP-proform as complement. The special d-distributive behaviour is due to co-indexation of this proform with a clausemate DistKey antecedent. The analysis does not assume LF-movement of jeweils for interpretive or syntactic reasons. In 4.3, I summarise the arguments against LF-movement. Finally, I show that the analysis for adnominal jeweils extends to other s-expressions such as wenigstens ‘at least’ in 4.4. Given the parallel morphological shape and syntactic behaviour of s-expressions and jeweils pointed out in chapter II.3, this is a welcome result.

### 4.1 The Structure of jeNP-Constructions

The revised analysis of ILCs extends directly to jeNP-constructions, exemplified in (96a), and also to English *per*-constructions (96b), which are discussed in Choe (1987:135ff.).

(96)  
a. [Drei Bewacher *je Gefangenen*] hat der Direktor bereitgestellt.  
three guards *per prisoner* has the director assigned  
b. [Three guards *per prisoner*] were assigned by the director.

The basic claim is that jeNP-constructions (and likewise *per*-constructions) are but special instances of ILCs (on the “inverse” reading), licensed by the general availability of the structure in (94) (see also Sauerland 2001). ILCs and jeNP-constructions differ in that the former contain an overt preposition, whereas the latter have a covert preposition $P^0$, which selects the jeNP. The underlying structure for the jeNP in (96a) is shown in (97):

(97)  
\[
\text{DP} \\
\text{D}^0 \rightarrow \text{NP} \\
\text{AP} \rightarrow \text{NP} \rightarrow \text{PP} \\
\text{QP} \\
\text{drei Bewacher} \rightarrow \text{je Gefangenen}
\]

The structure in (97) has the following properties. First, the quantifying element *je* is semantically restricted by the denotation of its NP-complement *Gefangenen* ‘prisoners’. Second, the jeNP-constituent is embedded inside a PP that is right-adjoined to the DistShareNP *drei Bewacher* ‘three guards’. Third, the jeNP is selected by a null preposition. Finally, the postnominal constituent can be fronted if required by discourse factors:
In (98), the preposed phrase *je Gefangenen* ‘per (male) prisoner’ has a prominent discourse status. It is most likely interpreted as contrastive or partial topic, indicating that other groups of people, e.g. groups of female prisoners, with fewer or more guards are under consideration as well (see Büring 1996:49 on the terminology used).

*Je-*NP-constructions and ILCs differ only concerning the overt or covert realisation of the prepositional head $P^0$. This naturally raises the question of whether the former really contain a covert preposition, and, if so, how it can be licensed. An alternative analysis would be to assume that the $P$-head is filled with the element *je* itself. In section 4.1.1, I argue against this view. I present arguments to the effect that *je* is not a preposition, but really just a ’pure’ quantifier which selects for an NP-complement.

4.1.1 The Categorial Status of *Je* and *Per*

Turning to the categorial status of *je*, Jung (1980) analyses it as a preposition when it occurs in sentences such as (99). If so, *je* in (97) could be the head of the PP.

(99) Benzin kostet [zwei Euro *je* Liter].

petrol costs two Euros per Liter

In this section, I present evidence against the view that *je* is a preposition. The conclusion will be that the distributive element *je* is a ‘pure’ quantifying element, perhaps the only one in German.

Two sets of data cast doubt on the prepositional status of *je*. First, *je* behaves differently from regular prepositions in that it does not take a singular count noun with overt determiner as complement (cf.100ab). In contrast, overt prepositions never select for a singular count noun without overt determiner (cf.101ab).49

(100) a. *je* dem/einem Gefangenen   b. *je* Gefangenen

per   the / a prisoner    per prisoner

(101) a. mit/ auf/ unter dem/einem Tisch  b. *mit/ auf/ unter Tisch

with/ on/under the/ a table with/ on/under table

The complementary behaviour of prepositions and *je* in (100) and (101) argues against treating them as being of the same syntactic category. The different selectional properties lead to the categorisation in (102ab). Prepositions select for full DPs (102a), while *je* selects for bare NPs (102b).

---

49 Prepositions can optionally appear with determinerless abstract nouns such as *Befehl* ‘order’ and *Wissen* ‘knowledge’ in idiomatic expressions such as (iab).

(i) a. auf (den) Befehl von   b. mit (dem) Wissen von

on (the) order of with (the) knowledge of

Whatever the reason for optional determiner-drop in (iab), it suffices to show - for the present purposes - that prepositions and *je* exhibit a different behaviour with concrete nouns, as illustrated in the main text.
The categorial status of Q for *je* in (102b) has been chosen because the selectional properties of *je* match those of the universal D-quantifier *jeder* ‘every’. The parallel behaviour of *je* and *jeder* is highlighted by the fact that both allow only for singular complements (cf.103). In contrast, prepositions freely allow for plural complements (cf.104).

(103) a. zwei Blumen je Frau / *Frauen
  two flowers per woman women
b. jede Frauen mit / für / unter Frauen
  every woman with for under women

The data in (100) – (104) argue for a treatment *je* as a universal quantifier, and not as a preposition. The semantic nature of *je* determines its selectional properties. The singular NP-complement of *je* provides the restriction for the universal quantifier.50

*Je* is a special quantifier in that it does not exhibit any inflectional morphology. It simply does not seem to be specified for any D-features such as case or phi-features (person, gender, number). From this, I conclude that *je* is not a D-quantifier, which usually contain a combination of quantificational and D-features in German. Consider some samples from the inflectional paradigm of *jeder* ‘every’ in (105).

(105) je - d-er , je - d-e , je - d-en
   \( \forall \) - d - 3rd,sg,masc,NOM \( \forall \) - d - 3rd,sg,fem,NOM \( \forall \) - d - 3rd,sg,masc,ACC

I conclude that *je* is a bare quantifier of categorial status Q.51

The categorial status of English *per* in (96b) and its German equivalent *pro* in (106), which are both loans from Latin, is not entirely clear.

(106) Benzin kostet [zwei Euro pro Liter].
petrol costs two Euros per Liter

Like *je*, and unlike prepositions, *per* and *pro* only take bare singular count nouns as complements (Zifonun et al. 1997:2083). This argues for an analysis as a quantifier. On the other hand, the source words *per* and *pro* clearly were prepositions in Latin. *Per* and *pro* both have a directional meaning, and share distribution and case-marking properties with other prepositions (cf.107ab).

(107) a. per / in hortum , b. pro / in castris
through/ into garden ACC before inside camp abl
‘through/into the garden’ ‘before/ inside the camp.’

---

50 This is not in line with recent proposals by Matthewson (2001). Based on data from Straits Salish, Matthewson argues that quantification ranges over DP-denotations universally.

51 The analysis in (105) suggests that forms like *jeder* ‘every’ are analysed as the result of incorporation of the Q-head *je* into a (functional) D-head, or vice versa. This synchronic perspective does not match the historical origin of *jeder* (>8th century), which is a contraction of the Old High German form *iowedar* ‘each of both’ (Kluge 1999:410).
The source of the problem seems to lie in the fact that the source language Latin is a language without overt determiners. The absence of (overt) determiners makes it impossible to distinguish between prepositional P-heads and determiner D-heads. This may have led to a ‘wrong’ categorisation of per/pro as a quantifying element in English and German. In German at least, this re-categorisation may have been supported by the analogy of pro and je.

The alternative is that per/pro have retained their status of (for the target languages) special prepositions because they are still marked as loans. In this case, the restricted distribution and peculiar selection properties of per and pro in English and German would follow from their origin as loans. The latter view implies that per and pro must be prepositions with some sort of quantificational content at least in the constructions in (96b) and (106).

In conclusion, the analysis of jeNPs in (97) provides a straightforward account for the double nature of per and pro as quantificational prepositions. I assume that per and pro lexically fill the P-head in (97), and that their apparent quantificational force results from incorporation of an empty quantifier Q₀ into P. This process is discussed in the next section. If correct, per/pro NPs would differ from jeNPs only concerning the question of whether P or Q is lexically filled.

4.1.2 Licensing P₀

The postulation of a zero preposition P₀ lends a certain degree of abstractness to the syntactic structure in (97). It is clear that the postulation of abstract syntactic structure must be constrained in some way in order to avoid overgeneralisations. In the present case, this means that the covert head P₀ in (97) must be properly licensed.

Two general strategies can license P₀ in principle (see also chapter I.2.4.3). P₀ could be licensed through incorporation of or into an overt lexical head (e.g. Baker 1988, den Dikken 1992, Longobardi 1994). This incorporation process must satisfy general restrictions on head movement such as Travis’ (1984) ‘Head Movement Constraint’. In other words, P₀ is licensed if it stands in a structural configuration to a lexical head so that the two can be related by (successive) application of head movement.

The second way to license a covert preposition P₀ is through overt morphological marking in the complement of the empty head, in line with Emonds’ (1987:615) ‘Invisible Category Principle’. The Invisible Category is stated in (108).

(108) A closed category B with positively specified features C_i may remain empty throughout a syntactic derivation of the features C_i (save possibly B itself) are all alternatively realized in a phrasal sister of B.

According to (108), a syntactic head may be covert if its category is closed (which is the case for prepositions) and if its feature content is overtly realised in alternative form in its syntactic complement. The wording ‘in its syntactic complement’ signals that the alternative feature realisation does not have to occur directly on the complement, but can also be located on a daughter of the complement.

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52 This view is found in Zifonun et al. (1997:2083), where the special behaviour of the loan preposition pro in German is attributed to its deficient integration into the German language system.

53 The analysis of pro as a preposition is supported by the occurrence of prepositional uses, as in (i):

(i) Der Schiedrichter pfeift eindeutig pro Heimmannschaft.

the referee whistles clearly for-the home team
The Invisible Category Principle mostly applies in languages with a rich (case) morphology, whereas languages without rich morphology tend to choose the first strategy (den Dikken 1992:129). In this section, I argue that both strategies are employed for licensing the zero head \( P^0 \) in German jeNP-constructions. We first look at morphological (case) licensing, and then at licensing through movement.

Looking at (96a) again, we observe that the NP-complement \( \text{Gefangenen} \) carries an overt case marking, the basic form being \((\text{der}) \ \text{Gefangene} \quad \text{‘the prisoner}_{\text{NOM}} \)’. There seems to be some variation between speakers regarding the realisation of the case suffix as either \( -n \) or \( -m \) (see fn.55), but one of the suffixes must appear (cf.109).

(109) drei Bewacher \( \quad \text{je Gefangene-}n \) / \( \text{je Gefangene-}m \) / \( \ast \text{je Gefangene-}\emptyset \)
three guards \( \quad \text{per prisoner} \)

The \( m \)-ending suggests that the NP is marked for dative case. Compare the inflectional paradigm for non-feminine de-adjectival or de-participial nouns in \( -e \) in table 3.

Table 3: Case inflection of non-feminine de-adjectival nouns in \(-e\)

<table>
<thead>
<tr>
<th></th>
<th>definite NP</th>
<th>indefinite NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>der Gefangene</td>
<td>ein Gefangene-r</td>
</tr>
<tr>
<td>GEN</td>
<td>des Gefangene-n</td>
<td>ein-es Gefangene-n</td>
</tr>
<tr>
<td>DAT</td>
<td>dem Gefangene-n</td>
<td>ein-em Gefangene-n</td>
</tr>
<tr>
<td>ACC</td>
<td>den Gefangene-n</td>
<td>ein-en Gefangene-n</td>
</tr>
</tbody>
</table>

The suspicion that the NP in jeNP-constructions can be overtly marked for dative case is supported by the fact that case is realised by an \( m \)-suffix if the masculine head noun is modified by an adjective. In contrast, if the head noun of the jeNP-construction is feminine, the expected feminine dative marker \( -r \) appears.

(110) a. drei Bewacher \( \quad \text{je langjährige-}m \) Gefangenen
                  three guards \( \quad \text{per veteran-DAT prisoner}_{\text{masc}} \)

b. 100 Euro \( \quad \text{je richtige-}r \) Antwort
        100 Euro \( \quad \text{per correct-DAT answer}_{\text{fem}} \)

I conclude that the NP-complements in jeNP-constructions can be overtly case marked. The \( m \)- and \( r \)-endings in (109) and (110ab) suggest that the NP is marked for dative case.55

The observation that the NP-complement is overtly case marked for dative is significant for the following reason. According to the ‘Invisible Category Principle’ in (108), a closed category, such as \( P \), may remain empty if its feature content is realised overtly on or inside the phrasal sister of this category. Observing that languages like Latin

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54 In German, case marking is always expressed on the first element inside the NP that can be inflected. In the paradigm in table 3, this is the determiner. Since \( \text{Gefangene} \) is a count noun it cannot occur without a determiner in the singular paradigm. Therefore, we cannot check what the dative case-ending on bare \( \text{Gefangene} \) would be. However, there is a small number of de-adjectival neuter abstract nouns in \(-e\), e.g. (das) Böse ‘(the) evil’, which take the dative ending \( -m \), showing that \( -m \) is the default dative marker for de-adjectival singular masculine or neuter nouns.

55 Presumably, the optional \( n \)-ending on the bare NP \( \text{Gefangenen} \) in (109) is the result of neutralising the more marked \( -m \)-ending to the less marked \( -n \). (1ab) show that neutralisation from \( -m \) to \( -n \) is productive in other contexts as well:

(i) a. bei längere-m \( \quad \text{genaue-}m \) Hinsehen \( \rightarrow \) b. bei längere-m \( \quad \text{genaue-}n \) Hinsehen
                  at longer-DAT \( \quad \text{close-DAT scrutiny} \) \( \rightarrow \) at longer-DAT \( \quad \text{close-DAT scrutiny} \)
and German exhibit alternating pairs of overt PPs and prepositionless but case-marked NPs, Emonds concludes (ibid.:618) that “a language can utilize ‘empty P’ structures […] if features of P like Direction, Location, or P itself are realised on NP” by oblique or dative case. In other words, empty prepositions are licensed by overt dative morphology on or inside their syntactic complement. I conclude that the NP-complement of German jeNP-constructions licenses the empty head $P^0$ when it is overtly case-marked for dative (see also den Dikken 1992:129). This is the case with de-adjectival masculine NPs ending in –e (109), and with NPs modified by an adjective (110a). Presumably, dative case is assigned by the empty preposition in these cases.

Unfortunately, inflection in the nominal system in German is not that rich any longer. It turns out that, apart from de-adjectival masculine and neuter nouns ending in –e, most bare NPs cannot be overtly case-marked in jeNP-constructions (nor can they in other constructions). A few representative examples are given in (111).

(111) a. drei Bewacher  je Häftling / *Häftling-en / *Häftling-em/ *Häftling-e  
   three guards  per inmate
b. drei Verehrer  je Frau / *Frau-e / *Frau-er / *Frau-en
   three admirers  per woman
c. drei Mann  je Boot / *Boot-e / *Boot-em / *Boot-en
   three man  per boat

In the examples in (109), the empty preposition $P^0$ is not licensed by overt dative morphology on the NP-complement. For these structures, we must assume application of the second licensing mechanism for empty heads: An empty head can be licensed by way of incorporation with a lexical head.

Licensing of empty heads through incorporation can happen in two ways. The first option is that the empty head incorporates into a lexical element above it. This is the process proposed by den Dikken (1992) for dative shift constructions, and for possessive have-constructions. With dative shift, an empty ‘dative’ preposition incorporates into the main verb. With possessive have, an empty dative preposition incorporates into copular be, forming the verb have (den Dikken 1992:123ff.). However, since the D-head of the DP is equally empty this process is not applicable to jeNP-constructions.

The other way to license an empty head through movement is by incorporation of a lexical element into the empty head. This process is illustrated by N-to-D-movement with proper names in Italian (cf. Longobardi 1994:624). In the absence of an overt determiner, proper names can move in front of otherwise prenominal adjectives, resulting in the structure in (112).

(112) $[\text{DP} [\text{D Roma} + \text{D}^0] [\text{NP antica} [\text{NP t}_1]]]$

I would like to argue that the empty preposition $P^0$ in jeNP-constructions with non-inflecting nouns as in (111) is licensed by an analogous syntactic operation. The lexical quantifier je incorporates into the empty preposition $P^0$. Since movement of je is by

56 In some cases, an overt case-marking does not seem impossible altogether, but only archaic. (i) is an example.

(i) ?? drei Brote  je Kind-e
   three breads  per child-DAT

This suggests that the strategy of P-licensing through overt dative morphology was more productive at an earlier stage of German in accordance with the richer inflectional system of the language at that time.
necessity string vacuous (P being covert), it is impossible to determine if such movement applies at surface structure, or at LF. Here, I take it to apply at surface structure. The resulting structure of jeNP-constructions without overt case marking on the NP is given in (113).

\[(113) \quad [DP^0 [NP {drei Verehrer} [PP [je_1+P^0] [QP t_1 [NP Frau]]]]] \]

three admirers per woman

The same mechanism applies to the per-construction in English, which has lost all inflection in the nominal paradigm. If per is analysed as a preposition selecting for a QP with a zero quantifier Q^0, as suggested at the end of the previous section, Q^0 is licensed by incorporating into the preposition per.

This concludes the discussion of how the empty P^0-head in jeNP-constructions is licensed. I have argued that licensing is accomplished either by (dative) case morphology on the NP-restriction (with overtly inflecting nouns), or by Q-to-P movement of the lexical quantifier je into the empty preposition (with nouns that do not inflect overtly). In any event, licensing of P^0 in (97) is achieved by two general licensing mechanisms for empty syntactic heads.

4.1.3 Case Alternations

In passing, I would like to direct the attention to a curious case phenomenon that sometimes emerges with jeNP-constructions in German. In place of oblique dative case, the NP-restriction of je can also optionally be marked for structural case. If the jeNP-construction occurs in subject position, case marking on the NP-restriction can alternate between dative (114a), and optional nominative case marking (114b).

\[(114) \quad \begin{array}{l}
a. \text{Drei Bewacher je Gefangene-}m/n \text{ wurden bereitgestellt.} \\
\quad \text{three guards per prisoner-masc-DAT were assigned}
\end{array} \\
\begin{array}{l}
b. \text{?Drei Bewacher je Gefangene-}r \text{ wurden bereitgestellt.} \\
\quad \text{three guards per prisoner-masc-NOM were assigned}
\end{array} \\
\]

Similarly, if the jeNP-construction occurs in object position, the NP-restriction can optionally be marked for accusative.

\[(115) \quad \begin{array}{l}
a. \text{Wir bekamen 500 Euro je richtiger Antwort.} \\
\quad \text{we got 500 Euro per correct-DAT answer}
\end{array} \\
\begin{array}{l}
b. \text{?Wir bekamen 500 Euro je richtige-∅ Antwort.} \\
\quad \text{we got 500 Euro per correct-ACC answer}
\end{array} \\
\]

Native speakers seem to display a certain amount of uncertainty regarding the correct case marking, with the (b)-examples having a slight substandard flavour to them.

Possibly, the observed case alternation is due to the existence of the two alternative licensing strategies for P^0, which were discussed in the preceding section. Assume that the empty P^0-head in (114) and (115) can be licensed either by overt case morphology on the NP-restriction, or by Q-to-P-movement of the quantifier je. If the first mechanism applies, the NP-restriction occurs with dative morphology, as in the (a)-examples. If the second

\[57\] Of course, the empty D-head D^0 must also be licensed. I leave open if this happens through overt morphology in the plural paradigm à la Emonds (1987), or by N-to-D-movement at LF à la Longobardi (1994).
mechanism applies, the empty preposition seems to have lost its ability to assign oblique case to the QP-complement after incorporation. In order to escape the case filter, which demands that all QPs/DPs must be case-marked, the structure must utilise a different strategy to assign (structural) case to the QP. By way of speculation, one could assume that the case of a DP, which is obligatorily assigned to the D-head, can spread not only to the head noun of the construction (indicated by case agreement between D and N), but optionally also to other QP/DP-constituents that are contained within the larger DP-structure. I tentatively assume that such case spreading is responsible for the emergence of structural case in the jeNP-constructions in (114b) and (115b).

If these admittedly speculative considerations are on the right track, the case alternations in (114) and (115) provide indirect evidence for the availability of P-to-Q raising as a licensing mechanism for P0 in jeNP-constructions.

4.1.4 Summary
The discussion of jeNP-constructions has delivered the following results: (i.) jeNP-constructions are a special instance of ILCs on the “inverse” reading, and have the same syntactic structure. (ii.) The main difference between jeNP-constructions and ILCs is that the former contain a covert preposition P0 where the latter feature an overt preposition. (iii.) Finally, it was shown that the empty head P0 can be licensed alternatively by overt (dative) case marking in the complement of P, or by head movement of the bare Q-head je into P0.

4.2 The structure of jeweils-DPs
We are now in a position to turn to the analysis of adnominal jeweils-DPs in German. The main argument of this section is that jeweils-DPs are special instances of jeNP-constructions, and (by transitivity) of ILCs on the “inverse” reading. Jeweils-DPs differ from jeNP-constructions in that they contain an overt NP-proform weil in place of a lexical NP. This proform provides the semantic restriction for the universal quantifier je-.

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58 It is possible that the inability of P0 to assign oblique dative case after incorporation of the Q-head je lies in the nature of je. Je does not seem to be a case-assigning element, for otherwise its presence should block case assignment by P0 in (114a) and (115a). If so, the inability of je to assign case seems to be inherited by the complex head je+P0 after incorporation, and case must be assigned some other way. Notice that incorporation of a lexical head into a covert head often has the opposite effect of adding case marking possibilities. In (ia) from Modern Hebrew, an embedded transitive verb has incorporated into a covert (causative) verb, and the complex V-V-head can assign accusative case to the embedded subject and the embedded object (cf. Cole 1976).

(i) Hirkadeti 1+V [et hatalmidin et ti harikud haxadas].
   (I) caused-to-dance ACC the students ACC   the dance the new

The case in (i) differs from the above case in that the incorporated element is a case assigner itself. By way of speculation, let us assume, then, that the ability of a complex head to assign case depends on the ability of the incorporated element to assign case. If the latter is not a case assigner, the complex head will not be either.

59 Many questions remain of course. One may wonder why the adjunct status of the postnominal PP does not act as a barrier to case spreading. Whatever the answer, it can be observed that case can spread to adverbial adjuncts in Finnish (Maling 1993). Perhaps, the observed case alternation receives a better treatment in terms of the small clause-analysis presented in 3.6. On the SC-analysis, the QP consisting of je and a restricting NP is located in the syntactic predicate of the small clause. As part of the predicate, it could potentially agree with the numeral NP in subject position of the SC, which gets its case from P0 through percolation:

(i) [DP D0 CASE,i [PrP [num NPCASE,i Pr0 [P QPCASE,i]]]]

Case agreement between NPs in subject and predicate position of a predicative copular structure is not rare, and therefore not altogether implausible for the case of jeNP-constructions. Other problems arise, though: (i.) How is P0 licensed? (ii.) How can the QP-complement of the PP be co-indexed with the subject NP of the SC although it is not the syntactic predicate of the small clause? How is the empty P-head licensed in the absence of overt oblique case on its complement? I leave these questions open for further research.
It receives its semantic value through co-indexation with an antecedent DistKey element. Jeweils-DPs also differ from jeNPs in the relative position of DistShare NP and PP-adjunct. In the unmarked case, the PP-adjunct (i.e. jeweils) moves overtly to the specifier of jeweils-DPs, whereas it stays in postnominal position with jeNP-constructions. With this, the underlying structure of jeweils-DPs is as in (116a), the (unmarked) surface structure as in (116b).

(116)  a. 

```
  DP
   D*  
    D^0  NP
       NP  PP
         AP  NP  QP
            drei  Bewacher  Q  NP
              je-weweils  weil-s
```

b. 

```
  DP
   D*  
    D^0  NP
       NP  PP
         AP  NP
            drei  Bewacher
```

The structures in (116) resemble those found in Safir & Stowell (1988) for English each and in Junker (1995) for French chacun(e) not only in terms of the overall syntactic architecture, but also in that they contain a proform.

It follows from the analysis of jeweils-DPs in (116) that adnominal jeweils is not an ‘anti-quantifier’ in the sense of Choe (1987). Instead, jeweils consists of a quantifying element je that takes its semantic restriction in form of an NP-complement just like the regular D-quantifier jeder ‘each’. This makes the German d-distributive element jeweils not an ‘anti-quantifier’, but a quantifier, albeit of a special sort. The analysis in (116) therefore refutes Choe’s claim (1987) that the phenomenon of ‘anti-quantification’ constitutes a deeper property of natural languages that must be accounted for by special assumptions. In section 5, this claim will be extended to d-distributive elements in other languages, showing that the phenomenon of ‘anti-quantification’ is only an epiphenomenon cross-linguistically (and possibly universally).

The structure of this section is as follows. In 4.2.1, I show that the empty P-head in jeweils-DPs is licensed by overt (oblique) case marking. In 4.2.2, I discuss the NP-proform –weil-. The pronominal status of –weil- is confirmed by comparing its binding behaviour with that of possessive pronouns. 4.2.3 briefly discusses related structures with other nominal proforms, such as je Stück ‘apiece’ and pro Person ‘per person’. 4.2.4 discusses why jeweils moves overtly to SpecDP in the unmarked case. Movement is
shown to be triggered by discourse structure requirements. In 4.2.5, I discuss how the facts concerning extraction from jeweils-DPs follow on the analysis in (116). Finally, the analysis is extended to the short form je, which is argued to contain a covert proform instead of overt –weil- in section 4.2.6.

### 4.2.1 Licensing P³: The Case of Genitives

The covert head P³ in jeweils-DPs is licensed by the same licensing mechanism that was shown to be active in (some) jeNP-constructions, namely by overt (oblique) case marking in the complement of the preposition (Emonds 1987). In the case of jeweils-DPs, the NP-complement (–weil-) of the quantifier je is invariably marked for genitive case.⁶⁰ This was shown in chapter II.1.3, where it was also shown that German adverbials often alternate between a PP-form with overt preposition and a P-less, but genitive-marked DP.⁶¹ The relevant data are repeated in (117).

(117) a. (des) abend-s = am Abend b. dies-seit-s = auf dieser Seite c. jeden-falls = auf jeden Fall

In line with Emonds’ (1987) Invisible Category Principle, the genitive-marked adverbials in (117) can be analysed as PPs with a covert preposition, thus accounting for the alternation. By the same reasoning, the covert head P³ in (118) should be licensed by genitive marking on jeweils.⁶²

(118) [pp P³ [QP je-weil]-GEN]

I conclude that the empty P³-head in jeweils-DPs is properly licensed by genitive case.

Before going on, take note of the fact that the possibility of genitive adverbials in German allows for a direct extension of the structure in (118) to adverbial jeweils. From now on, I will treat adverbial jeweils as a PP-adverbial, the covert P-head of which is licensed by genitive case.

### 4.2.2 The Proform –weil-

In this section, I justify the claim that jeweils contains an NP-proform –weil-, which provides the quantifier je with its semantic restriction, and which (in the normal case) receives its semantic value through co-indexation with a DistKey antecedent. The analysis of –weil- as a pronominal element is motivated in two ways. First, the presence of jeweils exerts a semantic restriction (the plurality requirement) on potential DistKey expressions. This follows if –weil- is a pluralic NP-proform and co-indexed with a DistKey antecedent. Second and stronger, it can be shown that DP-initial jeweils parallels the behaviour of

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⁶⁰ According to Kluge (1999: 411), there is an alternative form jewelle-n, which seems to be marked for dative case. See fn.66 for more discussion.

⁶¹ This process was productive at earlier stages of German as witnessed by the abundance of lexicalised genitive forms of temporal or locative adjuncts, e.g. gester-n ‘yesterday’, links ‘on the left hand’, rechts ‘on the right hand’ (cf. also Teuber 2000). Note also Grimmelshausen’s use of dies-art-s (this-side-GEN) for contemporary hier ‘here’, and aller-wege-n (all-way-GEN) for contemporary immer ‘always’. Analogous lexicalised genitive forms of temporal / locative adjuncts can arguably be found in English as well: always, hereabout-s, and nowadays.

⁶² Presumably, it is the entire QP that is case-marked for genitive. As with other complex nominal constituents in German, case is expressed on the first constituent that can be inflected, here the NP –weil-.
other DP-initial pronouns regarding Chomsky’s Binding Principles (1981, 1986b). The parallelism suggests that jeweils contains a proform as well.

Above, it was argued that the NP-proform –weil- denotes the restriction of the universal quantifier je. Unlike lexical NPs in jeNP-constructions, however, –weil- cannot freely denote just any entity. Normally, it is co-referent with a clausemate DistKey antecedent, as illustrated in (119), where co-reference is indicated by co-indexation.

(119) Die Jungen, haben [DP je-weil-s zwei Würstchen gegessen].

the boys have each two sausages eaten

From the restriction-denoting nature of –weil-, it follows that its value is restricted to pluralic groups (or sets) of discrete entities over which the quantifier can distribute. From this, it follows that –weil- can only be co-referent to plural-denoting antecedents (cf.119), like the plural pronoun they. As expected, mass DPs and singular count DPs are not appropriate DistKey antecedents for jeweils (cf.120), an observation that was referred to as the plural restriction on DistKey in chapter II.1.5.

(120) a. *Peter hat gerade jeweils zwei Würstchen gekauft.
   Peter has just each two sausages bought
   *’Peter has bought two sausages each.’
   b. *Benzin kostet gerade jeweils zwei Euros.
   petrol costs just each two Euros
   *’Petrol costs two Euros each.’

The plurality requirement on DistKey receives a straightforward explanation if jeweils contains a set-denoting proform –weil-. The set-denoting nature of the proform restricts the range of possible co-referring antecedents to plural expressions.

Unfortunately, the data in (119) and (120) only suggest that jeweils should be analysed as containing a proform. They do not show conclusively that it must be. (120ab) would also be ungrammatical without jeweils containing a proform, simply for the reason that the distributive element jeweils would not have access to a plural entity over which to distribute.

The following argument is meant to show more convincingly that jeweils contains a pronominal element. Adnominal jeweils is shown to behave like possessive pronouns regarding Chomsky’s Binding Principles. Jeweils is shown to act as an intervener between a potential binder (a DP) and a pronoun inside the jeweils-DP. Presence of jeweils restricts the co-reference possibilities of the pronoun. This property of jeweils parallels that of possessive pronouns in DP-initial position. If jeweils is analysed as containing a pronominal element, namely the proform –weil-, the parallel behaviour of possessive pronouns and jeweils receives a uniform explanation.


(121) a. [Peter, liest Bücher über sichr.]
   Peter reads books about himself
   b. *[Peter, liest Bücher über ihn,]
   Peter reads books about him

(122) a. Peter, liest [ Chomskys Bucher ueber sich-r].
   Peter reads Chomsky’s books about himself
b. Peter liest [Chomskys Bucher uber ihn].

Peter reads Chomsky’s books about him

(123) a. Peter liest [seine Bucher uber sich].

Peter reads his books about himself

b. Peter liest [seine Bucher uber ihn].

Peter reads his books about him

In (121ab), the subject Peter syntactically binds the co-indexed anaphor and the personal pronoun inside the object DP, resulting in grammaticality (Principle A) and ungrammaticality (*Principle B) respectively. In Chomsky (1986b) this was put down to the fact that the ‘Minimal Governing Category’ for anaphor and pronoun is the matrix clause in (121). Anaphors must be bound within their minimal governing category (Principle A, cf.121a), while pronouns must be A-free within their minimal governing category (Principle B, cf.121b). In (122), the intervening possessive phrase Chomsky’s reverses the grammaticality judgments: the anaphor sich must be bound by DP-internal Chomsky’s, while the pronoun ihn can be bound by the matrix subject Peter. Chomsky (1986b) accounts for this reversal of judgments in the following way. The possessive phrase Chomsky’s is the subject of the object DP (it is located in SpecDP), turning it into the minimal governing category for the pronoun (see fn.63). Within its minimal governing category, the anaphor sich must be bound and the pronoun ihn must be A-free in accordance with Binding Principles A and B. This accounts for the grammaticality judgments in (122). Finally, (123) shows that possessive pronouns in DP-internal position behave like possessor DPs. They are the subject of the DP, turning it into a minimal governing category in which the anaphor must be bound and the pronoun must be A-free. The details of this are irrelevant. What is important is that (123ab) show that DP-initial pronouns act as interveners for the binding possibilities of DP-internal anaphors and pronouns.

This allows for a prediction regarding the postulated status of –weil- as a proform. If jeweils really contains a proform, we expect its presence in prenominal position to affect the binding possibilities of DP-internal material as well. The following argument shows that this is the case. The argument is rather complex and rests on the observation that sentences with adnominal jeweils in direct object position and two potential plural antecedents are ambiguous. Consider the ambiguous (124).

(124) Die Popstars haben den Sängern jeweils zwei Bücher geschenkt.
the pop stars have the singers each two books given (as a present)

a. ‘Each of the pop stars has given two books to the singers.’

b. ‘The pop stars have given each of the singers two books.’

On the reading in (124a), jeweils distributes over the subject denotation such that each of the pop stars gave the singers two books (i.e. the total number of books depends on the number of pop stars). On the second reading in (124b), jeweils distributes over the indirect object denotation such that each of the singers got two books from the pop stars (the total number of books depending on the number of singers). The ambiguity of (124) is parallel to that observed with possessive pronouns in (125).

63 In Chomsky (1986b:169), the term ‘Governing Category’ for α is defined as “a maximal projection containing both a subject and a lexical category governing α (hence, containing α)”. 
(125) Peter, hat Bill sein Buch gegeben.

‘Peter has given his book to Bill.’

In (125), the pronoun *sein* ‘his’ can refer either to Peter or to Bill.

Consider now the following sequence of ditransitive sentences. Each sentence contains an anaphor inside a direct object DP. The anaphor must be bound within its minimal governing category, in accordance with principle A. In (126b) and (126c), the object DP contains an additional possessive pronoun, which is the subject of the DP (presumably in SpecDP). The following binding patterns are observed:

(126) a. Peter hat Klaus ein Buch über sich gegeben.

‘Peter gave Klaus a book about himself.’

b. Peter hat Klaus sein Buch über sich gegeben.

‘Peter gave Klaus his book about himself.’

c. Peter hat Klaus sein Buch über sich gegeben.

‘Peter gave Klaus his book about himself.’

With no possessive pronoun present, the anaphor can be bound by the subject or by the indirect object, and the sentence is ambiguous (cf.126a). In (126bc), presence of the possessive pronoun turns the object DP into the minimal governing category for the anaphor, in which it must be bound. If the possessive pronoun co-refers with the subject Peter, the anaphor (which must be bound by the possessive) co-refers with the subject (126b). If the possessive pronoun co-refers with the indirect object, the anaphor co-refers with the indirect object (126c).

Interestingly, analogous binding facts can be observed with *jeweils*.

(127) a. Die Popstars haben den Sängern zwei Bücher über sich geschenkt.

‘The popstars gave the singers two books about themselves.’

b. Die Popstars haben den Sängern jeweils zwei Bücher über sich geschenkt.

‘The popstars gave the singers each two books about themselves each.’

c. Die Popstars haben den Sängern jeweils zwei Bücher über sich geschenkt.

‘The popstars gave the singers each two books about themselves each.’

Like (126a), (127a) without *jeweils* is ambiguous. The anaphor can be bound either by subject or indirect object. The insertion of *jeweils* in (127bc) results in the following picture. The anaphor can no longer be ambiguously bound by either subject or indirect object. This suggests that *jeweils* is the subject of the object DP in SpecDP, turning it into the minimal governing category for the anaphor. If *jeweils* distributes over the subject, i.e. if each of the pop stars gave two books to the singers, the anaphor has to co-refer with the subject (cf.127b). If *jeweils* distributes over the indirect object, such that each of the singers got two books, then the anaphor has to co-refer with the indirect object (cf.127c).
(127a-c) show that the presence of jeweils blocks the anaphor from being freely bound by either subject or indirect object.64 (127bc) show that the range of potential antecedents for the anaphor depends on the interpretation of jeweils, namely on which antecedent is chosen as DistKey expression. The facts in (127bc) follow on the assumption that jeweils contains an NP-proform –weil-, which is co-indexed with a pluralic antecedent (i.e. either subject or indirect object), and which in turn binds the anaphor within its minimal governing category, the jeweils-DP.

Parallel facts with reversed binding possibilities are observed if we replace the anaphor with a pronoun.

(128) a. Peter hat Klaus ein Buch über ihn*/*j gegeben.
   ‘Peter gave Klaus a book about him.’
   b. Peter hat Klaus sein Buch über ihn*/*j gegeben.
   ‘Peter gave Klaus his book about him.’
   c. Peter hat Klaus sein Buch über ihn*/*j gegeben.

(129) a. Die Popstars haben den Sängern zwei Bücher über sie*/*j geschenkt.
   ‘The popstars have given the singers two books about them.’
   b. Die Popstars haben den Sängern jeweils zwei Bücher über sie*/*j geschenkt.
   ‘The popstars have given the singers two books about them each.’
   c. Die Popstars haben den Sängern jeweils zwei Bücher über sie*/*j geschenkt.

In (129bc), the pronoun sie must not be bound by the proform in jeweils. On the other hand, it is the presence of pronominal jeweils which establishes a minimal governing category within which the pronoun is A-Free. This opens the possibility for the pronoun to be bound by the subject or the indirect object in (129bc). Again, the behaviour of jeweils is parallel to that of the possessive pronoun in (128bc).

Summing up, the parallel behaviour of possessive pronouns and jeweils in (126) – (129) is accounted for on the present analysis, which takes jeweils to contain an NP-proform –weil-. In addition, the fact that presence of jeweils turns the object DP into a minimal governing category suggests that jeweils functions as the syntactic ‘subject’ of the jeweils-DP. This observation is in line with the present analysis of jeweils-DPs, which assumes jeweils to be located in SpecDP (the position for DP-internal subjects) at surface structure.

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64 Since the intuitions concerning (127a-c) are subtle and possibly influenced by the simultaneous possibility of an adverbial reading for jeweils, consider (i), which is simpler in two respects. First, (i) contains only one potential DistKey for jeweils, thus excluding ambiguity in the reference of –weil-. Second, (i) contains the imperfectivity marker gerade ‘just’, thus excluding an adverbial interpretation for jeweils.

(i) Die Jungen schenken dem Popstar gerade jeweils zwei Bücher über sich*/*j.
   ‘The boys are each giving the pop star two books about themselves / *himself.’

It seems to me that the co-reference between the reflexive anaphor and the singular antecedent den Popstar ‘the pop star’ is impossible in (i) despite the fact that our knowledge of the world suggests otherwise. If correct, data like (i) suggest that presence of adnominal jeweils indeed restricts the co-reference possibilities of a reflexive anaphor contained in the same DP.
Before going on, a word of warning concerning the nature of –weil- is in order. The discussion of (119) and (120) may have led to the incorrect impression that –weil- is a syntactic anaphor which must be licensed in its minimal governing category by a c-commanding DP-antecedent.65 That this is not the case, can be seen from sentences such as (130) (repeated from chapter II.1.8), where jeweils does not take a DP as its DistKey expression.

(130) Peter hat Maria aus jeweils zwei Gründen kritisiert und gelobt.
Peter has Maria for each two reasons criticised and praised
‘Peter has criticised and praised Maria for two reasons respectively.’

This is very much unlike the behaviour of other syntactic anaphors, which require a DP-antecedent as licensor. The behaviour of jeweils rather resembles that of the pronoun it, which can co-refer with non-DP expressions (Kamp & Reyle 1993:306, fn.1). In (131), for instance, it seems to refer to the event described by the preceding clause.

(131) Bill passed the exam. It surprised everyone.
In chapter V, we will encounter a conclusive argument against treating –weil- as an anaphor. There, it will be shown that adnominal jeweils is licensed in syntactic configurations without an appropriate antecedent. In this case, the value for –weil- must be provided by the context, showing clearly that –weil- cannot be a syntactic anaphor.

4.2.3 Other NP-Proforms: Grammaticalisation

Apparently, the proform –weil- is derived from the lexical noun Weile ‘while, time’ through a process of grammaticalisation. Processes of grammaticalisation are frequently argued to involve a process of ‘bleaching’, which makes them lose part of or their entire inherent feature content (Roberts 1993, Lehmann 1995, Haspelmath 1998). As expected, –weil- has lost its semantic restriction to points of time, events, or intervals, unlike its English counterpart time in each time. As a result of bleaching, –weil- can co-refer to pluralic entities of any ontological sort. Furthermore, bleaching must also have affected the grammatical properties of Weile. As a feminine noun, Weile is not overtly case-marked for genitive, whereas the proform –weil- carries the genitive –s of the masculine and neuter paradigm (presumably forced by the need to license P0 through overt case). This suggests that –weil- has either lost its D-feature for gender or that the gender marking has changed from [+fem] to [-fem].

The purpose of the foregoing remarks was to motivate the assumption that the proform –weil- is derived from a full lexical noun through the process of grammaticalisation. If so, we expect to find other instances where grammaticalisation turns lexical nouns into NP-

65 Recall from chapter II.5 that such an analysis was suggested for English each by Burzio (1986) and Stowell & Safrir (1988). In section III.5.4, an explanation for the (non-) anaphoric nature of jeweils vs. each is given.
66 In fn. 60, it was mentioned that jeweil-s has an alternative form jeweiℓ-n, with –n being the old dative marker in the feminine paradigm (nach einer Weilen ‘after a whileDAT’). This dative ending is still found in some Upper German dialects, as witnessed by the following example from Viennese (Austrian):

(i) med ana schwoazzn dint-n (Artmann 1958)
with a black ink-DAT

It could be that the switch from n- to s-ending in German jeweils coincides with the loss of the –n suffix as dative marker for feminine nouns, under a simultaneous loss or change of the gender-feature in –weil(e)-.
proforms that can serve as the restriction for the universal quantifier je (or alternatively for pro). The expectation is borne out, as witnessed by (132ab).

(132)  

a. Wir haben je / pro Person 5 Euro bezahlt.
we have each per person 5 Euro paid.
‘We paid 5 Euro per person.’

b. Die Eier kosten 50 Cent je / pro Stück.
the eggs cost 50 cents each per piece
‘The eggs cost 50 cent apiece.’

*Person* in (132a) is the proform used for groups of human individuals, especially if the gender structure of the plural group is not clear or mixed. Likewise, *Stück* ‘piece’ is the proform used for groups of inanimate entities. The proforms *Person* and *Stück* differ from –weil- in that they have retained some of their semantic feature content. As a result, they cannot be interchanged in (132ab), nor can they ever be used to refer to groups of abstract entities, such as events, which is possible with –weil-.

One may wonder if the presence of an NP-proform is not forced by independent grammatical requirements, such as satisfaction of the binding conditions (Chomsky 1981, 1986b). Principle C of the binding conditions states that an R-expression (= a referential expression), i.e. a DP or a proper name, must be syntactically free. An expression is free if it is not bound, and an expression is bound if it is co-indexed with a c-commanding expression. Looking back at (132ab), we see that both the subject and the NP-complement of the universal quantifier refer to the same entity, the plural set of ‘us’ and a set of eggs respectively. Being co-referent, they carry the same index so that the subject syntactically binds the NPs *Person* and *Stück* respectively. But this would result in a principle C violation if the NP-complement of je or pro were a genuine referential expression. If correct, these considerations show that pronominalisation of an NP is a precondition for its occurrence in a d-distributive construction.

In conclusion, the proform –weil- was argued to derive from the lexical noun *Weile* ‘while, time’ through grammaticalisation. As often with grammaticalisation, processes of bleaching accompany the development from the lexical NP to an NP-proform. Finally, I have shown that grammaticalisations into a proform complement of the universal quantifier je (or pro ‘per’) are found with other lexical nouns in German (and English as well). This shows that the derivation of *jeweils*, in particular the pronominalisation of *Weile* to –weil- is by no means exceptional, and perhaps even forced by independent grammatical principles. This concludes the discussion of the proform –weil-.

### 4.2.4 Movement of *Jeweils*: Topic Fronting

In the unmarked case, *jeweils* moves from its postnominal base-position to SpecDP of the *jeweils-*DP. In this section, I argue that this movement is conditioned by the discourse structure of the DP. It is shown that German exhibits a process of (DP-internal) ‘topic-fronting’, which overtly moves DP-internal topics to the left edge of the DP, namely to SpecDP. Following Reinhart (1995:105), ‘topic’ here refers to the element that denotes the most accessible, contextually most prominent, most salient entity. On the plausible assumption that the NP-proform in *jeweils* forms the topic of the *jeweils-*DP, the (almost) obligatory overt movement of *jeweils* can be attributed to the application of topic fronting.

67 Additional examples are *pro Nase* ‘per nose’ and *pro Kopf* ‘per head’.
In 2.4.2, it was shown that the postnominal PP in ILCs and jeNP-constructions can move to DP-initial position under special discourse conditions. (133a) shows this for ILCs, and (133b) for jeNP-constructions.

\[(133)\]

a. \[DP\{Für jeden Gefangenen\}, drei Bewacher t1\] hat der Direktor bereitgestellt.  
   ‘As for every prisoner, the director has assigned him three guards.’

b. \[DP\{Je Gefangenen\}, drei Bewacher t1\] hat der Direktor bereitgestellt.  
   ‘As for the prisoners, the director has assigned each of them three guards.’

Informally, the fronted constituents in (133ab) must be interpreted as a contrastive topic. As a topic, the fronted constituent refers to the contextually most prominent or most accessible discourse referent or file card in DRT or file change semantics terms (Kamp 1981, Heim 1982). This definition seems in accordance with the more traditional notion that the topic stands for what the sentence is about, its ‘aboutness’. The topic in a topic-comment structure is not identical with presupposed or background information in a background-focus structure even though the two notions can overlap. E.g., a syntactic subject often expresses the topic and presupposed information at the same time.

The topic status of the fronted constituents in (133ab) is confirmed by applying Reinhart’s (1995) empirical test for topichood. The test is a negative test and is based on the referential possibilities of the Dutch demonstrative pronouns deze ‘this’ and diens ‘hisDEM’, when used as discourse anaphora. In a nutshell, Reinhart shows that the topic of a sentence – being the most accessible discourse antecedent - cannot be picked up by deze or diens. Apparently, the co-referential potential of these elements is restricted to discourse antecedents of intermediate accessibility (Reinhart 1995:102). From this, Reinhart concludes that a constituent that cannot serve as antecedent to deze or diens must be a topic.

The topic-test also works for German where the demonstratives diese(r) ‘this’ und dessen/deren ‘his/hersDEM’ cannot refer back to the most accessible discourse antecedent, i.e. the topic of their clause. For illustration, consider (134a), where the demonstrative can refer to the indirect object, but not to the subject, which is the topic of the clause. (134b) shows that a free pronoun in indirect object position is an unsuitable antecedent for the demonstrative, presumably because of the contextual salience of the pronoun’s referent.

\[(134)\]

a. Peter, gab Hans dessen, Buch zurück.  
   ‘Peter gave Hans his book back.’

b. *Peter gab ihm dessen, Buch zurück.  
   ‘Peter gave him his book back.’

This should suffice in order to give an idea of how the topic-test works. In what follows, I employ the test as a diagnostic for the topic-status of the DP-internally fronted constituents in (133ab). The prediction is that the fronted constituents in (133ab) should not be able to serve as discourse antecedents for a clausalant demonstrative pronoun if

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68 I assume that it is the discourse status of the DP, which triggers movement. Since German does not allow for preposition stranding, the embedding PP is pied-piped along.
they are fronted because of their topic status. (135) and (136) show that the prediction is borne out for ILCs and jeNP-constructions. In order to keep the judgments clear, the examples are construed with a feminine and a masculine noun in the initial DP. This way, the demonstrative pronoun refers unambiguously.

(135) a. [Ein Gärtner in jeder Stadt] pflegt deren Gärten.
    one gardener in every city looks after its DEM gardens.
    'One gardener in every city, looks after its gardens.'

b. [In jeder Stadt] ein Gärtner pflegt *deren / ihre Gärten.
    in every city one gardener looks after its DEM / its cities
    'One gardener in every city, looks after its gardens.'

    one employee per company checks its DEM spending
    'One employee in every company controls its spending.'

b. [Je Betrieb] eine Angestellte kontrolliert *dessen / seine Ausgaben.
    per company one employee checks its DEM / its spending
    'One employee in every company controls its spending.'

In (135a) and (136a), the demonstrative can refer back to the postnominal QP, showing that it is not the topic of the clause. The situation is different in the (b)-examples, where the PP-adjunct has moved to SpecDP. Here, the fronted constituent can no longer be picked up by the demonstrative pronoun, showing that it is the topic of the clause.69

The same facts are found with DP-internal possessor phrases. (137a) shows the basic case of a possessor PP in postnominal modifier position. In postnominal position, the possessor phrase is not a topic and can be picked up by a demonstrative pronoun. If a possessor phrase occurs in DP-initial position, however, it is the topic and can no longer be picked up by a demonstrative. (137b) shows this for a prenominal genitive DP, and (137c) for a fronted possessor-PP.70 Again, the judgments are those on a neutral intonation of the clause. The demonstrative is possible if the head noun is assigned prominence by (contrastive) stress.

(137) a. [DP Die Jacke [pp von Peter]] verriet dessen Anwesenheit.
    the coat of Peter betrayed his DEM presence

    Peter's coat betrayed his DEM / his presence

    of Peter the coat betrayed his DEM / his presence

69 The demonstrative can refer to the fronted constituent in the (b)-sentences if the head noun of the DP receives the highest degree of accessibility or contextual prominence by independent means, e.g. contrastive stress. In this case, the fronted PP has only secondary, or ‘intermediate’ prominence and is a possible antecedent for the demonstrative. The judgments in the main text are those for sentences pronounced with neutral or sentence grammar intonation (see Reinhart 1995, Cinque 1993).

70 On the possibility of PP-fronting inside possessive DPs in German see Bhattacharyya (1990) and Fortmann (1996). The similarity of (137b) and (137c) suggests that the two constructions have the same underlying structure, with the prenominal GEN- or PP-element being base-generated in postnominal position. This is in effect the analysis of prenominal genitives found in den Dikken (1998). The assumption of a shared underlying structure is further supported by the genitive-PP-alternation observed for German in connection with Emonds’ Invisible Category Principle. Nonetheless, the facts surrounding prenominal genitives in German are more complex than indicated here, suggesting that synchronically the structural parallelism between (137b) and (137c) no longer holds. The reader is referred to Hartmann & Zimmermann (2002) for a detailed discussion of adnominal genitive expressions in German.
The data in (135) – (137) are summarised in form of the generalisation in (138), with the corollary in (139).

(138) Topics must occur at the left edge of DP (in German).

(139) **Topic Fronting:**
A constituent moves overtly to DP-initial position (in German) iff it is a topic.

(139) is the DP-internal counterpart to the discourse driven processes of overt scrambling and topicalisation at clause level. It supports the parallelism between clausal and nominal domain that is argued for in Stowell (1989, 1991) and Szabolcsi (1989, 1994). (139) accounts for obligatory fronting of adnominal *jeweils* on the assumption that *jeweils*, or better the embedded proform *–weil-* has topic status. The topic status of *jeweils* is confirmed by Reinhart’s topic-test. In (140a), the demonstrative pronoun can refer to the indirect object. But it cannot do so in (140b), where presence of *jeweils* turns the indirect object into the DistKey for adnominal *jeweils*.\(^{71}\)

(140)  
  a. Maria erzählt den Kindern\(_i\) eine Geschichte über deren\(_i\) Herkunft.  
  Maria tells the children one story about their origin
  ‘Maria is telling the children one story about their origin.’

  b. ?* Maria erzählt den Kindern\(_i\) jeweils\(_i\) eine Geschichte über deren\(_i\) Herkunft.  
  Maria tells the children each one story about their origin
  ‘The aunt is telling the children each one story about their origin.’

The topic status of the DistKey expression is not surprising. It seems that contextual prominence, hence high accessibility of a discourse referent is a precondition for distribution over it. If so, the DistKey must be a topic. Since the proform *–weil-* is coreferent with the topic, the DistKey expression, it inherits the latter’s topic status. As a topic, *–weil-* must move to SpecDP by topic fronting. Being a bound form, it can only do so by pied-piping the universal quantifier *je* and the empty preposition along. This explains why *jeweils* moves to SpecDP in the unmarked case.

Movement of a constituent for discourse reasons is driven by a specific discourse status of that constituent such as ‘most prominent’, ‘old information’ etc. These notions are relative in the sense that a constituent can acquire a prominent discourse status in a given context, leading to a change in word order. This explains why *jeweils* can occasionally stay behind in its postnominal base position, as in (141ab).

(141)  
  a. [Wieviel WÜRSTCHEN jeweils] haben die Jungen gegessen?  
  how many SAUSAGES each have the boys eaten
  ‘How many SAUSAGES each have the boys eaten?’

  the boys have two SAUSAGES each bought not two oranges
  ‘The boys have bought two SAUSAGES each, and not two oranges.’

The small caps on the DP-initial phrase indicate that the postnominal occurrence of *jeweils* is accompanied by stress on some other constituent in the DP. This suggests that

\(^{71}\) This judgment for (140b) does not seem to be shared by all speakers.
\textit{jeweils} can optionally remain its base position, if some other element inside the DP has a more prominent discourse status. In (141ab), the prominent discourse status of the stressed constituents seems to be due to their interpretation as contrastive topic.

Summing up, I have argued that topics must occur at the left edge of DP in German. If a topic is not base-generated at the left edge of DP, it raises overtly to SpecDP by application of topic fronting (cf.139). It was also argued that – in the unmarked case - \textit{jeweils} inherits the topic status from its DistKey expression under co-reference between the DistKey and the proform –\textit{weil-}. As a topic, \textit{jeweils} must move overtly to SpecDP. This explains the prenominal occurrence of \textit{jeweils} in the unmarked case. \textit{Jeweils} moves for discourse reasons. Finally, it was shown that \textit{jeweils} may optionally stay in its postnominal base-position if the role of topic is taken over by some other constituent inside the DP.

\subsection{4.2.5 Extraction from \textit{Jeweils}-DPs}

The analysis of \textit{jeweils}-DPs also accounts for certain facts regarding extraction from \textit{jeweils}-DPs. There are two cases to distinguish: In section 2.1.3, it was shown that the DistShareNP can extract from the \textit{jeweils}-DP (cf.142). Second, the analysis of \textit{jeweils}-DPs predicts that adnominal \textit{jeweils} should be able to leave the DP, using SpecDP as an escape hatch. Below, this prediction is shown to hold as well, supporting the present analysis of \textit{jeweils}-DPs (see also the discussion of movement of adnominal \textit{jeweils} in chapter II.2.3).

The extraction of DistShareNPs from \textit{jeweils}-DPs was illustrated in (39b) in 2.1.3, which is repeated as (142). In (142), the DistShare extracts from DP, leaving adnominal \textit{jeweils} behind.

\begin{enumerate}
\item[(142)] [Zwei Geschenke], hat Peter den Kindern, ja doch gerade [jeweils, t1] gegeben.
\begin{verbatim}
  two presents     has Peter the children PART  ProG each given
\end{verbatim}
\end{enumerate}

\begin{quote}
I would like to argue that the present analysis of \textit{jeweils}-DPs leaves room for extraction of DistShareNPs, but that the position of the trace is not as indicated in (142). In particular, I would like to argue that the extraction in (142) is analogous to that found with instances of ‘NP Split’, illustrated in (143) (from Pafel 1995:159, ex.37a)

\begin{enumerate}
\item[(143)] a. Gemälde, besitzt der Louvre [DP viele \text{t1} [PP von Leonardo]].
\begin{verbatim}
  paintings owns the louvre many of Leonardo
\end{verbatim}
\end{enumerate}

\begin{quote}
\begin{itemize}
\item[(143a)] The Louvre owns many paintings by Leonardo.
\item[(143b)] The Louvre owns some beautiful paintings by Leonardo.
\end{itemize}
\end{quote}

In (143a), the head noun of the object DP has extracted from the DP, leaving behind a postnominal PP-modifier. (143b) shows that more than the head noun may move as long as the moved elements form a constituent. This presentation of NP Split is an oversimplification and glosses over a lot of complexities and confusing details that have made NP Split the focus of a controversial debate.\footnote{See e.g. Tappe (1989), Fanselow (1987b), Riemsdijk (1989), Pafel (1995), and for different accounts of the phenomenon in question.} It is not even clear if movement is
involved in NP Split or if the structures are base generated. Following Pafel (1995), I assume that the structures in (143) are indeed derived by movement. If correct, (143a) shows that extraction from DPs can strand postnominal PP-modifiers. The possibility of PP-stranding will be an important ingredient of the analysis to come.

As pointed out repeatedly, clausal domain (CP) and nominal domain (DP) behave alike in a number of ways. One of the observable parallels concerns the availability of the SpecDP-position as an escape hatch for movement. The first empirical argument to this effect is – to the best of my knowledge – from Szabolcsi (1983), where it is shown that dative possessor DPs in Hungarian can leave the embedding DP through SpecDP. The structure of (144a) (from Szabolcsi 1994:181, ex.4b) is given in (144b).

(144) a. Mari-nak fekete volt a kalap-ja
   Mari-DAT black was the hat-POSS3sg,NOM ‘Mari’s hat was black.’
   b. Mari-nak ... [DP t1 a t1 kalap-ja]

Based on data such as (144a), Willim (2000) proposes to use the extractability of a phrase from within a nominal argument as a diagnostic for the presence of a functional DP-layer. According to Willim, extractability out of a nominal argument is possible only in the presence of an empty SpecDP-position, which can serve as escape hatch.\textsuperscript{73,74} I will adopt Willim’s assumption that the SpecDP position functions as an escape hatch for extraction without further discussion.

Given Willim’s proposal, the extraction of the DistShareNP from the jeweils-DP in (142) constitutes a problem. Note that jeweils precedes the NP-trace in (142), indicating that it has moved overtly to SpecDP. If so, it would block extraction of the NP, which must proceed through SpecDP (according to Willem). I conclude that jeweils cannot have moved overtly in (142), so that it is still in its base position. The revised structure of (142) is given in (145).

(145) [Zwei Geschenke], hat Peter den Kindern, ja doch gerade [t1 jeweils] gegeben.

(143a) shows that extraction of an NP under stranding of postnominal PPs is possible. Therefore, nothing should block the jeweils-PP from staying behind in (145), especially since the fronted DistShareNP must have prominent discourse status in order to license its topicalisation. That is, jeweils is not forced to move overtly to SpecDP because it is not the topic (= the most prominent element) of the clause anyway.\textsuperscript{75} Considering all this, extraction of DistShareNPs from jeweils-DPs is accounted for on the present analysis.

The second type of extraction from jeweils-DPs is the extraction of jeweils itself. Extraction of jeweils is similar in nature to the extraction of the Hungarian possessor in (144). The dative possessor in (144) first moves to SpecDP, from where it can leave the

\textsuperscript{73} That this is only a necessary, but not a sufficient condition for extraction from DPs is shown by the ungrammaticality of extraction from specific DPs, as in (i):

(i) *Who did you invite [the friend of t1]?

\textsuperscript{74} Interestingly, Pafel (1995) arrives at the opposite conclusion. For Pafel, extraction from an NP contained inside a DP is highly restricted because the additional DP-layer introduces a barrier for extraction.

\textsuperscript{75} The analysis would still go through even if jeweils was a topic. The generalisation in (138) requires the topic to be at the left edge of DP. If this restriction applies at the level of PF (Phonological Form), jeweils in postnominal position would automatically be at the left edge after extraction of the NP, thus satisfying (138) without moving to SpecDP.
DP. Likewise, jeweils is expected to be able to leave the jeweils-DP after movement to SpecDP. (146a) shows that such movement is possible, creating the structure in (146b). Note that the presence of the imperfectivity marker gerade ‘just’ excludes the adverbial reading for (146a).

(146) a. Die Jungen, haben jeweils, gerade Peter zwei Bücher verkauft.  
the boys have each just Peter two books sold  
‘The boys have just sold Peter two boys each.’

b. Die Jungen, haben jeweils, gerade [DP t, [NP zwei Bücher t]] verkauft.  
the boys have each just Peter two books sold

Overt extraction of jeweils is constrained by discourse requirements and general restrictions on overt movement. Thus, extraction of jeweils will be accompanied by prominent stress on the moved element, indicating its prominent discourse status (a precondition for movement to SpecDP). Second, extraction of jeweils obeys general constraints on movement. It cannot raise across co-indexed constituents for this would result in a Principle C violation (147a) (cf. chapter II.2.2, fn.15), nor can it raise out of syntactic islands (147b). See also the discussion in chapter II.2.3.

Peter has each just the boys two roses given  
*b. *Die Jungen, bedauern jeweils, gerade, dass Peter, t’ zwei Gäste, t’ einlädt.  
the boys regret each just that Peter two guests invites

The extractability of adnominal jeweils from its host DP was cited in chapter II.2.3 as a problem for distinguishing instances of adverbial and adnominal jeweils. It blurs the syntactic dividing line. This section has shown that the extractability of adnominal jeweils from jeweils-DP’s is unproblematic for the present analysis of jeweils-DPs. To the contrary, the present analysis predicts such extraction to be possible.

In conclusion, the two observable types of extraction from jeweils-DPs follow on the present analysis of jeweils-DPs.

4.2.6 The Short Form Je

In this section, I extend the analysis of adnominal jeweils to its shorter counterpart je. I argue that je is structurally parallel to adnominal jeweils, when used as an adnominal d-distributive quantifier. Instead of an overt proform –weil-, the je- construction contains a covert proform that is co-indexed with the DistKey expression. The structure of the je- construction in (148a) is spelt out in (148b), with the covert proform indicated by ‘∅’. The fine structure of the je-PP is shown in (148c).

(148) a. Die Jungen, kauften je, zwei Bücher.  
the boys bought each two books  
‘The boys bought two books each.’
The parallel treatment of *je* and *jeweils* accounts for the observation from chapter II.1.9 that the two elements have the same syntactic distribution. Distributive *je* occurs in all and only in those positions where adnominal *jeweils* occurs. It only gives rise to adnominal readings (see chapter II.1.9), and it is excluded from positions reserved for adverbial *jeweils* (cf.149ab).

(149) a. Die Jungen haben je*(weils) alle zwei Würstchen bestellt.
    the boys have each (time) all two sausages ordered
    *'Each time, the boys all ordered two sausages.'

b. Peter hat je*(weils) gewonnen.
    Peter has each(time) won
    'Peter has won each time.'

Classifier constructions, as in (150a) with the structure in (150b), support the analysis of *je*DPs as involving a covert NP-complement.

(150) a. Benzin kostet fünf Euro je Liter.
        petrol costs five Euros per liter

b. Benzin kostet [DP fünf Euro [PP[QP je [ClP Liter [NP ∅ [i]]]]]].

In (150a), only part of the complement of *je* can be covert for semantic reasons. The presence of the classifier *Liter* shows that *je* takes a complement. The classifier must be expressed overtly because *je* and *jeweils* can only distribute over groups of discrete entities, not over mass denotations (cf. chapter II.1.5, fn.8). It requires an NP-argument which is covert in (148b), its value being determined by co-indexation with the antecedent mass DP *Benzin* ‘petrol’. I take the presence of a covert NP-proform in (150a) to support the presence of an analogous covert NP-proform in (148a), the two structures differing only regarding the presence or absence of a classifier.

The analysis of *je* as the short form of adnominal *jeweils* is in line with Safir & Stowell’s (1988) treatment of d-distributive *each* as containing a covert proform. Furthermore, since *jeweils*-DPs are analysed as special instances of *je*-NP-constructions (and ILCs), the present analysis is in line with Sauerland’s (2001) claim that the *je*-construction in (148a) is a *je*-NP-construction underlingly. According to Sauerland, *je* is an ordinary distributive universal quantifier (like *every*). The NP-complement of this quantifier is a silent copy of its (DistKey) antecedent. Presumably the content of this silent copy is recovered under identity to the antecedent. The QP formed by *je* and (covert) complement forms an ILC-like constituent with the DistShareNP, an assumption also
shared by the present analysis. According to Sauerland, (148a) has the underlying structure in (151), with the (phonetic) deletion indicated by strikethroughs.

(151) Die Jungen kauften [DP [QP je [NP Junge]] [zwei Bücher]].
the boys bought each boy two books

The present analysis of je(weils)-DPs in (148b) and Sauerland’s in (151) do not differ widely regarding their surface structure. However, the two analyses differ regarding the (non-) application of LF-movement. In Sauerland’s (2001) analysis, the QP raises out of its embedding DP at LF. In contrast, the present analysis of adnominal je(weils)-DPs does not assume LF-movement of the quantified phrase at all. In chapter IV, it will be shown that je(weils)-DPs are interpretable in situ, making LF-movement for interpretive reasons superfluous. Section 4.3 presents more evidence to the effect that the assumption of LF-movement of je or jeweils is not only unnecessary, but even detrimental to the analysis of these constructions.

There is a second argument against Sauerland’s analysis, which arises in connection with the assumption that the NP-complement of the quantifier je is a silent copy of the DistKey. Recall from chapter II.1.8 that adnominal jeweils is able to distribute over a plurality of events, e.g. over the denotation of two conjoined verbs. (152) shows that the same is possible with je.

(152) Peter hat Maria aus jei zwei Gründen [kritisirt und gelobt].
Peter has Maria for each two reasons criticised and praised
‘P has criticised and praised Mary for two reasons respectively.’

In (152), the plurality of events over which je distributes is not expressed by an NP, but by two conjoined transitive verbs. It is not clear to me how the NP-complement of the je could be a silent copy of the two conjoined verbs, neither syntactically nor semantically. The present treatment of je(weils)-DPs does not encounter this problem. Je always takes an overt or covert NP-proform as complement. This complement receives its value through co-indexation with a plural antecedent. Since the NP-proform is not restricted to range over sets of individuals, it can also refer to the set of events denoted by the conjoined Vs.

The structure of je-constructions in (148bc) is maximally abstract in that it involves not only an empty D-head and an empty P-head, but also a covert proform. The only lexical elements are the quantifier je, and the DistShareNP. Since je has no overt complement that could be case-marked, P must be licensed by incorporation of the lexical head je. This incorporation is followed by movement of the entire postnominal PP to SpecDP on the assumption that the constituent je-∅ inherits the topic status from the DistKey expression, as was the case with jeweils. Since je is a syntactic Q-head, it would also be possible that it moves into prenominal surface position by successive head-movement from Q to P, and from P to D. The resulting structure of the je(weils)DP would be as in (153).76

76 Note that the P-to-D movement indicated in (153) involves extraction of the P-head out of an adjunct. Such extraction should be blocked since adjuncts form islands for extraction (see Huang 1982). Baker (1988) and den Dikken (1992:11-13) allow for incorporation of the heads of selected or lexically governed constituents into their lexical governors. This qualification allows for incorporation of the heads of ECM-subjects and lexically selected adjuncts. It is doubtful if the right-adjointed PP in (153) is lexically governed by the empty D-head. Given this, (153) should not be well-formed. The difficulty can be overcome by adopting the SC-analysis from section 3.6, which does not assume right-adjunction. On the SC-analysis, the P-head can move successively to D
Successive head-movement of *je* as in (153) licenses all empty heads and derives the correct word order. Nonetheless, I do not assume that successive head-movement takes place in German. For once, the assumption of successive head-movement makes a unified treatment of *jeweils* and *je* impossible. Second, the discussion of ILCs, *je*-NP-constructions and *jeweils*-DPs has shown that empty D0 is licensed in all these constructions without the assumption of overt movement to D. In particular, D0 in object position is licensed under lexical government by the verb (see also the discussion in chapter I.2.4.3). Third, if Q to P to D-movement took place one might expect to find overt grammatical reflexes of such movement given that the affected D3-head is the locus of the DP’s D-features.

In section 5.1.1, I will suggest that successive head-movement from Q to P to D takes place in Slavic languages like Polish and Czech, where the d-distributive constructions exhibit a preposition *po*. Movement of P to D3 is reflected by a change in the case and agreement properties of the d-distributive DP. E.g., the DP carries oblique case (presumably assigned by P) instead of the expected structural case. Such a change in grammatical properties is accounted for if the preposition has raised overtly to D3, contributing to the complex head’s feature content. Since no such effects are attested for German *je*-DPs, I conclude that Q-to-P-to-D movement does not take place. It follows that *je* reaches its DP-initial position by way of topic movement, same as its long form *jeweils*.

In conclusion, I have argued that the short form *je* has the same syntactic distribution as adnominal *jeweils* because it has the same underlying structure modulo its NP-proform being covert. The analysis in terms of a covert proform accounts for the fact that *je* can distribute over non-DP denotations as well. This concludes the discussion of the short form *je*.

### 4.2.7 Summary

The section has shown that German *jeweils*-DPs can be analysed as special instances of ILCs and *je*-NP-constructions. Adnominal *jeweils* is analysed as being of categorial status PP, its empty P-head being licensed by overt genitive case in its complement. The restriction of the universal quantifier *je*-, -weils-, is analysed as an NP-proform that is co-indexed with the DistKey and which is derived from the full NP *Weile* by a process of grammaticalisation. The normal DP-initial position of adnominal *jeweils* is attributed to the application of overt DP-internal movement that is driven by discourse requirements. Finally, the analysis of adnominal *jeweils* was applied to its short form *je*.

### 4.3 Against LF-Movement

The preceding discussion has shown that *je* and *jeweils* can be syntactically analysed as quantifiers that take an overt or covert NP-proform as complement. Chapter IV will show how these structures are interpreted. The upshot of the discussion will be that d-distributive constructions can be interpreted in situ, obviating the need for LF movement through the head of the small clause. It is shown in the main text below that there are independent arguments against P-to-D movement of German *je*. Therefore, the right-adjunction analysis can be maintained for German.

The parallel analysis of *je*–∅ and adnominal *jeweils* raises the question of which form developed first. Based on the observation that *je* is attested much earlier (>9th century) as an independent form than *jeweils* (>17th century), one could speculate that *je* has acquired an additional (d-distributive) use, which - over time - has been marked overtly by -weils. Against this view speaks the fact that *je* does not seem to have had the d-distributive use before the emergence of *jeweils*, even though *je* was attested in *je*-NP-constructions before the emergence of *jeweils*. This suggests that the actual development was *je* >> *je*-NP construction >> *jeweils* >> *je*-∅.
for semantic reasons. Nevertheless, some analyses of d-distributive constructions assume LF-movement. Safir & Stowell (1988) argue that the covert proform that forms the complement of each is a syntactic anaphor. In order for the anaphor to be licensed in a local configuration with the antecedent, the entire QP must raise at LF (see chapter II.5.3). Sauerland (2001) argues that the QP consisting of je and the deleted NP-complement leaves the embedding DP at LF because it must take scope over the latter.

In this section, I present three arguments that show that jet(jeweils) does not move at LF. The argument is the same in each case. It will be shown that jeweils occurs in a number of configurations in which an island or a barrier for movement intervenes between jeweils and its proposed landing site. The mere possibility of jeweils in these constructions shows that it does not move at LF. Insistence on LF-movement of jeweils, on the other hand, would result in the relaxation of a number of well-established restrictions on syntactic movement. Since it will be shown in chapter IV that jeweils can be interpreted in situ, such a relaxation is unnecessary.

In section 4.3.1, I show that negative operators, which form a barrier for LF-movement of quantificational elements in German (cf. Beck 1996), can intervene between jeweils and the DistKey. In 4.3.2, I show that jeweils occurs in coordinate structures, which are also a barrier for movement (Ross 1967). In 4.3.3, I show that jeweils can occur inside adjuncts, which also constitute islands for movement (Huang 1982). The data presented argue – in my view – convincingly that jeweils does not move at LF. In section 4.3.4, I show that English each occurs inside syntactic islands as well. Applying the reasoning concerning jeweils to each, I conclude that English d-distributive each does not move at LF either. This result is important, because section 5 will take up the point that d-distributive each has certain anaphoric properties from chapter II.5. The arguments produced in this section show that whichever way the anaphoric properties are satisfied syntactically, it is not by means of LF-movement.

### 4.3.1 Jeweils and Negative Operators

The first argument against LF-movement of jeweils is an argument against long LF movement into the vicinity of the DistKey. The argument is built on the status of negative operators as barriers for LF-movement in German. The blocking effect of negative operators on LF-movement is discussed in Beck (1996), and – following her – in Pesetsky (2000). It is illustrated in (154) and (155).

\[
\begin{align*}
(154) & \text{a. } \{\text{Wen alles}\} & \text{hat niemand } t_1 \text{ gesehen?} \\
& \text{Who all has nobody seen} \\
& \text{b. } \text{Wen}_1 \text{ hat Peter } t_1 \text{ alles gesehen?} \\
& \text{who has Peter all seen} \\
& \text{c. } \ast \text{Wen}_1 \text{ hat niemand } t_1 \text{ alles gesehen?} \\
& \text{who has nobody all seen} \\
\end{align*}
\]

\[
\begin{align*}
(155) & \text{a. } \{\text{Wen von den Musikern}\} & \text{hat niemand } t_1 \text{ gesehen?} \\
& \text{Who of the musicians has nobody seen} \\
& \text{b. } \text{Wen}_1 \text{ hat Peter } t_1 \text{ von den Musikern gesehen?} \\
& \text{who has Peter of the musicians seen} \\
& \text{c. } \ast \text{Wen}_1 \text{ hat niemand } t_1 \text{ von den Musikern gesehen?} \\
& \text{who has nobody of the musicians seen}
\end{align*}
\]
(154) is an exhaustive question formed by means of a question word *wen* `whoACC` and an exhaustivity marker *alles* `all`. The question asks for a full list of all individuals that nobody saw as an answer. Beck (1996) shows that both elements must occur together at LF for semantic reasons. In (154a), the semantic requirement is guaranteed at surface structure already. (154b) shows that the question word can move alone at surface structure, leaving the exhaustivity marker *alles* behind. Since both elements must occur together at LF, one is forced to assume that *alles* moves to the question word at LF. The interesting case is (154c). (154c) is structurally parallel to (154b), the only difference being that the negative operator *niemand* `nobody` intervenes between question word and exhaustivity marker. But (154c) is ungrammatical, presumably because of the intervening negative operator.

(155) shows that the same facts hold for partitive questions, which ask for elements out of a previously mentioned set denoted by the *von*-PP. The requirement that the two elements must occur together at LF is satisfied by (155a) at surface structure, and by (155b) at LF. (155b) shows that the question word can occur alone in sentence-initial position as long as the *von*-PP can raise at LF. This movement is blocked by the intervening negative operator *niemand* in (155c). Beck (1996:12) concludes on the base of such data that intervening negation blocks LF-movement in German, leading to the constraint in (156) (Beck’s ex.26).

\( (156) *[X_{k\ldots} \text{[Neg \{[\ldots_{k}^{\text{LF}} \ldots]\}]} \ldots] \)

The constraint in (156) is relevant to the analysis of adnominal *jeweils* for the following reason. Looking at sentences containing *jeweils* or *je*, we find that these are grammatical even if the negation operator *niemand* `nobody` intervenes between the d-distributive element and the DistKey. (157a) is an example without, and (157b) an example with intervening negative operator.

(157) a. Den Jungen, hat gerade Peter jeweils, zwei Würstchen bestellt.
   the boysACC has just Peter each two sausages ordered
   ‘Peter has just ordered the boys two sausages each.’

b. Den Jungen, hat gerade niemand jeweils, zwei Würstchen bestellt.
   the boysACC has just nobody each two sausages ordered

If *jeweils* were to move to DistKey at LF in (157b), such movement would result in a configuration excluded by (156).

\( (158) *[\text{Den Jungen, jeweils, hat gerade [niemand, NEG [t, zwei Würstchen] bestellt]]} \)

The grammaticality of (157b) shows, then, that *jeweils* does not move to its DistKey at LF in declarative clauses.  

---

78 The qualification ‘in declarative clauses’ is necessary, for Beck (1996) assumes that the question in (i) involves LF-movement of *jeweils* to CP-adjointed position for semantic reasons.

(i) Was hat Karl Uli und Susanne jeweils geschenkt?
   What has Karl Uli and Susanne each(time) given
   ‘For each x of Uli and Susanne: what did Karl give to x?’ (adnominal reading)
   ‘For each occasion: what did Karl give to Uli and Susanne on that occasion?’ (adverbial reading)

Strictly speaking, Beck (1996) only shows the validity of (156) for interrogative clauses, even though she speculates on its validity for German declarative clauses. For this reason, the grammaticality of (157b) is not per
4.3.2 **Jeweils in Coordinate Structures**

The second argument against LF-movement of *jeweils* is based on the fact that *jeweils* can occur inside coordinate structures. This is shown in (159).79

(159) Die siegreichen Jungen erhielten [DP[den Pokal] und [jeweils die Medaille]].

   the victorious boys got the cup and each one medal
   ‘The victorious boys got the cup and one medal each.’

Extraction of *jeweils* from the DP would incur a violation of Ross’ (1967) ‘Coordinate Structure Constraint (CSC)’, which bans extraction out of coordinate structures. The effects of the CSC are shown for overt extraction in German in (160a). (160b) shows the working of the CSC for LF-movement in English (which has scope-driven QR).

(160) a. *Was haben die Jungen [einen Pokal] und (für eine Medaille) bekommen?

   what have the boys a cup and for a medal got
   ‘What did the boys get a cup and a medal?’

b. Someone loves [[Mary] and [every teacher]].
   *For every teacher, there is someone different who loves her and Mary.’

The comparison between the grammatical (159) and the ungrammatical (160ab) shows that *jeweils* does not leave the DP at LF.

4.3.3 **Jeweils Inside Adjuncts**

The last argument against LF-movement is based on the ability of *jeweils* to occur inside adjuncts. An example is given in (161).


   the boys have in each two shops books bought
   ‘The boys have bought books in two shops each.’

Adjuncts are generally considered syntactic islands for extraction (cf. Huang 1982). (162a) shows that overt extraction from adjunct-PPs is impossible in German. Instead, the entire PP must be pied-piped (162b).

(162) a. *Von wem haben die Jungen [in zwei Läden (von wem)] eingekauft?

   of whom have the boys in two stores shopped
   b. [In zwei Läden (von wem)] haben die Jungen gekauft?

   in two stores of whom have the boys shopped
   ‘In whose two stores did the boys shop?’

The fact that *jeweils* occurs inside adjunct islands shows that it does not move at LF.

---

79 This test against LF-movement of *jeweils* is inspired by Petrova (2000), who uses the same argument in order to show that Bulgarian *po* does not move at LF.
4.3.4 Against LF-Movement of Binominal \textit{Each}

The previous sections have adduced evidence to the effect that the German d-distributive element \textit{jeweils} does not move at LF. A closer look reveals that some of the empirical arguments extend to English \textit{each}. In particular, \textit{each} can occur inside coordinate structures (163a), and inside adjuncts (163b) (see also chapter II.5.3).

(163) a. Two boys, got the cup and one medal each,
    b. The men, cut the salami with one knife each. (Safir & Stowell 1988: 447)

The choice of a numeral DistKey antecedent in (163a) excludes the possibility that the subject and the verb are simply deleted in the second conjunct, as in (164). In (164), \textit{each} need not extract from a coordinate structure in order to get into a local configuration with its antecedent.

(164) Two boys, got the cup and \textbf{two boys} got one medal each.

(164) differs in meaning from (163a), though. It allows for situations in which two boys got the cup, and two other boys got one medal each. This reading is not available for (163a), arguing that \textit{each} really occurs inside a coordinate structure.

Given the island status of coordinate structures and adjuncts, one is led to the conclusion that d-distributive \textit{each} moves as little at LF as does its German counterpart \textit{jeweils}. In light of this, there must be some other explanation for the facts presented by Safir & Stowell (1988), which showed that English \textit{each} is banned from some syntactic islands. These were the underlying subject positions of main clauses (165a) and of small clauses (165b).

(165) a. *[One man each] accompanied the ballerinas home.
    b. *We painted [two houses each] red.

The ungrammaticality of (165ab) raises the question of why d-distributive \textit{each} is absent from (underlying) subject position in English, whereas German \textit{jeweils} can occur in this position.

In section 5, I turn to these questions in detail. There, the first steps towards a cross-linguistic characterisation of d-distributive elements are undertaken. This enterprise will accompany us throughout chapters IV and V because the explanation for the (non-) occurrence of a d-distributive element in subject position in a given language will be shown to be partly syntactic and partly semantic in nature. By way of example, the ungrammaticality of (165a) will be attributed to syntactic reasons in section 5, while the ungrammaticality of (165b) will be shown to follow from a combination of syntactic and semantic reasons in IV.6. The picture to emerge is much more complex than a one-dimensional explanation in terms of (non-) extraction, but so are the facts.

4.4 The Syntax of other \textit{s-}Expressions

The analysis of adnominal \textit{jeweils} has shown that it forms part of a postnominal PP-modifier, which moves to DP-initial position overtly. In chapter II.3, it was shown that there are a number of other expressions that share certain morphological (shape), semantic (ambiguity) and syntactic (cross-categorial occurrence) features with \textit{jeweils}. All these expressions were lumped under the cover term ‘s-expression’. The overall similarity in properties exhibited by the other s-expressions and \textit{jeweils} seems to warrant an extension
of the syntactic analysis of *jeweils* to the former. In this section, I show this for *wenigstens* ‘at least’, assuming that the same holds for *mindestens* ‘at least’ and *höchstens* ‘at most’.

To begin with, the overt genitive marking on *wenigstens* argues for its categorial status as a PP, with an empty P-head licensed by case marking.

(166) \[ PP \quad P^0 \quad [QP \quad \text{wenigsten}] \quad - \quad \text{GEN} \]

(166) is the underlying structure for both adverbial and adnominal *wenigstens*. The PP-status is backed up by diachronic evidence that shows that *wenigstens* derives from the overt PP *zum wenigsten* ‘to the least’ historically (Gebrüder Grimm 1960:46-48). The underlying PP-status of *wenigstens* fits in nicely with the fact that the cognates of *wenigstens* are expressed as overt PPs in English, the Romance languages, and – optionally - in Dutch.80 Examples are provided in (167).

(167) a. at least b. au moins [French] c. op z’n minst [Dutch] to least on its least

The PP-status of all these elements can be taken as evidence in favour of a cross-linguistic analysis along the lines proposed here.

(169) show the underlying and surface structure of the *wenigstens*-DP in (168).

(168) Peter hat \[ DP \quad \text{wenigstens] zwei Bücher} \quad \text{gelesen.} \]

‘Peter read at least two books.’

(169) a.

```
DP               
   D'             
   D0            
   NP            
   AP zwei       
   NP Bücher     
   PP wenigsten s
   P0             
   AP leit       
   NP O-s        
```

b.

```
DP               
   D'             
   D0            
   PP wenigsten-s
   NP t1         
   AP zwei       
   NP Bücher     
```

Dutch also has the alternative genitive forms *minstens* ‘at least’, and *hoogstens* ‘at most’.

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80 Dutch also has the alternative genitive forms *minstens* ‘at least’, and *hoogstens* ‘at most’.
The structures in (169ab) differ from that of jeweils-DPs in two ways: (i.) the empty head P does not take a QP, but a modified NP as complement; (ii.) the head noun of the complement NP is covert. The analysis of wenigstens resembles that of je in this respect. As argued above, the empty P-head is licensed by overt case marking in the complement, as in the jeweils-case. The postnominal base-position of the wenigstens-PP in (169a) is supported by the optional occurrence of wenigstens in postnominal position (cf.170).81

(170) Peter hat mit [ZWEI Freunden wenigstens] geredet.
Peter has with two friends at least talked
‘Peter has talked to TWO friends at least.’

Since the numeral expression is embedded inside a PP (headed by mit ‘with’) in (170), the word order numeral NP >> wenigstens cannot be the result of scrambling of the numeral NP from out of the wenigstens-DP. The stress on the DP-initial numeral in (170) indicates that the postnominal occurrence of wenigstens is the marked case, and that its staying behind is motivated by discourse factors. In this case, the numeral is interpreted contrastively against other numbers of friends. From this, we can conjecture that the default movement of wenigstens to DP-initial position is conditioned by discourse, or information structure factors as well. Unlike with jeweils, which was argued to move because of its topic status, I would like to suggest that movement of wenigstens is triggered by its status as a focus particle, which – in the unmarked case – selects its focus domain to the right. In other words, default movement of wenigstens to the left takes place because the focused numeral NP has to be to the right of wenigstens at surface structure. This shows that DP-internal fronting of s-expressions can be triggered by different factors, as long as the movement takes place in order to satisfy discourse or information structure requirements.

A word of warning is in order here. From the fact that the different s-expressions share an underlying syntactic structure, it does not follow that they must be alike in all respects. The different s-expressions have different semantic properties, and this fact has repercussions for their syntactic behaviour. For instance, the quantified expression jeweils can combine with fewer expressions (predicate-denoting expressions) than the focus marker wenigstens because of their different semantic nature. In addition, different s-expressions seem to have different possible landing sites at their disposal. Wenigstens does not have to move as far as SpecDP, as witnessed by its occurrence below the definite determiner in (171).

(171) [Die wenigstens 500 Demonstranten] marschierten zum Rathaus.
the at least 500 protesters marched to the townhall

Wenigstens in (171) could be adjoined to NP, or it could be in the specifier position of an intermediate functional projection FP, which has been proposed by den Dikken (1998) for the so-called N-of-a-N-construction.82

---

81 The paraphrase shows that the same word order variation is possible for English at least. This suggests that English at least can be analysed along the same lines.

82 Marginally, such an intermediate landing site seems possible for jeweils as well. Consider (i):

(i) Die Kinder mit [ihren jeweils zwei Spielzeugen].
the children with their each two toys
‘The children with their two respective toys.’

Assuming that the possessive pronoun is located in SpecDP or D, jeweils must be located below DP.
The analysis of *wenigstens* in (169) differs from analyses that treat *wenigstens* as a modifier of the numeral alone (cf. Link 1987). In (169), *wenigstens* modifies the entire numeral NP. A similar treatment of English *at least* as being adjoined to the numeral NP instead of the numeral alone is found in Krifka (1999). Krifka shows that the focus markers *at least* or *wenigstens* can be interpreted correctly in this syntactic position. This gives additional semantic backing to the analysis proposed in (169). I conclude that the analysis of *jeweils*-DPs is applicable to other *s*-expressions, leaving open the details of this proposal for further research.

### 4.5 Summary

The chief result of the discussion of *jeweils*-DPs is that adnominal *jeweils* can be analysed as a regular generalised quantifier. *Jeweils*-DPs have the same structure as ILCs (on the “inverse” reading) and *je*NP-constructions. That is, *jeweils*-DPs contain more covert structure than what appears at first sight. The d-distributive element *jeweils* forms a postnominal PP with an empty prepositional head *P₀*, a universal quantifier *je*, and a pronominal NP-complement. The NP-proform provides the restriction for the universal quantifier, and must be co-indexed with a plural expression. This accounts for the fact that adnominal *jeweils* usually has a clausemate DistKey expression (but see chapter V!). The DP-initial position of *jeweils* is due to a general syntactic property of German. In German, topics must be located in DP-initial position. Another important result is that adnominal *jeweils* does not move at LF. Finally, it was shown that the analysis for *jeweils* might be applicable to other *s*-expressions in German and their counterparts in other languages, pending further investigation.

With this, the first two objectives of this chapter have been achieved. First, I have given a detailed syntactic analysis of both adverbial and adnominal *jeweils*. Second, the phenomenon of d-distributivity was reduced to an instance of regular quantification. It was shown that d-distributive elements can be analysed as regular quantifiers, given the correct syntactic analysis. In the following section, we turn to the last objective of chapter III, the investigation of d-distributivity from a cross-linguistic perspective.

### 5 The Cross-Linguistic Perspective

The objective of this section is to apply the analysis of *jeweils*-DPs to d-distributive DPs in other languages and account for observable cross-linguistic differences in the expression of d-distributivity (see chapter II.4 for an introductory discussion). The main claims of this section are the following: First, the syntactic analysis of *jeweils*-DPs applies to d-distributive constructions in other languages in a straightforward manner. Second, d-distributivity does not exist as an independent phenomenon in the other languages under investigation, as little as it does in German. Third, the observed variation between languages regarding the expression of d-distributivity can be accounted for in a principled way on the base of (i.) general syntactic properties of the languages in question, and (ii.) the grammatical feature content of the respective d-distributive elements, which is reflected in their morphological form.

In 5.1, the analysis of *jeweils*-DPs is applied to the other languages under discussion in chapter II.4. In 5.2, the main cross-linguistic differences between d-distributive constructions are recapitulated. Section 5.3 explains the differences in relative word order of DD and DistShare. Section 5.4 points out an interesting difference in syntactic feature content between DDs of different languages. The difference in feature content is almost
always encoded morphologically and will be shown to account for differences in the range of possible DistKey expressions, as well as for differences in the syntactic distribution of DDs across languages. The overall result of section 5.4 is that some DDs are restricted in their syntactic distribution because they contain syntactic (D-)features that must be licensed by the DistKey expression under c-command. The section concludes with the discussion of two open problems in 5.5. These problems turn out not to be solvable in purely syntactic terms, and the solution of them is consequently postponed to chapters IV and V.

5.1 Applying the Analysis Cross-Linguistically
In this section, the analysis of jeweils-DPs is applied to the respective d-distributive constructions in the languages under discussion in chapter II.4. These are English and Dutch from the West Germanic language family, Italian, French (and Romanian) from the Romance language family, Icelandic and Norwegian from Scandinavian, Russian, Czech, and Bulgarian from Slavic, and finally the two East Asian languages Korean and Japanese from the Altaic language family. The restricted sample of languages (most of them from Indoeuropean languages) should make it clear that this section does not aim at a full-blown typology of d-distributivity. Nonetheless, the observed patterns seem to hold quite generally, for Indoeuropean languages at least. Therefore, the analysis presented here may very well form the basis for a more elaborate and more inclusive typology of d-distributivity.

The movement analysis of jeweils-DPs, which assumes jeweils to be base-generated in postnominal position, allows for a unified analysis of languages with pre- and postnominal d-distributive elements. On this view, the structure in (172) (cf. 116) is the underlying structure for d-distributive constructions in all the languages under discussion.

(172) The Underlying Structure of D-Distributive Constructions Across Languages:

Taking (172) as the cross-linguistically underlying structure implies that d-distributive DPs are syntactically complex cross-linguistically. (172) provides the abstract syntactic skeleton over which the overt lexical material is distributed. Apart from the fact that all languages express the DistShare overtly, languages fall into several classes depending on which parts of the postnominal PP in (172) are filled overtly, and which ones are not. The following patterns can be observed (The reader is invited to consult chapter II.4 for illustrative examples).
The West Germanic languages Dutch and English express only the quantifier overtly. Both the preposition and the NP-proform are covert. The same holds for the Scandinavian languages Norwegian and Icelandic on their regular pattern without a pronoun (cf. chapter II.4.1, in particular fn. 23 and 24).

(173) \[ \text{West Germanic, Scandinavian} \]
\[ \text{a. } [\text{PP } P^0 [\text{QP elk } [\text{NP } \emptyset]]] \text{ (Dutch)} \]
\[ \text{b. } [\text{PP } P^0 [\text{QP each } [\text{NP } \emptyset]]] \text{ (English)} \]
\[ \text{c. } [\text{PP } P^0 [\text{QP hver } [\text{NP } \emptyset]]] \text{ (Norwegian, Icelandic)} \]

The pattern in (173) matches that of the German \textit{je}-construction in section 4.2.6 in terms of the lexical poverty of the construction.

The Romance languages French and Italian are a little richer in lexical content. They express both the quantifier and the NP-proform overtly, but they do not feature an overt preposition (nor any evidence for it, e.g. in form of case-marking).

(174) \[ \text{Italian, French (Romance)} \]
\[ \text{a. } [\text{PP } P^0 [\text{QP cias- } [\text{NP uno/una}]]] \text{ (Italian)} \]
\[ \text{b. } [\text{PP } P^0 [\text{QP chac- } [\text{NP un/une}]]] \text{ (French)} \]

Following Junker (1995:33), I assume that the proform \textit{un/une} incorporates into the quantifier head \textit{chac-} in French, thus forming a complex syntactic head at surface structure. I assume the same for Italian \textit{ciasuno/a}.

Russian resembles German in that it expresses both the quantifier and (optionally) the prepositional head overtly (175a). The other Slavic languages, Czech, Bulgarian, Polish, only express the preposition \textit{po} overtly (175b). The pattern in (175b) seems to match that of the English \textit{per}- and the German \textit{pro}-construction, on the assumption that \textit{per} and \textit{pro} are indeed prepositions (see section 4.1.1 for discussion).

(175) \[ \text{a. } \text{Russian} \]
\[ [\text{PP po } [\text{QP kazhdyi } [\text{NP } \emptyset]]] \]
\[ \text{b. } \text{Czech, Bulgarian, Polish} \]
\[ [\text{PP po } [\text{QP Q0 } [\text{NP } \emptyset]]] \]

The prepositional status of \textit{po} was supported independently in chapter II.4.2.2. The relevant example from Russian is repeated as (176).

(176) \[ \text{On shel po doroge. } \text{[Russian]} \]
\[ \text{he went on/along road } \]
\[ \text{‘He was going along the road.’} \]

Korean –\textit{ssik}- is called a particle in traditional grammars of Korean, and this is what it was called in chapter II.4.2.2. According to Martin (1992:192), Korean particles can be treated as postpositions (often with the semantics of prepositions in Western languages). If so, an analysis along the lines of the Slavic pattern (175b) seems feasible. Since Korean is left-
branching (Comrie 1987:895), the word order should be the mirror image of that found in (175b). 83

Regarding Japanese sorezore, it was pointed out in chapter II.4.2.2 that this element is DP-like in that it can be case-marked. Also recall from II.4. that Japanese presented us with a problem because it is the only language in which d-distributive element and regular distributive D-quantifier differ in form, but still sorezore is unable to distribute over non-DP denotations, or to occur with underlying subjects. In section 5.4.4, I propose a solution to this problem that rests on the assumption that sorezore contains D-features after all. If so, it should be a DP headed by a quantifier. Postponing further discussion until then, I assume the structure in (177) for Japanese.

(177) Japanese

\[
[PP [QP sorezore] P^0]
\]

This brief survey of the structure of d-distributive constructions in other languages is summarised in table 4, showing where languages differ and where they behave alike.

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Q</th>
<th>NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. German</td>
<td>+ (case marking)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>ii. French, Italian, Japanese</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>iii. Russian</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>iv. not attested</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>v. Dutch, English, Icelandic Norwegian</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>vi. Bulgarian, Polish, Czech, Korean</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>vii.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>viii.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4 shows that German is the only language that provides overt evidence for all syntactic positions in (172) (except for the D-head, that is). The Romance languages Italian and French, and possibly Japanese, fill two positions lexically, namely Q and NP. The same holds for Russian, which fills P and Q overtly. English, Dutch, Norwegian and Icelandic fill only one of the functional projections, namely Q. The same holds for the Slavic languages Bulgarian, Polish, and Czech, which express P overtly.

All attested patterns have in common that at least one of the functional heads is filled lexically, suggesting that this is a universal requirement (triggered by the need to be interpretable). 84 If this reasoning is correct, the structures in rows (vii) and (viii) are.

83 A potential problem arises from the fact that, Korean being a left-branching language, nominal modifiers (demonstratives, genitives, adjectives, relative clauses) usually precede the head noun (Comrie 1987:895). If so, the postnominal position of –ssik- will be unaccounted for if –ssik- forms part of a modifying PP, as argued in the text. See also fn.98.

84 Notice that this generalisation is based on a treatment of prepositions as functional elements. See Abney (1987:67), who points out the mixed character of prepositions between functional and content elements.
THE SYNTAX OF DISTANCE-DISTRIBUTIVITY

excluded on principled grounds for they either express no lexical material at all (i.e., they are formally identical to numeral DPs) (cf.viii), or they contain no functional element, violating interpretability (cf.vii). In contrast, the structure in row (iv) satisfies the requirement that at least one functional head must be filled overtly. It should therefore be a possible structure for d-distributive constructions. I leave it open whether the pattern is attested cross-linguistically.

Summing up, the foregoing discussion has shown that the structure in (172) is flexible enough to accommodate d-distributive constructions in other languages. All plausible combinations but one of the three elements P, Q, and NP(-proform) are attested. In 5.1.2, I take up the question whether or not all the functional heads in (172) are universally projected.

5.1.1 Licensing the Empty Heads

In all languages discussed above, the structure of d-distributive constructions is abstract to some degree, involving one or two empty elements. Therefore, it needs to be checked if all these empty elements are properly licensed.

German is the only language that licenses the empty P-head by overt case marking. It follows that all other languages must resort to head movement and lexical government in order to license the empty heads in their respective structures (see chapter I.2.4.3 and III.4.1.2).

In English and Dutch, the D-quantifiers each and elk license the empty complement NP through lexical government. The empty P-head is licensed by incorporation of Q into P.85 In Romance, the empty P-head is licensed by incorporation of the complex head [Q+N], which is the result of N-to-Q incorporation (see the remark below (174)).

Setting Korean and Japanese aside, this leaves us with the Slavic languages Bulgarian, Czech, and Polish. If their structure is as in (172), the empty elements N and Q must be licensed by incorporation into the preposition po, forming a complex head [po+Q+N]. The formation of a complex head containing (at least) an overt P and a covert Q-head is reminiscent of the analysis of per and pro from section 4.1.1. Incorporation of Q into P directly accounts for the seemingly quantifying nature of the preposition po in d-distributive constructions, without assigning any quantificational content to the preposition itself.86

Looking at the data from Slavic (including Russian) again, we see that the preposition po always occurs before the DistShare. This is shown again for Bulgarian.

(178) a. John i Mary kupicha po edna tetradka.
    John and Mary bought PREP one notebook

---

85 According to den Dikken (1992:57), incorporation of a lexical element into a non-lexical element will turn the latter into an L-marker. This way, lexical government of the empty NP-proform is guaranteed before and after Q-to-P movement in English or Dutch.

86 The presence of ‘quantificational’ po in other contexts poses an apparent difficulty for the proposed analysis of po as a conglomerate of P and Q: Carlson & Filip (2001) for Czech, and Pinon (2000) for Polish show that the aspectual marker po, which is syntactically realised as a suffix on the verb, also has (universal) quantificational content. I see two options. Either, we maintain the incorporation analysis for po, and analyse aspectual po not as a suffix to the verb, but say to VP (and assume that some aspectual head with aspectual/quantificational force incorporates into po). Or, we assume that prepositions in Slavic languages (which mostly provide no evidence for a syntactic DP-level anyway) can have inherent quantificational content. In the latter case, there is no need to assume two (functional) head positions (P and Q) in the structure of d-distributive constructions. A single P/Q-position would be sufficient. This in turn has repercussions for the question of universality, discussed in 5.1.2.
b. *John i Mary kupicha edna tetradka po.
   John and Mary bought one notebook PREP

On the analysis presented here, it follows that po has moved overtly across the DistShare, setting Slavic apart from the other languages under discussion. We have encountered a similar situation with the German short form je in section 4.2.6. As opposed to there, I would like to argue that Slavic po gets into DP-internal position in (178a) by head movement of the complex head \([po+Q+N]\) to D⁰.

Evidence for overt P-to-D movement comes from the fact that the presence of d-distributive po has an effect on the case and agreement properties of the embedding po-DP. In Polish and Czech (and in restricted form also in Russian), po-DPs in argument position do not show the expected structural case. Instead, they are marked with oblique case, which is presumably assigned by the preposition po. The case difference is illustrated for Polish in (179).

(179) Mama kupiła swoim dzieciom balon / po balonie. [Polish]
   'Mother bought her children a balloon / one balloon each.' (Choe 1987:67)

In Czech, po-DPs in object position are marked for locative (oblique) case. In subject position, they do not only carry oblique case, they also disagree with the main verb. A plural po-subject can only occur with a verb in 3rd singular:

(180) Po třech ženách vstupovalo do místnosti.
   'Each three LOC women-LOCpl entered into room.'
   (Choe 1987:67)

The occurrence of oblique case and the subject-verb disagreement in number in (179) and (180) signal that the presence of po effects a change of features in D⁰. The change follows naturally on the assumption that po has overtly incorporated into D⁰, overruling the latter’s feature content at least in part. In particular, the case properties of po seem to block the assignment (checking) of structural case to D. If these assumptions are on the right track, Slavic d-distributive constructions provide overt evidence for P-to-D incorporation whatever the motivation for such movement.⁸⁷ Note that this conclusion ties in with Petrova’s (2000) analysis of the preposition po as the determiner of po-DPs in Bulgarian. On the present account, the determiner-like properties of po are the result of its overt incorporation into D.

5.1.2 Universal Considerations

The limited cross-linguistic survey has shown that German and Russian are the only languages that provide overt evidence for the existence of two functional heads, P and Q. All other languages in the sample express only one of these heads overtly. Even though the covert heads have been shown to be licensed in principle in 5.1.1, the question arises whether the elaborate German structure should be taken as the universal structure for d-

⁸⁷ This means that the question if extraction of a head from adjuncts is possible is a relevant question for Slavic d-distributive constructions (see the discussion in fn. 76). If the answer is negative, this means that Slavic d-distributive DPs are best analysed in terms of an underlying SC structure, as presented in section 3.6. If all the languages under discussion have the same underlying structure for d-distributive DPs (as suggested by their similar properties), this means that German jeweils-DPs should be analysed as involving an SC-structure as well.
distributive constructions, or whether languages with fewer lexical elements should be analysed as containing only one functional projection, P or Q. Universal grammar considerations argue for assuming the full structure for all languages as long as the empty elements in them are properly licensed. On the other hand, reducing the number of empty heads reduces the number of head movement operations for licensing, making the syntactic derivation more economical. In addition, the absence of overt lexical material raises a learnability issue. How is a child to know that there is a PP in the d-distributive construction in English, Dutch, or Romance, if the prepositional head is never expressed overtly?

In response to the learnability problem, one can argue that the task for the English or French learning child is not as difficult as appears on first sight, as soon as the child identifies the entire d-distributive construction as a DP-constituent. In both English and French, postnominal constituents are either PPs or CPs (relative clauses), but never DPs. Examples from English are given in (181).

(181)  a. the walk in the garden  
    b. the man who is in the garden  
    c. *the man the garden ≠ the man in the garden

(182) shows that the postnominal d-distributive element in two mean each does not allow for reconstruction as a relative clause.

(182) *two men who are each

Since an analysis as a relative clause is out, and since postnominal DPs are not attested elsewhere, the child could deduce the PP-status for the postnominal d-distributive constituent by exclusion.

Pending a decisive answer to the above questions, I take the structure in (172) to be the uniform underlying structure of d-distributive constructions in all the languages under discussion, despite surface differences in their lexical realisation.

5.2 Cross-Linguistic Differences - Revisited

The following sections provide an explanation for the differences between d-distributive constructions across languages that were established in chapter II.4. The main claim of sections 5.3 and 5.4 is that two basic factors are responsible for the observed differences. The first factor is the (non-) application of overt DP-internal movement in a given language. This factor determines if the d-distributive element (DD) occurs before or after the DistShareNP. The second factor is the syntactic feature content of the DD, which is generally reflected in its morphological shape. This factor determines the other observable differences, and is the result of an apparently language-specific process of grammaticalisation, which may be arbitrary to a certain extent. I leave it open, if there is a

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88 I take postnominal adjectival constructions as in a man proud of his son, or a letter sent recently to be reduced relative clauses, i.e. CPs underlyingly.

89 In some cases, there may be some (indirect) evidence for the presence of more structure. Witness the English structure in (i.a), which involves an overt preposition. In French (ib), too, a preposition co-occurs with the quantifier chaque at least in some cases (admittedly not inside a DP).

(i) a. [Two boys at a time] were admitted into the room.  
    b. Peter a adulé et critiqué Marie pour deux raisons à chaque fois [French]  
    Peter has praised and criticised Mary for two reasons at each time
deeper reason behind the question which type of language grammaticalises which grammatical element as DD.

The discussion in chapter II.4 has identified four differences between d-distributive constructions in different languages, which are briefly illustrated with examples from German and English in (183). The four differences concerned

(183) a. the relative word order between DD and DistShare
   i. Die Jungen kauften jeweils zwei Bücher.
   ii. The boys bought two books each.

b. the form of the DD as (non-)identical to the D-quantifier
   i. jeweils ≠ jeder ‘every’
   ii. each = each

c. the (non-) obligatorily DP-status of the DistKey
   i. Peter lobte und kritisierte Maria aus jeweils zwei Gründen.
   ii. *Peter praised and criticised Maria for two reasons each.

d. the (non-) occurrence of the DD with underlying subjects
   i. Jeweils ein Offizier begleitete die Ballerinen.
   ii. *One officer each accompanied the ballerinas

In table 2 in II.4, it was shown that the languages in the sample exhibit a consistent behaviour regarding (183b-d). The only exception was Japanese, which will be dealt with separately in section 5.4.4. The general observation was that if a DD in a given language is formally identical to the distributive D-quantifier of that language, then it will not be able to take a non-DP as DistKey antecedent, and it will not be able to occur in subject position. Likewise, if a DD in a given language is formally different from the distributive D-quantifier of that language, then it will also take a non-DP as DistKey antecedent, and it will be able to occur in subject position. In II.4, it was suggested that the behaviour of a DD with respect to (183c) and (183d) is predictable on the base of its syntactic feature content, which in turn is reflected in its morphological form. DDs that are formally identical to the D-quantifier are analysed as containing D-features (which must be checked). DDs that differ in form from the D-quantifier are analysed as containing no D-features (and consequently there is no need to check any).90 This difference was captured in form of the parameter [+/- D-features]. The relative word order of DD and DistShare does not depend on the form of the DD. In II.4, this difference was captured in form of the parameter [+/- DP-internal movement].

The postulation of the two parameters predicts a cross-classification into four possible language types concerning the expression of d-distributivity. Table 5 shows that all four language-types are attested in the sample of languages under discussion.91

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90 The last claim will have to be qualified below in light of the Japanese facts. The Japanese DD sorezore differs formally from the D-quantifier, but will be shown to contain D-features nevertheless. See section 5.4.4 for arguments and discussion.

91 Notice that the value [+ DP-internal movement] is assigned to all languages that can front the DD to prenominal position. In II.4.2.1, it was shown that such movement is attested for German, Dutch, Italian, French, Russian, Japanese, and Romanian. The Slavic languages Polish and Bulgarian are the only languages where fronting of the DD is obligatory. This suggests that the DD (here: the preposition po) in these languages moves for a different reason than prenominal DDs in the other languages.
5.3 Differences in Word Order: DP-Internal (Topic) Fronting

In this section, the prenominal or postnominal occurrence of DDs (+/- DP-internal fronting) is derived from an independent grammatical property of the languages under discussion. I show that DDs can occur prenominally only in languages that (like German) exhibit overt DP-internal movement for discourse reasons. In contrast, DDs occur postnominally in languages that do not have overt DP-internal movement for discourse reasons.

In section 4.2.4, I have argued that the prenominal position of the German DD jeweils follows from its status as discourse topic plus a syntactic operation of topic-fronting, which applies in the clausal and in the nominal domain. The generalised rule of topic-fronting is repeated in (184).

(184) Topic Fronting:

A constituent moves overtly to DP-initial position if it is a topic.

Since the rule in (184) is sensitive to the relative notion of ‘topic’ (the element referring to the most prominent entity in the discourse), it leaves room for exceptions. It does not apply if some other element takes over the role of topic for whatever reason, and jeweils can stay behind. This accounts for the (restricted) ability of jeweils to occur in its postnominal base position.

It is tempting to extend this account of jeweils to the other languages in which DDs occur in prenominal position. The strongest hypothesis is that the DD can occur prenominally in those and only those languages which allow for DP-internal fronting of elements with a prominent discourse status, i.e. languages which have topic-fronting as in (184). As a first approximation, this cross-linguistic generalisation is captured in form of the biclausal ‘DD-fronting hypothesis’ in (185).

(185) The DD-fronting hypothesis (to be revised):

i. A d-distributive element can occur in prenominal position in a given language iff that language allows for DP-internal (topic) fronting.

ii. A d-distributive element must occur postnominally in a language iff that language does not allow for DP-internal (topic) fronting.

One could ask if there is a deeper connection between DP-internal topic-fronting, and topicalisation at the clausal level, but I will set this issue aside. Section 5.3.1 discusses the

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<td>I. Dutch, French, Italian, Russian, Japanese</td>
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<td>II. German, Bulgarian, Czech, Polish, Romanian,</td>
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prenominal occurrence of DDs. Section 5.3.2 discusses the postnominal occurrence of DDs.

5.3.1 DDs in Prenominal Position

The first part of the hypothesis in (185) accounts directly for the prenominal occurrence of DDs in French, Dutch, Russian, Romanian, and Japanese in (186a-f). On the unified analysis proposed in 5.1, the DD in prenominal position has moved there from postnominal base position.

(186) a. Les professeurs ont lu [chacun1 deux livres t1]. [French]
   the professors have read each two books
   (Tellier & Valois 1993:574, ex.1b)
   b. De jongens hebben [elk1 twee boeken t1] gelezen. [Dutch]
   the boys have each two books read
   ‘The boys have read two books each.’
   c. Mal’chiki kupili [kazhdyj1 (po) dve sosiski t1]. [Russian]
   boysnom bought each two sausages (Borik, p.c.)
   d. Doi oameni au cărat [cîte1 trei valize t1]. [Romanian]
   two men have carried each three suitcases
   ‘Two men have carried three suitcases each.’ (Gil 1982:19,ex1f)
   e. Otoko=ta-ti-ga [sorez ore huta=ri-no zyosei-o t1] aisi teiru] koto. [Japanese]
   men=pl -nom each two=cl-gen women-acc love-asp fact
   ‘The men love two women each.’ (Sakaguchi 1998:115,ex.1)

The examples in (187) – (196) below show that DP-internal fronting for discourse reasons is attested independently in all these languages. It therefore follows from (185i) that the DD-element in these languages can occur prenominally.

We begin with French. Drawing on Milner (1978), Tellier & Valois (1993) show that a postnominal constituent can move to the left edge of its embedding DP in French (cf.187b).

(187) a. J’ai lu tous les livres de Zola. (Tellier&Valois 1993:582, exs. 18ab)
   I-have read all the books by Zola
   b. J’ai lu, de Zola1, tous les livres.
   I-have read by Zola all the books
   ‘I have read all the books by ZOLA, (but not by somebody else).’

According to Milner (1978), the moved PP de Zola in (187b) is adjoined to the NP (in our terms the DP). I take the landing site of the PP to be SpecDP, leading to the structure in (188).^93

(188) [DP [PP de Zola]1 tous les [NP livres t1]]
   by Zola all the books

Since DP-internal movement for discourse reasons is possible in French, the DD chacun/e can also move to SpecDP, in accordance with (185i). The surface structure of prenominal chacun(e)-constructions is schematised in (189), which is structurally parallel to (188).

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^93 This analysis presupposes a treatment of tous les as a complex quantifier in D.
The structure in (189) agrees with that found in Tellier & Valois (1993:580), where prenominal *chacun(e)* is also located in SpecDP. The structural similarity is furthermore supported by extraction facts. Tellier & Valois (1993) show that extraction of the question word *combien* ‘how many’ out of the DP is possible only when *chacun(e)* and the PP in (187a) occur postnominally (cf.190ab). In contrast, it is blocked when prenominal *chacun(e)* or the PP are preposed (cf.191ab).

(190) a. *Combien* *les professeurs* *ont-ils* *lu* *[t1 de livres chacun]?
   how many the professors have-they read of books each
b. *Combien* *as-tu* *lu* *[t1 de livres de Zola]?
   how many have-you read of books by Zola
(191) a. *Combien* *les professeurs* *ont-ils* *lu* *[chacun t1 de livres t2]?
   how many the professors have-they read each of books
b. *Combien* *as-tu* *lu* *[de Zola t1 de livres t2]?
   how many have-you read by Zola of books

The parallelism between (190) and (191) follows directly if both *de Zola* and *chacun* have moved to SpecDP for discourse reasons in (191). Being in SpecDP, they block extraction of *combien* (see the discussion on extraction from *jeweils*-DPs in 4.2.5). I conclude that (185) holds for French, and that the DD *chacun(e)* moves to SpecDP for discourse reasons in French.

Corver (1999) shows that Dutch allows for overt fronting of postnominal PP-modifiers when the preposition is covert.93 Glossing over irrelevant details, Corver analyses the structure in (192a) as the result of DP-internal fronting of a postnominal constituent that is a predicate of the head noun. The structure after movement is shown in (192b), with XP standing for a DP-internal small clause.

(192) a. *éen minuut* *voorsprong* *headstart* ‘a headstart of one minute’
   one minute headstart
b. *[[éen minuut]1 *voorsprong X0 t1] *
   *van* ‘of’
   one minute headstart
(192ab) show that Dutch has DP-internal fronting (for more instances of DP-internal fronting see Corver 1999). Furthermore, the postnominal counterpart of (192a) invariably surfaces with an overt preposition, as witnessed by (193):

(193) *éen* *voorsprong* *(van)* *éen minuut* *headstart of one minute*

---

93 DP-internal fronting of PPs with overt prepositions is not attested (cf. iab).

(i) a. *[[DP *Een* [NP *boek]] *van* Zola] *a book by Zola*  
   a book by Zola
b. *[[PP *van* Zola] *Een* *boek t1] *
   *by Zola a book*
Based on (193), I conclude that the fronted constituent in (192) is a PP with a covert P-head. Since the Dutch DD-construction with elk also forms a PP with a covert P-head, (185i) predicts that elk can be fronted. The result of this movement is shown in (186b).

Russian allows for DP-internal fronting of PPs from postnominal position. This is shown in (194):

(194) a. [Prestavitel’ izamburga] to’ko chto priehal. [Russian]
    representative from hamburg just arrived

b. [Izamburga, prestavitel’t] to’ko chto priehal.
    from hamburg representative just arrived

‘The representative from Hamburg just arrived.’ (Borik, p.c.)

The possibility of DP-internal fronting accounts for the prenominal occurrence of kazhdyj in (186c) in line with (185i).

Russian also allows for DP-internal fronting. Corver (2001) shows that numeral predicates from 20 onwards from DP-internally from a postnominal base position. The preposition de in (195) is the spell out of a complex head [F+X] (cf. den Dikken 1998 and fn.94)

(195) a. treizeci de lei
    thirty of lei ‘thirty lei’

b. [FP treizeci2 [F‘ F0+X0 1(de) [XP lei t1 t2]]]

Consequently, overt movement of the Romanian DD cite to SpecDP in (186d) is predicted to be possible by (185i).

Finally, Japanese also seems to exhibit DP-internal leftward movement that is driven by discourse requirements. Muromatsu (2000) shows that numerals in their postnominal base position receive a cardinal focus-new interpretation (196a). When they occur DP-initially (196b), they receive a specific or presuppositional interpretation.

(196) a. [Kodomo o futa-ri] sitinen-sei ni ireta. [Japanese]
    child ACC two-cl 7th-grade DAT I-sent
    ‘I sent two children to the seventh grade.’

b. [Futa-ri no kodomo o] sitinen-sei ni ireta.
    two-cl GEN child ACC 7th-grade DAT I-sent
    ‘I sent two (particular) children to the seventh grade.’

Even though the notions of background or presupposition are not identical to topichood (see above), the DP-internal leftward movement is motivated by discourse factors. If we weaken the hypothesis (185) in such a way that it also subsumes other cases of DP-internal movement, e.g. movement of constituents expressing presupposed or discourse-old material, it correctly predicts that the Japanese d-distributive quantifier soarezore ‘each’ can occur prenominally as in (186e).

Taking stock, the first clause of the DD-fronting hypothesis in (185) makes good predictions for French, Dutch, Russian, Romanian, and Japanese. In addition, since (185i) 94 den Dikken (1998) gives an alternative explanation for the absence of an overt P-head. According to den Dikken, head movement of covert P into the covert head of a functional projection FP is necessary in order to expand the domain for predicate inversion of a postnominal PP to the DP-initial position.
links overt movement to relative discourse notions such as ‘topic’, it explains why fronting in French, Dutch, Russian, and Japanese is optional.  

An apparent problem arises in connection with the other Slavic languages. As discussed in 5.1.1, movement of the DD po to prenominal position seems to be obligatory in these languages. I would therefore like to argue that the prenominal position of po is not the result of discourse-driven movement, but of another movement operation, which was already discussed in section 5.1.1. There, it was shown that po moves to the prenominal D-position by head movement, as witnessed by the (unexpected) oblique case on the DistShare. If this reasoning is correct, we have to weaken (185) accordingly. All prenominal occurrences are due to overt DP-internal movement, but not all movement operations are instances of discourse-driven (topic) movement. This being said, (185) holds for Slavic as well.

A final problematic case is Italian. The DD in Italian occurs optionally in prenominal position (cf.197a) although DP-internal topic-fronting is barely possible, if not ungrammatical (cf.197b).

(197) a. I ragazzi hanno comprato [ciascuno, due salsicce]. [Italian]
   the boys have bought each two sausages
   b. Ho letto, di Zola, tutti i libri.
   I have read by Zola all the books (d’Allessandro, p.c.)

In light of (197b), the prenominal occurrence of ciascuno in (197a) casts doubt on the adequacy of (185). In the absence of further evidence as to what is going on in Italian, I will leave the matter open for further research.

In conclusion, the first part of the DD-fronting hypothesis in (185) makes by and large good predictions in its weakened version. The hypothesis accounts for all the languages in the sample, except – perhaps – for Italian. I take this as evidence in favour of (185i), assuming that there is a solution for the problematic Italian facts.

5.3.2 DDs in Postnominal Position

The second clause of (185) predicts DDs to occur postnominally in those languages that do not show overt DP-internal movement. This accounts directly for English, which has no overt topic fronting (cf.198), nor overt head movement to D0 (cf. Longobardi 1994).

(198) *[By Chomsky, an article] is always interesting.

The postnominal position of d-distributive each follows directly.

The situation is the same in Icelandic and Norwegian. In the basic DD-construction without a possessive pronoun (cf. chapter II.4.1, fns. 23 & 24), the DD occurs postnominally in both languages.

(199) a. Guttene har kjøpt to pølser hver. [Norwegian]
   boys-the have bought two sausages each (Vangsnes, p.c.)

---

95 Possibly, the situation in Romanian is slightly different. I was not able to establish whether cite occurs in prenominal position optionally or obligatorily. The same holds for the obligatoriness or optionality of numeral fronting in (195). If the prenominal position is obligatory in both cases, movement to initial position must happen for some other, syntactic reason. See the discussion of the Slavic languages in the main text. In the absence of further evidence, I have to leave the matter open for further research.
b. Strákarnir keyptu tvær pylsur hvor/hver.
   boys-the bought two sausages each\textsubscript{bul} each\textsubscript{d}
   ‘The boys bought two sausages each.’ (Hrafn, p.c.)

The postnominal occurrence of the DD in (199ab) corresponds to the ungrammaticality of structures with overt DP-internal fronting in these languages. (200ab) show this for Icelandic.

(200)  a. stúdent-inn/ einn stúdent frá Reykjavík  [Icelandic]
        student-the a student from Reykjavik
   b. *frá Reykjavík student-inn /einn stúdent (Hrafn, p.c.)

Since overt DP-internal fronting for discourse reasons does not seem to be licensed in these two languages, (185ii) correctly predicts the postnominal occurrence of the DD in (199ab).

This leaves us with Korean, in which the DD –ssik- occurs postnominally.

(201)  Ai-tul-i phwungsen-hana-ssik- ul\textsubscript{DistShare} sa-ess-ta.  [Korean]
        child-pl-NOM balloon one ACC bought
        ‘The children bought a balloon each.’

The postnominal occurrence of –ssik- is unexpected since Korean resembles Japanese in allowing for DP-internal movement of number phrases to DP-internal position (albeit with no discernible difference in discourse status).\footnote{Soowon Kim (p.c.) informs me that it is not certain that head noun and numeral form one constituent in (202a). If so, (202b) is not derived from (202a) by DP-internal fronting, and the problem disappears.}

(202)  a. Ai-rul twul-ul chingchanha.yess-ta.  [Korean]
        child-ACC two-ACC praise-PAST-IND
   b. Twu myeng-uy ai-rul      chingchanha.yess-ta.
        two CL-GEN    child-ACC praise-PAST-IND
        ‘(I) praised two kids.’ (Kim, p.c.)

Given the possibility of DP-internal fronting in (202), the postnominal occurrence of –ssik- in (201) is somewhat surprising if we think of the DD-fronting hypothesis in (185).

I can only give a speculative answer to this problem. The obligatory postnominal occurrence of the DD –ssik- may have to do with the left-branching nature of Korean DPs, as indicated in (203).


In 5.1, the DD -ssik- was treated tentatively as a (possibly complex) postpositional head. Apparently, as a syntactic head, –ssik- is banned from undergoing phrasal movement to the left. It could undergo head movement, but since Korean is left-branching, there simply is no DP-initial head position into which –ssik- could move.

If this reasoning is on the right track, it suggests that the hypothesis in (185) can account only for a subset of the observable data, and is in need of revision. The relative order of DD and DistShare seems to depend not only on the possibility or impossibility of
overt DP-internal topic-fronting, but on other factors, such as the possibility of DP-
internal head movement to D\(^0\) (in Slavic), or the direction of branching inside the DP. The
latter factor seems to be operative in Korean, where the DD is a bare functional head. All
this goes to show that the word order facts surrounding d-distributive elements are more
complex than thought at first sight. Nonetheless, I propose to maintain (185i,ii) in its
revised form in (204), at least until we encounter conclusive evidence to the contrary.

(204) **The DD-fronting Hypothesis (revised version):**

i. A DD can occur in prenominal position in a language iff that language allows
for overt DP-internal fronting of postnominal material for grammatical or
discourse reasons.

ii. A DD must occur postnominally in a language if that language does not allow
for DP-internal (topic) fronting or if that language is right-branching and the
DD is a bare head.

Although still sketchy in nature, the DD-fronting hypothesis in (204) shows that the pre-
or postnominal occurrence of DDs across languages is not an idiosyncrasy of the
construction. Instead, it appears to be correlated to independent grammatical properties of
the languages in question. The hypothesis accounts for the observable variation between
languages, making possible a unified underlying analysis at the same time. As such, it
may serve as the basis for further investigations into the nature and motivation of DP-
internal movement of DD.

5.4 Differences in Feature Content: D-features and Agreement
The second cross-linguistic difference of DD-constructions concerns the morphological
form of the DD itself. In chapter II.4.2.2, a bipartition was observed. In some languages,
the DD is formally identical to the D-quantifier (cf. 205a). In others, it differs in form
(cf.205b).


Romanian: cîte (vs. fiecare, oricare)

I propose that the formal identity or difference reflects a deeper grammatical property of
the DDs in question. The argument is that DDs which are formally identical to the D-
quantifier contain a set of D-features comprising person, number, and gender features as
part of their lexical entry. Likewise, DDs that differ formally from D-quantifiers do not
contain such D-features as part of their lexical entry.\(^97\)

That the elements in (205a) contain D-features is witnessed by their ability to occur on
their own in subject position, if the preceding context provides a suitable set over which
they can quantify.

(206) The children are happy…

a. Each (of them) has what he/she wanted.

\(^97\) This holds for all languages in (205b) with the exception of Japanese sorezure, to which we will turn in section 5.4.4.
b. Chacun a ri. [French]
each one has laughed
‘Each (child) laughed.’
c. Ciascuno ha quello che merita. [Italian]
each person has what that deserves
‘Each (child) has what he/she deserves.’

In contrast, the elements in (205b) do not contain D-features, and cannot occur on their own in subject position. This is illustrated for German in (207).

(207) *Jeweils hat bekommen was er wollte,
each has got what he wanted

How does this difference affect the different syntactic behaviour of DDs in the two groups in (205)? It is natural to assume that, if a functional element contains D-features, it must check them against an identical set of features on its NP-complement under agreement.

(208) shows this for the regular D-quantifier jede/r ‘each’ in German. Agreement licenses the grammatical (208a), and blocks the ungrammatical (208b) because of feature mismatch in the gender feature.

(208) a. je-den        Mann
each-[sg, masc, 3rd, ACC]  man <sg, masc, 3rd>
b. *je-den       Frau
each-[sg, masc, 3rd, ACC]  woman <sg, fem, 3rd>

If a d-distributive element contains D-features, it is natural to assume that it must also check them against its NP-complement under agreement. However, this complement is an NP-proform, which by assumption does not contain any D-features of its own.

(209)  

It follows that the DD each in (209) cannot check its D-features, unless the NP-proform acquires the set of D-features from a co-referent expression, the DistKey. Presumably, this happens in form of a feature copying mechanism which is indicated overtly by agreement in French, Italian, and also in Icelandic. (210ab) show that the DD agrees in gender with its DistKey in French and Italian. (210c) shows that Icelandic DDs agree in number (dual or plural) with the DistKey.

After feature copying, the NP-proform has acquired the D-features of the DistKey and can check them against the D-features of the DD.

Now, if for some reason feature copying from the DistKey onto the DD cannot take place, we expect the resulting structure to be ungrammatical because the DD fails to check
its D-features against those of its NP-complement. At the same time, we expect the corresponding structures to be grammatical in those languages where the DD contains no D-features. In the following two sections, we will see two such cases. In 5.4.1, the DistKey expression is not a DP, and therefore contains no D-features that could be copied onto the NP-proform. In 5.4.2, there is a potential DistKey DP, but it is not in the right syntactic position to license feature copying onto the NP-proform.

5.4.1 Differences in the Range of Possible DistKeys

Given the mechanisms of obligatory D-feature checking and feature copying from DistKey onto the NP-proform, the differences regarding the range of possible DistKey expressions (see chapter II.4.3) fall out immediately.

In languages in which the DD contains no D-features (German, Czech, Bulgarian, Korean), it does not have to check them against D-features on the NP-proform. It follows that the NP-proform does not need to acquire a set of D-features through feature copying. And from this, it follows that the proform can be co-indexed with arbitrary plural denoting expressions, including V-conjunctions. (211ab) show that this prediction is borne out for German and Korean.

(211) a. Peter kritisierte und lobte Maria aus jeweils zwei Gründen. [German]
   ‘Peter criticised and praised Maria for each two reasons.’
   b. (serotarun) twu kaji-ssik-uy iyuro Peter-nun Mary-rul chingchan-to
      (different) two CL-ssik-GEN reason-for Peter-TOP Mary-ACC praise-also
      ha-ko pinan-to ha-yess-ta. 98
      do-and criticism-also do- PAST-INDICATIVE
      ‘Peter criticised and praised Maria for two reasons respectively.’

The Slavic languages Bulgarian and Czech do not allow the DD po to distribute over the denotation of verb conjunctions as in (211), for reasons unclear to me. DDs in these languages can distribute over non-DP denotations, though, namely over sets of events. The set of events can be established either by an adverbial quantifier, as in (212a). Or it can be implicit (provided by the context), as in (212b). The absence of a DP-expression as DistKey is expected because the DDs in both languages do not need an overt DP-antecedent that would copy its D-features onto their NP-proform.

(212) a. John nikogane pie [po 3 kafeta]. [Bulgarian]
   ‘John never drinks three coffees (per sitting).’ (Petrova, p.c.)
   b. V tazi stja spjat [po dvama choveka].
      ‘Two people at a time sleep in this room.’

A similar example from Czech, where po is in subject position, will be provided in the following section.99 Distribution with d-distributive elements over (implicit) sets of events is the subject of chapter V.

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98 In (209b), -ssik- seems to have fronted together with the numeral, suggesting that the two form a constituent. Possibly, this fact implies that the universal structure for d-distributive constructions proposed in 5.1 does not hold for Korean. See also the doubtful remarks in fn. 83.
DDs containing D-features (in English, Dutch, French, Italian, Russian, Icelandic, Norwegian) must check them against D-features on the NP-proform. It follows that the NP-proform must acquire a set of D-features through feature copying. And from this, it follows that the proform must be co-indexed with a DistKey-DP. As a result, the sentences in (213) are all ungrammatical (on the intended reading).

(213) a. *Peter criticised and praised Mary for two reasons each.

b. *Piet heeft Marie om elk tweede reden gekritiseerd en geprezen. [Dutch]

Piet has Marie for each two reasons criticised and praised

c. *Peter a adulé et critiqué Marie pour deux raisons chacun/e. [Fr.]

Peter has praised and criticised Mary for two reasons each

d. *Peter ha apprezzato e criticato Maria per due ragioni ciascuno/a. [Italian]

Peter has praised and criticised Maria for two reasons each

e. *Petja hvalil i kritikoval Mashu po kazhdym dvum prichinam. [Rus.]

Peter praised and criticised Maria for two reasons each

f. *Pétur lofaði og gagnrýndi Maríu af ástæðunni hvor. [Icel.]

Peter praised and criticised Mary of reason-the each

g. *Peter roste og kritiserte Maria av to grunner hver. [Norw.]

Peter praised and criticised Maria of two reasons each

In addition, since the DDs in these languages need a DP as DistKey, they will never be able to distribute over (implicit) sets of events like their Bulgarian and Czech counterparts in (212ab). (214) shows this for English and French.

(214) a. *One boy each came in.

b. *Un garçon chacun est entré. [French]

One boy each comes in *‘Each time, one boy came in.’

In (214), each needs an overt NP-complement to check its D-features against. Recall that the inability to distribute over events is not due to an inherent semantic restriction on the DD. The DDs in (213) are able to distribute over sets of events as soon as these are expressed in the disguise of a DP. (215) is an example from English.

(215) [The hailstorm and the accident] caused five casualties each.

(215) shows that the ungrammaticality of (213a-g) and (214) must be due to the absence of a DistKey DP.

Let us finally turn to the case of Icelandic, which proves instructive in this connection. (213f) shows that the DD hvor cannot distribute over a non-DP denotation, presumably because there is no appropriate antecedent against which it could check its D-features (after feature copying onto the NP-proform). The surprising fact is that the Icelandic DD can distribute over non-DP-denotations (such as the V-conjunctions in (213)), as soon as it occurs in the Icelandic II-pattern with a possessive pronoun in prenominal position.

Unfortunately, I was not able to establish the facts for Romanian. It is predicted that DDs in Romanian should be able to distribute over (implicit) sets of events because they do not seem to contain D-features that need to be checked.
I suggest that the grammaticality of (216) is due to the presence of the overt possessive pronoun *sitt*, which c-commands the DD *hvorri*. As discussed in connection with the German NP-proform –*weil*– in section 4.2.2, Kamp & Reyle (1993:306) point out that pronouns can differ regarding their co-reference abilities. Some pronouns, such as *he* and *she*, can only be co-referent with DP-denotations (*he/she*-type pronouns), while others, such as *it*, can freely co-refer with non-DPs (*it*-type pronouns). This is illustrated in (217).

(217) All the boys passed the exam. It, / *he, / *she, surprised everyone.

I propose that the possessive pronoun *sitt* is of the *it*-type variety, and that it can therefore be co-referent with the V-conjunction *lofaði og gagnrýndi* "praised and criticised", which expresses a plurality of events in (216). In other words, the possessive seems to act as a dummy DistKey that receives its semantic value under co-indexation with the real DistKeyDP. This way, the semantic value of the V-conjunction (a plurality of events) is transferred (under co-indexation) onto a D-expression, which contains a set of D-features. These D-features can check against those of the DD *hvor* (after copying to the NP-proform). The process of feature transfer is illustrated schematically in (218).

(218) \[
\text{[DistKey } lofaði og gagnrýndi]; \quad \text{plural, } \quad \text{-}\text{D-features } \quad \text{co-reference } \quad \text{plural, } \quad \text{+D-features } \quad \text{copying}
\]

In other words, Icelandic seems to overcome the absence of a DP-denoting DistKey expression by inserting a +D-pronoun, which is able to pick up the semantic value of the pluralic DistKey expression, and which is able to check the D-features of the DD. Icelandic therefore provides direct evidence for the claim that the ungrammaticality of (213a-g) is due to the absence of a DistKey DP.

Summing up, the fact that the DDs of some languages cannot distribute over the denotations of arbitrary plural expressions (but only over DP-denotations) follows directly from their need to check off their D-features. In languages in which the DD contains no

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100 The alert reader will have realized that the construction in (216) is slightly atypical for DD-constructions in that the DistShare is definite. Gunnar Hrafn (p.c.) informs me that the use of the indefinite *ástæðu* ‘a reason’ is not outright ungrammatical, but strange. Based on this, one could conclude that the Icelandic II-pattern is not a DD-construction at all. However, the following example, repeated from chapter II, fn.24, shows that the Icelandic II-pattern is possible with indefinite DistShare expressions in principle:

(i) *Sinn hver tveggja blaðamanna tóku viðtöl við stjórnmálamennina*  
POSS each two journalists GEN interviewed with politicians-the  
‘The politicians were interviewed by two journalists each.’

In light of (i), I propose to treat the definite DistKey in (216) as an instance of a non-specific DP that expresses the property of being the cause of some event. In chapter IV.5, an explanation will be given for why DDs are possible with definite DPs as long as these are non-specific. I conclude that (216) is a regular instance of a DD-construction.

101 In Norwegian, this “rescue” strategy is not available even though the alternative Norwegian II-pattern contains a pronoun in prenominal position as well (see chapter II.4.1, fn.23). Presumably, the difference lies in the different nature of the Norwegian pronoun. The Norwegian pronoun *sine* is a reflexive possessive pronoun. As a reflexive pronoun it must be locally bound by (hence: be co-referent with) a DP-expression. For this reason, it cannot be co-referent with a non-DP denotation.
D-features, no such restriction is observed, and the DD is free to distribute over the denotations of non-DPs.

5.4.2 Differences in Distribution

The variation regarding the (non-)occurrence of a DD with underlying subjects also falls out from the D-feature specification (or non-specification) of the DD. We need to make one additional assumption, namely that feature copying is licensed under c-command only. The DistKey must c-command the DD at surface structure if feature copying is to apply. If we perceive of feature copying as an instance of Chomsky’s (1998) ‘Agree’, this follows directly since ‘Agree’ seems to apply under c-command.

With the additional c-command requirement in place, we can account for the ungrammaticality of DDs in underlying subject position of a root clause (cf. 219a-f). None of the DDs in (219) is able to distribute backwards over the object denotation.

(219)  

a. *One journalist each interviewed the politicians.  
b. *Elk, twee journalisten hebben de politici, geïnterviewd. [Dutch]  
c. *Un journaliste chacun, a interviewé les politiciens. [French]  
d. *Uno giornalista ciascuno, ha intervistato i parlamentari. [Italian]  
e. *Kazhdye dva zhurnalista vzjali intervju u politikov. [Russ.]  
f. *Tvæggja blaðamanna hvor tóku viðtöl við stjórnmálamennina, [Icel.]

All the DDs in (219) contain D-features that need to be checked. However, none of the overt or covert NP-proforms in (219) is c-commanded by the DistKey expression in object position. It follows that the latter’s D-features cannot be copied onto the NP-proform under ‘Agree’. Hence, the DD cannot check its D-features against the NP-proform. Notice that this way we have arrived at a slightly different explanation for the anaphor-like behaviour of Italian ciascun/a and English each, which was observed in Burzio (1986). The DD-constructions appear to behave like anaphors because some of their features need to be licensed (via the NP-proform) under c-command. Nonetheless, the c-command requirement does not follow from the intrinsic anaphoricity of the elements in question, but from the need to check D-features.

DDs that do not contain D-features can occur in the underlying subject position of root clauses because no D-features need to be checked, and consequently no D-features need to be copied onto the NP-proform by feature copying. As a result, DDs in underlying subject position are possible in German, Korean, Bulgarian, and Czech.

(220) a. Jeweils, ein Offizier begleitete die Ballerinen, nach Haus. [German]  
each one officer accompanied the ballerinas to home  
‘Each ballerina was accompanied home by one officer.’  
b. Hyengsa-twu-myeng-ssik-i yonguicha-tu-ul ccooch-ko-iss-ta  
detective-two-CL NOM suspect-pl-ACC chase-PROG  
‘The suspects are chased by two detectives each (time).’ (Choe 1987:50, ex.15)
c. Пo edin student pomogna na vsesi profesor.    [Bulgarian]  
   each one student helped to every professor.  
   '(All) the professors were helped by one student each.' (Petrova 2000: ex.6b)

d. Po třech ženách vstupovalo do místnosti.    [Czech]  
   each three LOC women LOC entered3sg into room  
   'Each time / each ten minutes, three women entered the room.'

Similar facts are predicted for Romanian and for Japanese, given that the DDs in these languages differ formally from the distributive D-quantifier. In the following section, it will be shown that the prediction is borne out for Japanese, although with an unexpected twist.

In conclusion, the c-command requirement on feature copying together with the need of D-features on DDs to check (if present) gives a neat cross-linguistic account of the (non-)ability of a DD to occur in underlying subject position of a root clause. DDs with D-features cannot occur in this position because they must check their D-features under c-command. DDs without D-features are free to occur in this position because they do not have any D-features to check under c-command (nor otherwise).

5.4.3 The Locus of Agreement: The Case of Icelandic

One may wonder why the additional stipulation that the DistKey must c-command the DD should hold at surface structure. Would not LF-movement of the DistKey expression across the DD help to satisfy the c-commando requirement at this syntactic level? In this case, we cannot exclude LF-movement on the base of the methodological principle to do without LF-movement where possible, for in this case LF-movement seems necessary. Furthermore, Burzio (1986) argues that reconstruction at LF provides an account for the possibility of Italian and English DDs in constituents that have fronted overtly, as in (221) (exs. from Burzio 1986:200, 57a & 60a).

(221) a. ?[One interpreter each] was assigned to the visitors.  
   b. ?[Un evaso ciascuno] si consegnerà a quei carabinieri.  
      one escapee each  SI will.turn.in to those policemen  
      'We will turn in one escapee to each of those policemen.'

If this reasoning is correct, the ungrammaticality of (219a-f) would have to follow from some independent principle that would block LF-movement of the DistKey object across the DD in subject position. Against this view, I would like to argue that the c-command requirement must be satisfied at surface structure. Again, the decisive data comes from Icelandic.

Looking at (219a-f) again, we find that LF-movement of the DistKey object across the subject would result in a weak crossover configuration. To see this, consider the structural configuration after LF-movement in (222).

(222) [DistKey1 …[DP …proform] …t]
In (222), an indexed element binds a co-indexed proform and a trace to it right in this order, a typical weak crossover configuration. Since most of the languages in (219) show WCO-effects, this could be the independent principle ruling out LF-movement in (219a-f). The sensitivity to WCO is illustrated for English, Dutch, French, Italian, and Russian in (223).

(223) a. *Who, has his, mother seen?
   b. *Wie, heeft z’n, moeder gezien? [Dutch]
   c. *Qui, a vu sa mère, t? [French]
   d. *Sua, sorella odia (soprattutto) Gianni, t. [Italian]
   e. *kogo, videl ego, otec t? [Russian]

The data in (223) suggest that LF-movement of the DistKey object across the DD in subject position is ruled out for independent reasons: It would result in a WCO-violation. If so, we are free to take the c-command requirement between DistKey and DD to hold at LF.

Again, data from Icelandic show that the explanation in terms of WCO cannot be correct. (224) shows that Icelandic – like German - is insensitive to WCO-violations.

(224) Hvern, sá mamma hans, t? [Icelandic]

For this reason, movement of a DistKey object across an DD in subject position should result in a grammatical configuration. Despite this, (217f) is ungrammatical. On the other hand, Icelandic DDs can occur in underlying subject position and distribute backwards over a DistKey object, if the alternative pattern with a possessive pronoun (Icelandic II) is chosen.

(225) Sinn hvor tveggja blaðamanna tóku viðtöl við stjórmálamennina
POSS each two journalists GEN interviewed with politicians-the
‘The politicians were interviewed by two journalists each.’

The striking fact about (225) is that the DD is c-commanded by the pronoun at surface structure. It seems, then, that the possessive pronoun in (225) appears for the same reason as when the DistKey expression is not a DP (see section 5.4.1). It provides the DD with a c-commanding antecedent against which it can check its D-features. In contrast, if the D-features of the DD could be licensed at LF, it remains mysterious why only the pronominal variant in (225) is grammatical.

I conclude that the c-command requirement between DistKey and DD must be satisfied at surface structure. In minimalist terms, this condition can be restated by saying that the D-features of the DD are strong and must be checked before spellout (Chomsky 2013). Olga Borik (p.c.) informs me that some speakers of Russian may marginally allow for WCO-configurations such as (223e). This is irrelevant for our purposes, since the explanation in terms of WCO will not stand anyway.
1993, 1995). LF-movement of the DistKey expression comes too late to check the D-features on the DD. From this, it also follows that the D-features of the fronted DDs in (221) must be checked in the base position of the moved constituent before movement.

5.4.4 Two D-distributive Elements in One Language: The Case of Japanese

At the end of chapter II.4, it was pointed out that Japanese is unusual in not obeying the correlation between the morphological form of the DD, and its (non-) ability to distribute over non-DP denotations or to occur with underlying subjects. Japanese is the only language in the sample where the DD (sorezore) differs formally from the distributive D-quantifier (wh…+mo), but still it is unable to distribute over non-DP denotations or to occur with underlying subjects.

The foregoing remarks show that the correlation between these three properties that was postulated in chapter II.4 does not hold for all languages: Not every DD that differs formally from the D-quantifier can distribute over events and occur in subject position (though the reverse still holds).

On the other hand, the Japanese data do not form counterevidence to the generalisation that only DDs without D-features can distribute over events and occur with underlying subjects. A closer look at the nature of sorezore ‘each’ provides a solution to the riddle. It was already mentioned in chapter II.4.2.2, and in 5.1 that sorezore has nominal properties. It is case-marked in (226ab), and it functions as a pronoun in (226b).

(226) a. [Huta-ri no musume]-ga [sorezore-ga tadasii to] iha-tta] koto] two-CL GEN daughter NOM each-NOM right cp insist-past fact ‘The fact that the two daughters insisted that each of them was right.’ (Sakaguchi 1998:115, ex.3)
   b. Ken-to Erika-ga sorezore-no hahaoya-o hometa. Ken-and Erika-NOM each- GEN mother-acc praised ‘Ken and Erika praised their own mother.’ (Tomioka, p.c.)

In addition, sorezore is formally similar to the demonstrative pronoun sorera ‘those’ in (227) (Tomioka, p.c.):

(227) Shinbunkisya-ga futari-zutu sorera-no seizika-o sirabeta.
    news-paper journalist-NOM 2-cl-each   those- GEN politician-ACC investigated
   ‘Those politicians were investigated by two newspaper journalists each.’

The data in (226) and (227) suggest that sorezore does have D-features after all, despite its formal dissimilarity with the distributive D-quantifier wh…+mo. The presence of D-features in sorezore accounts for its inability to distribute over non-DP denotations and to occur with underlying subjects.

(227) also shows that Japanese appears to have a second D-distributive element zutu ‘each’, which can occur with underlying subjects, licensing backwards distribution over the object denotation. The following example from Sakaguchi (1998:115, fn.1) shows that zutu can also distribute over implicit sets of events:

104 As will be shown in chapter V.3.2, the DistKey objects in (220) must LF-move for semantic reasons after all. Except for Bulgarian, the languages that allow for backwards distributive readings with DDs in underlying subject position show no weak crossover effects. That is, LF-movement of the DistKey across the DD is licensed in these languages, ensuring interpretability.
Although many questions remain, the data in (227) and (228) suggest that Japanese has a second DD, *zutu*. The ability of *zutu* to distribute over non-DP denotations and to occur with underlying subjects suggests that it contains no D-features. In conclusion, it was shown that Japanese poses no problem for the claim that there is a correlation between the feature content of a DD on the one hand, and the range of possible DistKeys and the (non-) occurrence with underlying subjects on the other. The discussion has also shown that one has to be careful with hasty conclusions regarding the syntactic behaviour of a DD on the base of its morphological shape alone. This being said, looking at the morphological shape of a DD remains a valuable tool in predicting its syntactic behaviour, when exercised with the necessary caution.

5.5 Two Open Problems

Section 5.4 has shown that the different feature specifications for DDs across languages determine part of their syntactic distribution. DDs with D-features are more restricted. Their DistKey antecedent must be a DP, and they cannot occur in underlying subject position of root clauses. DDs without D-features are not restricted in this way. Both restrictions on DDs where shown to follow from the need of the NP-proform to acquire D-features under c-command.

The explanation in terms of c-command does not account for all restrictions on the distribution of d-distributive elements, though. In light of the discussion so far, the ungrammaticality of the English sentences in (229ab) comes as a surprise.

(229) a. *The boys, painted two houses each, red.
    b. *The journalists, said that one politician each, was stupid.

In (229a), *each* occurs in subject position of a resultative small clause (see also (72b) from II.4.2.4). In (229b) (=72c) from II.4.2.4), *each* occurs in subject position of an embedded clause. In both sentences, there is a potential c-commanding DistKey expression that should suffice to license the DD.

The situation in German is slightly different. The German counterpart of (229a) is grammatical (cf.230a). The counterpart of (229b) in (230b) is equally ungrammatical when the DD distributes over the DP *die Journalisten* ‘the journalists’ in the matrix clause.

(230) a. Die Jungen, haben jeweils, zwei Häuser rot angestrichen.
    *The boys have each two houses red painted.*

105 A potential problem for a structurally parallel treatment of *soresetore* and *zutu* arises from the fact that sentences with *zutu* are only grammatical if *zutu* is suffixed to the numeral, and not to the entire numeral NP (Sakaguchi 1998:115).

106 Possibly, Japanese is not the only language with two DDs with different feature specification as [+/- D]. Dutch has a genitive-marked (!) element *steeds*, which can distribute over implicit sets of events from adnominal position (cf. i), suggesting that it is the [-D]-counterpart of *elk* ‘each’.

(i) Steeds twee meisjes zijn binnen gekomen.
    *Two girls at a time came in.*
b. Die Journalisten sagten, dass jeweils ein Politiker dumm sei.
the journalists said that each one politician stupid was
*‘The journalists said that one politician each was stupid.’

The contrast in grammaticality between English (229a) and German (230a) is revealing. Assuming that the semantics behind the DD-construction are universal, the difference must follow at least partly from syntactic reasons. In chapter IV.6, I will argue that the contrast in grammaticality is due to the different underlying word order of English and German, SVO and SOV respectively, in interaction with semantic considerations. In a nutshell, (229a) is out because the semantic derivation does not get the right arguments in the correct order in English. In German, this problem is avoided because the verb has a different underlying position.

Turning to (229b) and (230b), both are ungrammatical, suggesting that the difference be semantic in nature. As a matter of fact, both are violations of the clausemate condition discussed in chapter II.1.7. In my view, the clausemate-condition of DD and DistKey follows from semantic reasons. In chapter IV.6, this will be shown for DDs in object position that fail to distribute over a DistKey in the matrix clause. The interpretation of DDs in subject position is a little more complex and postponed to chapter V.3. As a result, an account for the ungrammaticality of (229b) and (230b) will have to wait until then.

This concludes the unified cross-linguistic analysis of d-distributive constructions. The analysis for German was shown to extend to a range of languages. The observable differences in the expression of d-distributive constructions were shown to derive from two independent factors. The (im-)possibility of overt DP-internal movement in a language governs the occurrence of the DD in pre- or postnominal position (abstracting away from the problematic Italian facts). The syntactic feature content of the DD governs its syntactic distribution. DDs with no D-features need not have a c-commanding DP as DistKey. They can distribute over all kinds of pluralities, including implicit sets of events, and are licensed in underlying subject position of root clauses. In contrast, DDs with D-features need a c-commanding DP as DistKey. For this reason, they can only distribute over DP-denotations, and are banned from underlying subject position.

6. Conclusion

This chapter has presented the syntactic analysis of d(istance)-distributive constructions, based on the German d-distributive element jeweils. The main results are as follows.

(231) i. The constituent jeweils ‘each, each time’ is a PP with a covert P-head licensed by overt genitive morphology.
   ii. There is no distance-distributivity: The universal quantifier je- takes its semantic restriction as complement. The restriction is expressed by an NP-proform –weil-
   iii. Adverbial jeweils is an adverbial quantifier adjoined to VP.
   iv. Adnominal jeweils is an adnominal quantifier
   v. D-distributive constructions with adnominal jeweils have the underlying structure of inverse linking constructions. The jeweils-PP is base-generated as a postnominal PP-modifier, and moves to SpecDP for discourse reasons.
   vi. Cross-linguistic differences in the distribution of d-distributive elements are due to two factors: a lexical factor (the syntactic feature content of the DD) that
determines its (non-)occurrence in subject position and with non-DPs as DistKey), and a general syntactic factor (the possibility of DP-internal fronting) that determines the pre- or postnominal occurrence of a d-distributive element in a given language.

This concludes the discussion of the syntax of distance-distributivity. In the next chapter, we will look at how the syntactic structures containing jeweils are interpreted semantically.
In chapters II and III, I have isolated and analysed two instances of the distributive element *jeweils* in German. Adverbial *jeweils* ‘each time’ occurs in the position of adverbial quantifiers. This position was analysed as being a VP-adjoined position. Adnominal *jeweils* ‘each’ was shown to form part of a postnominal PP underlyingly. In languages like German, which exhibit overt DP-internal fronting for discourse reasons, this PP normally moves to the specifier of DP overtly.

The presence of two homophonous elements in different syntactic positions presents us with a classical instance of the problem of ambiguity. The question is whether the two instances of *jeweils* have the same meaning, or not. In the first case, the homophony is expected. In the second case, it will be accidental. The question also pertains to the syntax-semantics interface. In the first case, the difference in sentence meaning will be the result of a difference in syntactic structure. In the second case, the difference in the meaning of *jeweils* will lead to a difference in syntactic position.

In this section, I adopt the first view and assume that the two instances of *jeweils* have only one underlying meaning. Differences in meaning are – on this view – the result of *jeweils* occurring in different syntactic positions. In chapter III.1, it was shown that adverbial *jeweils* does not differ from other adverbial quantifiers syntactically, and that it should therefore be treated as such. Adverbial quantifiers denote generalised quantifiers over events. If adverbial and adnominal *jeweils* have the same meaning, the null assumption is that adnominal *jeweils* also denotes a generalised quantifier, albeit in a different ontological domain. The nature of this domain will be shown to depend on the nature of the (DistKey) co-referent of the proform –*weil*–, which restricts the universal quantifier.

In chapter I.4, I have adopted a surface compositional view on the syntax-semantics interface. In this spirit, the semantic analysis of *jeweils* will demonstrate that both instances of *jeweils* are compositionally interpretable in their surface position, and that we do not have to fall back on LF-movement for interpretive reasons. The syntactic evidence against LF-movement that was presented in chapter III.4.3 backs up this result.

The semantic analysis to be presented is based on the internal structure of *jeweils*-DPs that was developed in chapter III.4. The analysis is similar in spirit to von Stechow’s (1996) account of the ambiguity of *wieder* ‘again’. There, as here, the semantic analysis takes as input a syntactic structure that is more complex than what appears on first sight. The difference between the two analyses lies in the fact that von Stechow’s analysis relies on lexical decomposition of the verb, while the present analysis involves analysing the free form *jeweils* as a PP. Since the presence of a prepositional head is morphosyntactically licensed through genitive case on *jeweils*-, the ‘decomposition’ of *jeweils* into P0 and NP appears to be well motivated.

The structure of the chapter is as follows. In section 1, I give a general introduction into the semantics of events. This discussion is indispensable for the analysis of adverbial *jeweils* and – to a certain extent – adnominal *jeweils*. In section 2, adverbial *jeweils* is analysed as an adverbial quantifier over events. In section 3, I present a few desiderata for the semantic analysis of adnominal *jeweils*. The section also gives an overview over
earlier semantic treatments of distance-distributivity in the literature. Section 4 presents the analysis of adnominal jeweils. It is shown that adnominal jeweils does not differ in meaning from its adverbial counterpart and that a (surface) compositional analysis of adnominal jeweils is possible. Section 5 shows how some of the properties of adnominal jeweils (as discussed in chapter II.1) follow on the analysis proposed here. In section 6, I adopt a wider cross-linguistic perspective again. The difference between English and German concerning the possibility of distance-distributive elements in the subject position of small clauses (see chapter III.5.5) is shown to derive from a combination of semantic factors and a syntactic difference between the two languages. Finally, I show in section 7 that the semantic analysis of jeweils-DPs can be extended to the interpretation of inverse linking constructions (ILCs). Given that ILCs and jeweils-DPs have the same underlying structure, this is a welcome result.

1 Event Semantics

Drawing on Reichenbach (1947), Davidson (1967) introduces events as ontological primitives into the analysis of natural language, namely as arguments of verbal predicates. Since natural language expressions often make implicit or explicit reference to events (cf. Link 1987, Parsons 1990:17-19), this move should hardly be surprising (even though Davidson’s reasons for doing so were of a different nature). Natural language expressions can refer directly to events (1a). Events are countable by means of adverbial modifiers (1b). Quantifiers can range over events (1c). Events can anaphorically bind pronouns (1c). And event-denoting antecedents can be picked up anaphorically across sentence boundaries (1d).

(1) a. The fall of the Berlin Wall
    b. Germany attacked Russia twice.
    c. Every traffic accident will leave its witnesses traumatized.
    d. The fall of the Berlin wall was unexpected. It came as a complete surprise.

The data in (1) justify the assumption that events are linguistically real entities. Unlike proper individuals, which in general are more stable over time, events are usually perceived as more fleeting, more transient, spatio-temporally occurring objects. Nevertheless, they are ontological entities, albeit of a different sort (cf. Eckardt 2002:91). In general, events are characterised and identifiable by their spatio-temporal location, i.e. by the space and time of their occurrence (Link 1998:236). It is the time of occurrence that helps to distinguish a visit by Schröder now from a visit by Schröder then. And it is the place of occurrence that helps to distinguish a thunderstorm here from a thunderstorm there (if the two events occur simultaneously).

Davidson’s idea was taken up by a lot of researchers both in natural language philosophy (Link 1987, 1998, Bennett 1988, Parsons 1990, among others) and in linguistic semantics. In the latter field, the notion of ‘event’ proved particularly useful in the analysis of two grammatical phenomena, namely of aspect (e.g. Bach 1986, Krifka, 1989, 1992, Kiparsky 1998, and others) and adverbial quantification (cf. Berman 1987,
In what follows, I will focus on the following aspects of events.

(2) i. Events as semantic entities (in section 1.1)
   ii. The internal structure of events (in section 1.2)
   iii. Adverbial quantification over events (in section 1.3)
   iv. Stage and individual level predicates (in section 1.4)
   v. The argument status of events (in section 1.5)

The ensuing discussion of events and their properties will serve two purposes: First, it provides a useful background for the semantic analysis of adverbial and adnominal jeweils. Second, it introduces the necessary tools required for a formal semantic analysis based on events. At the same time, some aspects of (the semantics of) events are illustrated by way of looking at adverbial jeweils. Therefore, the section can also be understood as a first step towards the semantic analysis of adverbial jeweils, which will be presented in section 2. The section as a whole is mainly intended for the more syntactically minded among the readership. Readers with a proficient background in event semantics and adverbial quantification are invited to skip the chapter, perhaps browsing through sections 1.2.3 and 1.4 that have a direct bearing on the semantics of adverbial jeweils.

1.1 Events

We begin with motivating the existence of events in the logical representation of sentences. Events are semantic arguments of predicates and enter the logical representation of sentences in form of an ‘event variable’. Because they are variables, it is to be expected that events can be bound, or quantified over by quantificational elements such as adverbial quantifiers. We will focus on the motivation for introducing events into the logical structure of sentences in section 1.1.1. In 1.1.2, we will point out the difference between particular events and event types. Drawing this distinction is important for a proper treatment of events, and neglecting it often leads into problems. In 1.1.3, I show that there is no real empirical difference between the ‘traditional’ Davidsonian analysis and so-called Neo-Davidsonian (Parsons 1990) analyses. As a result, I will go on to use the Davidsonian format.

1.1.1 Events as Semantic Entities

An argument in favour of events comes from the observation that declarative sentences, such as (3), can be used to make statements about a number of different occasions, or events, depending on when and where they are used.

(3) Brutus kisses Caesar.

To avoid confusion from the beginning, it is clear that (3) can mean two different things. On the one hand, (3) is an existential statement about an individual event that is usually identifiable through its context of utterance. At the same time, (3) describes a set of events which can occur at different times (and places), but which have the same property. In the case of (3), this property is the property of being an event of Brutus kissing Caesar. A set

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1 But see Lewis (1975), Kamp (1981), and Heim (1982) for a different view on which adverbial quantification involves unselective quantification over ‘cases’, i.e. n-tuples of individuals that do not contain events.
of events with the same property constitutes an event class, or an event type. We can say, then, that sentences always specify an event type. These event types are predicated of particular events. Below, it is argued that its VP denotes the event type of a sentence. The concrete utterance of a sentence, on the other hand, is always about individual events. The situation is reminiscent of that found in the nominal domain. There, the NP denotes a set of entities with a certain property, whereas the DP denotes either a concrete individual, or it gives rise to a quantified statement about a (group of) individual(s). The difference between particular events and their event types will play an important role in the discussion of the internal structure of events in section 1.2.

Formally, Davidson captures the intuition that sentences are about event types by saying that verbal predicates have an obligatory argument position for events, just as they do for internal and external arguments. This event argument position is filled by an event variable which stands for an individual event, and which - in the default case - is bound by existential closure. The logical entry of the verb _kiss_ is given in (4a). Repeated functional application (henceforth: ‘FA’) of (4a) to the object denotation _caesar_ (4b), and to the subject denotation _brutus_ yields (4c). (4c) denotes a set of events, the event type of Brutus kissing Caesar. Existential closure of the event variable in (4d) turns the event type into the proposition expressed by (3). The truth conditions are spelt out in (4e).

\[
\begin{align*}
(4) & \ a. \ \lambda y \lambda x \lambda e. \ \text{kiss}'(x, y, e) \\
   & b. \ \lambda x \lambda e. \ \text{kiss}'(x, \text{caesar}, e) \\
   & c. \ \lambda e. \ \text{kiss}'(\text{brutus}, \text{caesar}, e) \\
   & d. \ \exists e \ \text{kiss}'(\text{brutus}, \text{caesar}, e) \\
   & e. \ \text{There is an event } e \ \text{such that } e \ \text{consists of a kissing of Caesar by Brutus.}
\end{align*}
\]

An alternative, though equivalent way of formalising (4d) is (5), which brings out more clearly the fact that sentences contain event types (i.e. sets of events) as part of their meaning.

\[
\exists e \in \{e | \ \text{kiss}'(\text{brutus}, \text{caesar}, e)\}
\]

Davidson’s analysis in terms of events allows for an elegant account of sentences with adverbial modifiers, which are problematic otherwise. Consider (6).

\[
(6) \ \text{Brutus killed Caesar [with the dagger] [in Rome] [on the ides of March].}
\]

The instrument, place, and time adverbials in (6) do not denote properties of Brutus or Caesar. Instead, Davidson (1967) construes the additional time, place and instrumental adverbials as modifying predicates over events, i.e. as predicates of type <v,t> (with v the logical type of events). Like adnominal modifiers (adjectivals, PP-modifiers, restrictive relative clauses), which restrict the NP-denotation, event predicates restrict the VP-denotation, or the class of events in question. The VP [Brutus kiss- Caesar] denotes the

---

2 Event types can also be conceived of as (characteristic) functions from events to truth-values, their logical type being <v,t> (with v the logical type of events).

3 This claim is more general than Davidson’s claim that is restricted to ‘action sentences’, sentences with an intentionally acting agent. We will replace this vague restriction shortly with Kratzer’s (1995) claim that only sentences with stage-level predicates contain an event in their semantic structure. This does not obviate, but it confirms Davidson’s general point (1967:93): “Some predicates have an event place, some do not.”
set of all Brutus-kissing-Caesar-events. The modified VP \([Brutus\ kiss- Caesar\ on\ Monday]\) only denotes the subset of those Brutus-kissing-Caesar-events that occur on Mondays.\(^4\) And, as with adnominal modifiers, it is possible to compose the semantic values of VP and the adverbial phrase by predicate modification (henceforth: ‘PM’) (cf. Heim & Kratzer 1998:65).\(^5\)

For a concrete example, consider the interpretation of the modified VP in (7). Since I am not concerned with the precise syntactic location of time, place, and instrument adverbials, I will simply treat them as being right-adjoined to VP, as in (7).\(^6\) For simplicity, the subject Brutus is interpreted in its base position inside VP. The semantic types of the syntactic constituents are shown as subscripts on the respective syntactic nodes. The individual steps of the semantic derivation are listed in (8a-f).

\[
(7) \quad \frac{\text{DP}_{<e>} \quad \text{Brutus}}{\frac{\text{VP}_{<e, t>}}{\frac{\text{AdvP}_{<e, t>}}{\text{on the ides of March}}}} \quad \frac{\text{DP}_{<e>}}{\frac{\text{Brutus}}{\frac{\text{V}_{<e, e, t>}}{\text{killed}}}} \quad \frac{\text{Caesar}}{\text{in Rome}}
\]

\[
(8) \quad \begin{align*}
\text{a. } & \text{[[killed]]} = \lambda y \lambda x \lambda e. \text{killed}'(x, y, e) \\
\text{b. } & \text{[[killed Caesar]]} = \lambda x \lambda e. \text{killed}'(x, \text{caesar}, e) \quad \text{[FA]} \\
\text{c. } & \text{[[Brutus killed Caesar]]} = \lambda e. \text{killed}'(\text{brutus}, \text{caesar}, e) \quad \text{[FA]} \\
\text{d. } & \text{[[Brutus killed Caesar with the dagger]]} = \lambda e. \text{killed}'(\text{brutus, caesar, e}) \quad \text{[PM]} \\
\text{e. } & \text{[[Brutus killed Caesar with the dagger in Rome]]} = \lambda e. \text{killed}'(\text{brutus, caesar, e}) \land \text{with}'(\text{ιx.dagger}'(x), e) \quad \text{[PM]}
\end{align*}
\]

\(^4\) Recall that the VP-internal subject hypothesis is assumed throughout.
\(^5\) Of course, it is also possible to combine the two semantic values by functional application if one treats adverbial phrases as denoting functions of the type \(<<v,t>,<v,t>>\>. On this analysis, the adverbial expression takes a VP-denotation as its input and yields an expression of the same type as its output. Analogous analyses of modifiers as functors have been put forward for the semantics of attributive adjectives. The argument for such a functor analysis is based on the existence of non-intersective adjectives that receive no straightforward account in terms of predicate modification (cf. Hamann 1991).
\(^6\) See also Cinque (1999:29) and the discussion there. A potential problem for the structure in (7) arises in connection with the fact that pronouns inside the adverbials can be bound from direct object position.

(i) We interviewed everybody, / nobody, in his office / on his birthday. Since semantic binding of pronouns is usually taken to be contingent on c-command (cf. Reinhart 1976; Heim & Kratzer 1998), the direct object in (i) must be structurally higher than the adverbial expression.

There are at least two ways to uphold the right-adjunction analysis of adverbs in the light of the binding facts (and leaving aside theoretical consideration like the ban on right-adjunction (Kayne 1994), or on adjunction in general (Chomsky 1995)): The first option is to define binding in terms of linear precedence (cf. Jackendoff 1990). The second option is to assume that direct objects move to a structurally higher position at LF in order to check case, as in Chomsky (1995). In both cases, the object will be able to bind into an adverbial that is right-adjoined to VP.
f. \([\text{[Brutus killed Caesar with the dagger in Rome on the ides of March]]}\) [PM]

\[= \lambda e. \text{killed}(\text{brutus, caesar, e}) \land \text{with}(\text{ix, dagger}(\text{x}), \text{e}) \land \text{in}(\text{rome, e}) \land \text{on}(\text{the-ides-of-march'}, \text{e})\]

(8f) denotes the set of all events e such that e is killing event of Caesar by Brutus that is brought about with the help of a previously mentioned dagger, that took place in Rome, and that took place on the Ides of March. The expression in (8f) is eventually turned into a proposition by ‘existential closure’ (EC) over the event variable. Application of existential closure yields (9).

(9) \[\exists e \left[ \text{killed}(\text{brutus, caesar, e}) \land \text{with}(\text{the-dagger', e}) \land \text{in}(\text{rome, e}) \land \text{on}(\text{the-ides-of-march'}, \text{e}) \right]\]

In the default case, existential closure applies at the outermost VP-level (Kratzer 1995), i.e. after all event modifiers have been adjoined. This situation mirrors the situation found in the adnominal domain. There, the NP first combines with modifying material (adjectivals, RCs, PPs), and then with an adnominal quantifier (see also the discussion in chapter III.3.4.2).

(10) a. Peter has [[always [[lived happily] [in Rome]]].

b. [every [[8-legged [[animal] [in Africa]]]]]

(6) contains several optional event modifiers, which refer to the event’s time, place, and instrument respectively. Eckardt (2002:107-109) shows that events can be modified optionally along other dimensions: ‘Volitional participant’, ‘Moved-Object’, ‘Resulting-State’, and ‘Degree’. All these modifiers take the form of a relation between the event and some other entity. In 1.3, I will argue that events can come with another implicit modifier that relates them to an event in the preceding discourse. As will be argued, this relational modifier is responsible for discourse coherence phenomena and adverbial quantification.

To conclude, VPs denote sets of events, irrespective of the aktionsart of their verbs. This means that states and processes (both telic and atelic) must be subsumed under the general notion of ‘event’, or ‘eventuality’. However, in fn. 3 it has already been pointed out that not every verbal predicate introduces an event argument into the semantic representation. Kratzer (1995) shows that this holds only for so-called ‘stage-level’ predicates, while it is not true of so-called ‘individual-level’ predicates. ‘Individual-level’ predicates such as intelligent or altruistic hold of individuals over time. Therefore, it should not come as a surprise that they do not single out particular classes of events that hold at some points of time, but not at others. Unfortunately, Kratzer’s argument relies on a better understanding of adverbial quantification. For this reason, the discussion of Kratzer (1995) will be postponed to 1.4, after adverbial quantification has been discussed in more detail. For the time being, it is sufficient to bear in mind that a subset of the stative verbs does not introduce an event argument into the logical structure of sentences. Before we go on, it is necessary to dwell on the distinction between concrete events and event types a little longer. The term ‘event’ is often applied indiscriminately to both concepts even though they apply to different entities. I argue that a clear distinction between both in the sense of Link (1998) will help to avoid unclarities. It will also prove useful in the discussion of event complexity in section 1.2.
1.1.2 Individual Events and Event Types

The discussion of (3), repeated as (11), showed that there are two notions of ‘event’.

(11) Brutus kisses Caesar.

On its first use, ‘event’ refers to a particular occasion, an individual event that is localised in time and space, which has the property of being a Brutus-kissing-Caesar event. On its second use, ‘event’ refers to this very event property, or event type. In what follows, I will reserve the notion ‘event’ for the first use, and the notion ‘Event’ for the second. This is a notational variant of Link (1998:299), who proposes a distinction between abstract events types and concrete processes which instantiate these events. For Link (ibid.:298), these processes are the ‘stuff’ events are made of. For me, events are the ‘stuff’ Events are made of.

As concrete instantiations of abstract Events, individual events are localised in time and space. While an event e can have at most one time and place of occurrence (and possibly one possible world of occurrence), it can instantiate different Events. It can be a member of different sets of events. For instance, an event $e_1$ of stretching out one’s arm on a bike instantiates both the Event (type) of stretching out one’s arm on a bike, and the Event of indicating the direction. Formally, this is captured by (12):

(12) $e_1 \in E_{\text{stretch out one's arm}} = \{e_1, e_2, e_3, \ldots\} \land e_1 \in E_{\text{indicate-direction}} = \{e_1, e_4, e_5, \ldots\}$

The events $e_4$, and $e_5$ in (13) do not have to be events where an arm is stretched out. They could also be events of switching on the indicator, or pointing a finger, etc. Alternative ways to capture the relation between events and Events are to say that an event can have different properties (like individuals), or that an event can satisfy different event predications.

A finite sentence without an explicit adverbial quantifier such as often expresses an existential statement about an individual event $e$. As argued above, this is the semantic result of existential closure over the event variable. This suggests that event quantification ranges over individual events, not Events. Section 1.2 will provide more evidence for this claim.

Finally, observe that there is no biunique relation between Events and sets of events. All Events are sets of events, but not vice versa. There are many disparate events which do not form an Event. Nevertheless, just like other entities of the same kind, disparate events can be combined in a set by set union. A linguistic application of this process is found in (13):

(13) The frog hopped into the pond, and a satellite was launched.

7 The assumption that an ordinary declarative clause denotes a general existential statement of the kind ‘the set of events of such and such a kind is not empty’ seems to be at odds with the intuitive feeling that such sentences are usually about particular events (with accordingly stronger truth-conditions). Translating the semantic representation from a static into a dynamic framework where the event is introduced dynamically as a discourse referent ameliorates the problem. Below, it is shown that certain phenomena in connection with events and event quantification need to be captured in a dynamic framework anyway. The resulting dynamic semantic representation is still not a statement about a particular event, but its truth-conditions are stronger than those of existential statements (see Dekker 2002).
(13) is a statement about two concrete events: the frog hopping into the pond constitutes e1; a Russian satellite being launched constitutes e2. The meaning of the entire conjunct can be formally represented as (14a), which is set-theoretically equivalent to (14b):

\[
\begin{align*}
(14) \ a. \ & \exists e_1 \in \{\text{the frog hopped into the pond}\} \land \exists e_2 \in \{\text{a satellite was launched}\} \\
& \exists E \{e_1, e_2\} : e_1 \in \{\text{the frog hopped into the pond}\} \land e_2 \in \{\text{a satellite was launched}\}
\end{align*}
\]

(14b) shows that the conjunction in (13) is equivalent to a statement about a set of events. We will see below that sets of events that are derived through sentence coordination are linguistically relevant. They provide a domain of quantification for adverbial jeweils. Nevertheless, there does not seem to be a natural event type corresponding to E in (14b).²

1.1.3. Davidson (1967) vs. Parsons (1990)

Before we go on to discuss the structure of complex events, let us look briefly at Parsons’ (1990) reanalysis of Davidson (1967), if only because Parsons-style, ‘Neo-Davidsonian’ analyses are widespread in contemporary event semantics (cf. e.g. Laserson 1995, Landman 1996, Brisson 1998). Parsons (1990) criticises Davidson’s analysis of verbs as obligatorily taking an external and/or an internal argument, apart from the event argument. Instead, he suggests a reanalysis on which the verb takes a single argument only, namely the event argument. External and internal arguments are linked to the event variable through thematic relations, as are all other optional modifiers. Consequently, sentences (3) and (6), repeated as (15ab), receive the logical representation in (16ab) respectively.

\[
\begin{align*}
(15) \ a. \ & \text{Brutus kisses Caesar.} \\
& \text{Brutus killed Caesar with the dagger in Rome on the ides of March.} \\
(16) \ a. \ & \exists e \{\text{kiss'}(e) \land AG(\text{brutus}, e) \land TH(\text{caesar}, e)\} \\
& \exists e \{\text{killed'}(e) \land AG(\text{brutus}, e) \land TH(\text{caesar}, e) \land \text{INST(ix, dagger(x), e)} \land \text{PLACE(rome, e)} \land \text{TIME(ides\textunderscore of\textunderscore March, e)}\}
\end{align*}
\]

I will try to recapitulate Parsons argument, as I understand it. First, Parsons (1990:97) concedes that Davidson’s and his analyses do not differ very much concerning their empirical coverage, but only regarding the status of the internal and external argument as obligatory or not. Parsons (ibid.:97-99) claims that Davidson’s analysis runs into problems with passive constructions such as (17a), where one of the obligatory arguments, here the external one, is not expressed overtly. In such a case, the external argument variable, which stands for the stabber, would have to be bound by existential closure on Davidson’s analysis, yielding (17b). In contrast, the external argument (the agent) is not represented in logical form at all in Parsons’ analysis in (17c).

\[
\begin{align*}
(17) \ a. \ & \text{I was stabbed.} \\
& \exists e \exists x \{\text{stabbed'}(x, I, e)\} \\
& \exists e \{\text{stabbed'}(e) \land \text{TH(I, e)}\}
\end{align*}
\]

Parsons (1990:98) argues that the Davidsonian analysis in (17b) makes a wrong prediction in the following scenario. Assume that somebody utters (18), referring to a dream that is about the unrealistic situation of having been stabbed without a stabber.

² Of course, the two events instantiate very general Event types such as ‘being an event’. But it would seem rather odd if we wanted to refer to these Event types by using (13).
(18) I had a dream last night. *I was stabbed, although in fact nobody had stabbed me,* and I was not stabbed with anything.

According to Parsons, an analysis of the highlighted passage in (18) in terms of (17b) will lead to the contradiction in (19).

(19) \( \exists e[\exists x \text{[stabbed'}(x, I, e)] \& \neg \exists y \text{[stabbed'}(y, I, e))] \)

Nonetheless, we can utter sequences like (18) without being self-contradictory. Because of this, Parsons concludes that the Davidsonian analysis in (17b) must be false and should be replaced by (17c).

Is this reasoning sound? I think not. Parsons’ argument rests on the assumption that the argument structures of active verbs and their passive counterparts are necessarily identical. This is not necessarily the case, though. It seems to me that the passive form *was stabbed* in (18) is an instance of what Williams (1981:93, see also references there) calls ‘adjectival passive’, in contrast to the ordinary ‘verbal passive’. Languages like German or Dutch, in which the two passives differ not only semantically, but also syntactically, support the parallel existence of two passive forms. Adjectival passives do not denote an action (by somebody), but a property of the subject. No agens argument is present in argument structure, which is reflected by the fact that adding a *by*-phrase is impossible (20a). In contrast, verbal passives denote a process or activity that necessarily involves an agens which is expressed (optionally) by a *by*-phrase (20b). The examples are from German.

(20) a. *Ich war* (*von Peter*) geschlagen.  b. *Ich wurde* (von Peter) geschlagen.

* I was by Peter beaten    I became by Peter beaten

'I was beaten.'        'I was beaten by Peter.'

It seems reasonable to assume that the syntactic difference derives from an underlying difference in argument structure.\(^9\) If this assumption were correct, a Davidsonian analysis would assign the following logical representations to (20ab).

(21) a. \( \exists e[\text{beaten}_1'(I, e)] \)    b. \( \exists e \exists x [\text{beaten}_2'(x, I, e) \& \text{Ag}(\text{Peter}, e)] \)

In analogy, since *was stabbed* in (18) has the semantics of an adjectival passive (it denotes the property of having been stabbed), it should get the logical representation in (22a). The corresponding paraphrase of (18) in (22b) is not a contradiction. End of argument.

(22) a. \( \exists e [\text{stabbed}_1'(I, e)] \)    b. \( \exists e [\text{stabbed}_1'(I, e)] \& \neg \exists x [\text{stabbed}_2'(x, I, e)] \)

That this analysis is correct receives further support from the fact that the German translation of (18) only forms a coherent (non-contradictory) discourse if the adjectival

\(^9\) The assumption of a difference in argument structure is supported by the existence of languages that never allow for the expression of an external argument with passive verbs. Finnish is a language in question. (i) cannot contain a modifying phrase which indicates who does the eating:

(i) Omena syödään (*Ainolla).

*a/the apple* is eaten by Aino.

It seems that Finnish passive forms generally lack an external argument in their argument structure.
passive is used, as in (23a). Use of the verbal passive (which introduces an external argument variable) makes the discourse incoherent (23b), as expected.\textsuperscript{10}

\begin{align*}
(23) & \quad \text{a. Ich war gestochen, aber niemand hatte mich gestochen. [German]} \\
& \quad \text{I was stabbed but nobody had me stabbed} \\
& \quad \text{b. Ich wurde gestochen, aber niemand stach mich.} \\
& \quad \text{I became stabbed but nobody stabbed me}
\end{align*}

Summing up, Parsons’ counterargument to Davidson’s analysis rests on the problematic assumption that passive verbs in English have the same lexical entry as their active counterparts on all their uses. We have seen that there is empirical evidence from other languages which casts doubt this assumption. If Parsons’ counterargument is invalid, the two analyses seem equivalent in terms of descriptive adequacy. However, Parsons’ analysis fails to account for the special status of internal and external argument as obligatory. It treats these on a par with optional modifiers, such as adverbials of time, place and instrument. In contrast, Davidson’s analysis captures the prominent status of external and internal arguments, which has played and continues to play an important role in generative grammar. Since the concept of thematic roles (which - according to Eckardt (2002:106) - is used by Parsons in a circular fashion anyway) plays no relevant role in this thesis, and since I want to hold on to the prominent status of external and internal arguments (as opposed to modifiers), I will go on using the original Davisonian analysis. This being said, I assume that the analysis is translatable into a Neo-Davidsonian format in a straightforward manner.

It seems, then, that events are necessary for a proper account of natural language. Events are semantic arguments of verbal predicates. Events can be referred to by natural language expressions. Events allow for a neat account of adverbial modification with manner, place, and time adverbials, and – as we shall see – events allow for a neat account of adverbial quantification, also in the case of adverbial jeweils. If no overt quantifier element is present, binding of the event argument is achieved through existential closure, usually at the level of VP as in (9).

\subsection*{1.2 The Structure of Events and the Domain of Adverbial Jeweils}

In this subsection, I show that events can be complex in different ways. This is important because jeweils will be shown to operate on parts of complex events semantically. The following discussion of event complexity forms the second step towards a proper semantic analysis of the adverbial quantifier jeweils. In particular, it will help to determine the domain of quantification of adverbial jeweils. It will be shown that adverbial jeweils ranges over pluralities of atomic events, not over their parts.

Most researchers who assume events as semantic primitives (e.g. Link 1987, Krifka 1992, Lasersohn 1995, Landman 1996, Moltmann 1997, Brisson 1998, and many others) seem to agree on the fact that events (or Events) can be complex in some way or other.

\textsuperscript{10} Even though the regular passive in English is ambiguous between adjectival and verbal passive, there is an alternative passive form that must be interpreted as a verbal passive. The form in question is the get-passive, illustrated in (i):

(i) I got stabbed (by Brutus).

Interestingly, substitution of the get-passive into the discourse in (18) leads to a contradiction:

(ii) #I got stabbed. Although nobody stabbed me.

On the analysis sketched above, this is expected. Get-passive forms always have an external argument variable in their argument structure. This variable must be existentially bound, leading to the contradiction observed.
However, often a clear distinction between individual events and pluralities of events (i.e. either Event types or, more generally, sets of events) is lacking, leading to confusion in the best case. For the following, the distinction between individual events and sets of events is crucial. It is argued that the structures of both entities differ in nature. In particular, complex individual events consist of material parts, while Events, and other random sets of events are pluralities consisting of individual (atomic) events.

At first sight, events appear to be complex in three different dimensions: the temporal dimension, the material, or ‘stuff’ dimension, and the participant dimension. The three different kinds of complexity are exemplified in (24a-c):

(24)  a. Bill slept.             temporally complex
     b. Bill ate dinner.           stuff complex
     c. Bill and Suzie sneezed.         participant complex

In (24a), the complex event of Bill sleeping consists of a (potentially) infinite number of minimal sleeping events, which add up to make up the overall sleeping event. In (24b), the stuff complex event of Bill eating dinner consists of all the smaller subevents that form part of eating dinner, i.e. pouring wine, cutting the meat, lifting the fork (the example is inspired by Brisson 1998). In (24c), the participant complex sneezing event of Bill and Suzie consists of two subevents, Bill’s sneezing and Suzie’s sneezing. As a defining characteristic, participant complex events always involve plural participants.

In each case, the subevents stand in a part-whole relation to the complex superevent. In what follows, I would like to argue that there are only two different part-whole relations involved in (24a-c). In particular, I would like to argue that temporally and stuff complex events involve the same part-whole relation. Temporal and material subevents stand in a material-whole relation to a singular superevent that could not exist without them. This relation is best illustrated with an example from the nominal domain. There, it obtains, say, between a chair and its various parts (its legs, back, seat). The parts are linked to the whole (the chair) not by virtue of having the same property, but by contributing to the material stuff (i.e. a quantity of wood, steel, etc.) that the chair consists of.

In contrast to the first two, participant subevents form the atomic parts of a pluralic superevent. In the nominal domain, this corresponds to plural formation, as in the boys, books, Peter and Mary. The crucial difference between the two kinds of complexity is that the subevents of participant complex events are atomic events themselves. As a result, we expect these atomic events, which form part of a plural structure, to be accessible to semantic processes like (adverbial) quantification. This is precisely what I will argue below. In contrast, subevents of the first kind are only relevant in terms of the material stuff they contribute to the superevent. They are not represented as independent, atomic wholes, but as parts of one singular event. Therefore, we do not expect them to be accessible to semantic processes like quantification. Drawing on our example from the nominal domain again, a numeral like six cannot combine felicitously with the singular NP chair, even though the chair in question may consist of six parts (four legs, a seat, a back).

In the next section, I look at the substructure of atomic events in more detail. In section 1.2.2, I turn to the structure of plural events.
1.2.1 Temporal and Stuff Complexity: Material Parts of Individual Events

In this section, I discuss the material part-whole relation between events. As argued in connection with (24ab), this relation holds between temporally and stuff complex events and their material parts. The smaller subevents constitute, so to speak, the event stuff of which a singular concrete event consists. The subevents form the necessary parts of that event. In the case of temporal complexity, they do so by constituting the minimal parts of an event that goes on over time. In the case of stuff complexity, they do so by constituting the smaller (event) parts of a complex event without which the event would not come into being. For instance, the specific dinner eating of Bill in the example above involves a lifting of the fork.

The temporal complexity of events has attracted considerable attention in the literature because it is the temporal substructure of an event which determines the aspect of a VP as atelic (imperfective) or telic (perfective) (e.g. Bach 1986, Krifka 1989, 1992, Verkuyl 1993). More to the point, the temporal structure of an event is determined by the temporal structure of its time of occurrence, its running time. From this, it follows that temporal complexity must be a property of concrete events, for only these are localised in time. The running time of an event and its temporal substructure are related by a homomorphism (Eckardt 2002: 112). Just like the (possibly infinitely many) individual points of time combine to make up the running time of an event, say a particular sleeping of Bill, (possibly infinitely) many individual subevents combine to make up a temporally complex event.

Of course, not every Event characterises a set of temporally complex events. For instance, it is hard to imagine that instantiations of the Event of Peter waking up at five o’clock sharp have a temporal substructure, simply because they occur in an instance and have no temporal extension. Similarly, events of the type Bill-eat-two-sausages do not consist of temporal subevents that are also of the Bill-eat-two-sausages type (although they clearly seem to consist of subevents of Bill eating, but this is a case of stuff complexity). Whether or not an event is temporally complex, depends on the aspectual properties of its Event (type), i.e. its telicity or atelicity. Krifka (1989, 1992) shows that the binary aspectual distinction into telic and atelic Events can be reduced to the following three properties of Events: Divisibility (DIV), Summativity (SUM), and being quantised (QUANT). (25) gives the definitions of DIV, SUM, and QUANT:

\[
\begin{align*}
\text{(25) a. } & \text{DIV}(E) \iff \forall e \forall e' (E(e) \& e' < e \Rightarrow E(e')) \\
\text{b. } & \text{SUM}(E) \iff \forall e \forall e' (E(e) \& E(e') \Rightarrow E(e \oplus e')) \\
\text{c. } & \text{QUANT}(E) \iff \forall e \forall e' (E(e) \& e' < e \Rightarrow \neg E(e'))
\end{align*}
\]

An Event is divisible iff it holds for all events of that type that their (temporal) subparts are events of the same type. E.g., if we divide a sleeping event (which goes on over time) in two, the resulting two events are sleeping events as well.\(^{11}\) In the nominal domain, this corresponds to the properties of mass noun denotations: the many parts that make up a body of water, are themselves water (at least, if we neglect the submolecular level). An Event is summative iff all events of that type form a complex event of the same type when

\(^{11}\) The property of (non-)divisibility lies at the heart of Dowty’s (1979) ‘imperfective paradox’. While divisible events allow for the inference in (ia), the same inference is not valid for the non-divisible, measured out event in (ib):

(i)  
\[
\begin{align*}
\text{a. } & \text{Peter is running } \Rightarrow \text{Peter has run.} \\
\text{b. } & \text{Peter is running for an hour. } \Rightarrow \text{Peter has run for an hour.}
\end{align*}
\]
combined with one another by summation (indicated by ‘⊕’). For instance, many many small sleeping events can combine to make up an extended (complex) sleeping event. In the nominal domain, this corresponds again to the denotation of mass nouns. Two bodies of water are still water. An Event is quantised iff, for all events of that type, any subpart of them is not of the original type.

How does the aspect of an Event derive from these three properties? An Event is atelic iff it is divisive and summative. An Event is telic iff it is quantised. There are two kinds of quantised Events: (i.) Events that typically occur in a single instance, as in (26a); and (ii.) originally non-quantised Events that are measured out by a definite or quantised NP-argument or by an adverbial modifier, as in (26b).

(26) Quantised Events:
   a. Bill waking up / finding the treasure. momentary
   b. Bill eating two sausages / sleeping for an hour. measured-out

It is clear that the Events in (26ab) do not satisfy both SUM and DIV. The momentary Events in (26a) fail SUM, the measured out Events in (26b) fail both SUM and DIV. A subpart of the event of Bill sleeping for an hour is not a sleep-for-an-hour event by Bill. And two events of Bill sleeping for an hour taken together do not form a sleep-for-an-hour event, but e.g. a sleep-for-two-hour event. From (25c), it follows that the Events in (26ab) are quantised, hence telic.

In contrast, the Event types of events which occur over intervals of time, and which are not measured out satisfy both SUM and DIV. They are non-quantised, hence atelic. To these belong all states and activities (or atelic processes). Examples are given in (27).

(27) Bill sleeping / singing/ running / sitting on the oven.

It is easily verified that the atelic events in (27) satisfy both DIV and SUM.

A result of the foregoing considerations is that only events of atelic Event types can be temporally complex. They inherit their complexity from the running time of the event, an interval, simply because the event in question occurs over time and is not measured out. This gives us the correspondence in (28) (with e a concrete event, and E its Event type):

(28) temporally complex (e) & E(e) ⇔ atelic (E) ⇔ DIV(E) & SUM(E)
⇔ E(e) & e extends over time and is not measured out

According to (28) an event e of type E is temporally complex iff E is atelic iff E satisfies both DIV and SUM iff e (of type E) extends over time and is not measured out. The examples in (27) are cases at hand.

As for stuff complexity, I have claimed above that this type of complexity reduces to the same material-whole relation as temporal complexity. This implies that the various subevents of Bill cutting meat, pouring wine, chewing, etc. constitute necessary subparts of a particular complex event of Bill eating dinner (depending on Bill’s eating habits they could also be the subparts of other complex events, such as Bill eating breakfast). Unlike with temporal complexity, however, the subparts of stuff complex events are not smaller events of the same kind, but they are smaller events of a different kind. The subevent of Bill cutting the meat is clearly not a Bill-eating-diner event (it is too small), nor are the other subevents. Only by combining forces, can the various subevents constitute a complex event. Looking at the chair example from above, we see that an analogous
situation obtains in the nominal domain. Parts of a chair (a leg, the back, the seat) do not constitute a chair all by themselves, but only when combined in a particular way.

Summing up, we have seen that there are two ways for an event e to form a material part of a larger event e’. The first possibility is that both events are of the same type, but the running time of the larger event e’ includes the running time of e. This situation holds for events of atelic Event types only. The second possibility is that the two events are of different types, but the smaller event e is somehow a precondition for the coming about of the larger event e’. This situation holds for events e’ which are complex in the sense that they involve a variety of events of different kinds in order to come about. In both cases, the subevents are not represented as independent atomic entities, but only as material parts of a larger whole. Their status as parts of a larger whole accounts for the fact that natural language semantic processes (including adverbial quantification) are blind to temporal and stuff subevents. This is illustrated shortly in section 1.2.3.

1.2.2 Participant Complexity: Atomic Parts of Plural Events

In the previous section, I have argued that events can form the material part of complex singular events. In this section, I investigate the nature of participant complexity, which was illustrated in (24c), repeated as (29).

(29)  Bill and Suzie sneezed.

I will argue that participant complex events involve a different part-of relation, namely an element-of relation between atomic events and pluralities of atomic events. The existence of plural events was argued for by e.g. Bach (1986). In other words, atomic events can combine into pluralic entities, just like individual books can combine into pluralities of books, or just like the atomic individuals Peter and Lucky can combine into the plurality of Peter and Lucky. Given this analogy, it should hardly come as a surprise that examples like (29), which are arguably statements about a plurality of events, display a plural nominal expression in argument position. In a way, the plurality of an event seems to be inherited from the plurality of the nominal argument, or vice versa. In any event, the correspondence does not seem to be a mere accident.

The assumption of a different internal structure for participant complex events (as opposed to temporal and stuff complex events) is based on their different behaviour regarding adverbial quantification with jeweils. The data in (30) and (31) suggest that participant complexity does not involve a material-whole relation between events, but rather a relation between atomic events and a plural event.

(30)  a. #Bill schlief. Er hatte jeweils süsse Träume. (temporally complex)
   Bill slept He had each.time sweet dreams
   # ‘Bill slept. Each time, he had sweet dreams.’
   intended: ‘Bill slept, and at each moment of his sleep he had sweet dreams.’
   b. #Bill aß Abendbrot. Er genoss es jeweils. (stuff complex)
   Bill ate dinner He enjoyed it each.time
   # ‘Bill ate dinner. Each time, he enjoyed it.’
   intended: ‘Bill ate dinner, and at all subevents (of cutting meet,…) he enjoyed it.’

(31)  Bill und Suzie niesten. Die Gäste sagten jeweils ‘Gesundheit’. (part.complex)
   Bill and Suzie sneezed. The guests said each.time ‘Bless you’
   ‘Bill and Suzie sneezed. Each time, the bystanders said “Bless you”.’
The ill-formedness of the mini-discourses in (30ab) shows that adverbial *jeweils* cannot distribute over the material parts of temporally and stuff complex events. *Jeweils* appears to be blind to the fine structure of events along the material-whole dimension. In contrast, *jeweils* is able to identify and distribute over the minimal subevents of the participant complex event in (31), indicating that *jeweils* is sensitive to the structure of participant complex events. It is reasonable to assume that the reason for this lies in a structural difference between participant complex events on the one hand, and temporally and stuff complex events on the other.

I assume that the presence of the plural subject in (31) leads to the construal of a plural event. Given this, and given the plausible assumption that the adverbial quantifier *jeweils* operates over the atomic elements of a plural event, just like adnominal quantifiers operate over the atomic subparts of pluralities of individuals, the well-formedness of (31) is accounted for. *Jeweils* distributes over a plurality of events consisting of the atomic subevents of Bill sneezing and Suzie sneezing. The semantic representation of (29) after the construal of the plural event should be along the lines in (32).

\[
(32)[\text{[Bill and Suzie sneezed]]} = \exists E [\forall x [x \in \{b, s\} \rightarrow \exists e \in E \wedge \text{sneezed}'(x, e)]]
\]

As desired, the expression on the right-hand side in (32) is an existential statement about a set of events.\textsuperscript{14}

\textsuperscript{12}The same effect is observable with other plural arguments, e.g. with the plural direct object in (i).

(i) Die Polizei spürte die Ganoven auf. Jeweils half die Bevölkerung mit Hinweisen.

The police tracked the gangsters down each time helped the population with hints.

\textsuperscript{13}On most accounts in the Generalised Quantifier tradition (Barwise & Cooper 1981), this plural entity is taken to be a set. For a different view see Matthewson (2001). Based on evidence from Straits Salish and English partitive constructions, Matthewson argues that natural language quantifiers universally range over parts of plural individuals. See the discussion in 1.2.4 below.

\textsuperscript{14}I remain deliberately vague here as to the question where plural event formation takes place in the semantic derivation of (32). One possibility is that the presence of the set of events \(E\) in (32) follows directly from the compositional interpretation of the clause, along the lines in (i) (simplified).

(i) a. \[\text{[[}\forall t_1 \text{sneezed}]] = \lambda e. \text{sneezed}'(z_1,e)\] (existential closure of \(e\))
  b. \[\text{[[}\forall t_1 \text{sneezed}]] = \exists e \in E \text{sneezed}'(z_1,e)\]
  c. \[\text{[[}\forall \text{DIST}, t_1 \text{sneezed}]] = \forall x [x \in X, \exists e \in E [\text{sneezed}'(x,e)]]\] (FA of DIST to (ib))
  d. \[\text{[[}\forall \text{DIST}, t_1 \text{sneezed}]] = \lambda X, \forall x [x \in X, \exists e \in E [\text{sneezed}'(x,e)]]\] (\(\lambda\)-abstraction over ‘i’)
  e. \[\text{[[}\text{Bill and Suzie DIST} t_1 \text{sneezed}]] = \forall x [x \in \{\text{Bill, Suzie}\}, \exists e \in E [\text{sneezed}'(x,e)]]\]

(FA to [[B. and S.]]

In (ic), the application of the Dist-operator to the distributive predicate *sneezed’* may be forced by the need to avoid a representation as *sneezed’*(\(X,e)\)), according to which a plurality of people has sneezed collectively, a state of affairs excluded by the lexical semantics of the predicate *sneeze*. Notice that existential quantification over the atomic sneezing events in (i) is restricted by a set of events \(E\) that can either be contextually bound, or (existentially) quantified over. We will encounter the restriction \(e \in E\) again below, where it is shown to play a role in multiple adverbial quantification over different event layers.

A potential problem with (ic) and (32) is that the set of events \(E\) may be too big because it is underspecified. All that is required is that \(E\) must contain the individual events of Bill sneezing and Suzie sneezing. Apart from these two events, \(E\) can contain all sorts of other events, without making (32) false. In the case of quantification with adverbial *jeweils* in (31), *jeweils* would therefore have to quantify over these other elements as well, possibly leading to wrong results.

In order to prevent \(E\) from becoming too big, one could locate the construal of the set of events \(E\) at the level of discourse representation (cf. fn.7). Kamp & Reyle (1993:309ff) argue that a semantic operation of ‘abstraction’ collects individuals in the scope of a (universal) quantifier, turning these into a set that can be anaphorically referred to in later discourse. Sentence (ii) gives an example for the application of abstraction in the nominal domain.

(ii) Every ambassador brought one secretary along. None of *them* embarrassed his boss.
The analysis of participant complex events as pluralities of atomic events is in line with the well-known observation that participant complex sentences such as (29) are logically equivalent to conjunctions of their parts. This is shown in (33).

(33)  

Recall the assumption from section 1.1 that each atomic sentence (after existential closure) is an existential statement about an individual event. Now, we have already seen in connection with (13), repeated as (34), that arbitrary statements about individual events can be coordinated with and, no matter how disparate the events are.

(34)  The frog hopped into the pond, and a satellite was launched.

Unless we subscribe to a fatalist view of the world (in which the flap of a butterfly’s wings can cause a rainstorm somewhere else), we would not want to treat the two separate events in (34) as (material) subparts of one complex event. Instead, the coordinated structure in (34) is better viewed as an existential statement about a set of two different (and mutually independent) events, which are conjoined by set union. Generalising this reasoning, (33b) should also be about a set of two events. And by extension (because of the logical equivalence), (33a) should be about a set of two events as well.

The possibility of adverbial quantification with jeweils over participant complex events, and the equivalence in (33) thus argue for treating participant complex events as pluralities of atomic events. The idea that the respective subevents combine to form a plural event in (33a), (33b), and (34) is further supported by the fact that the German translations of (33b) and (34) are possible antecedents for adverbial jeweils.

(35)  

   b. Der Frosch hüpfte in den Teich und ein Satellit wurde gestartet. The frog hopped into the pond and a satellite was launched.

   Die Sonne strahlte jeweils vom Himmel. The sun beamed each time from the sky.

Notice finally that the treatment of participant complex events as pluralities of atomic events retains the spirit of Landman’s (1996:438) ‘unique role requirement’ (URR), which states roughly that each individual event has at most one individual satisfying each thematic role associated with it. Since participant complex events are not individual

In (ii), the plural pronoun them is most naturally construed as referring to the set of secretaries. Along the same lines, abstraction could apply to the separate events found in (id), and turn the expression into (iii).

(iii) \( \exists E \left[ E=\{e_1, e_2\} \land \text{sneeze}(\text{bill}, e_1) \land \text{sneeze}(\text{suzie}, e_2) \right] \).

Since adverbial jeweils usually picks up its restriction across sentence boundaries, the recourse to the dynamic process of abstraction seems warranted. In section 2.3, this issue is taken up again. In any event, both (i) and (iii) are statements about a set of individual events and provide an appropriate restriction for adverbial jeweils.

15 To quote Link (1998:240): “But not every such collection [of events, MZ] can in a significant sense be considered a coherent part of the world: for that to be the case it is necessary that a sum of events be closed or saturated with respect to all lawful constraints that organize reality and hold it together.”

16 Recall that sets of events need not have a ‘natural’ event type. They can be random collections of temporally and spatially disparate processes of different kinds with different participants.
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1.2.3 The Quantificational Domain of Adverbial Jeweils

The previous section has brought to light that adverbial jeweils cannot quantify over just any complex event. I have shown that adverbial jeweils is insensitive to subevent structures imposed by material-whole relations. Instead, the adverbial quantifier jeweils was argued to quantify over pluralic entities with atomic substructure. Since adverbial jeweils normally distributes over an implicit plurality of events that is not overtly expressed in the clause, the plurality must be recoverable from the linguistic context. So far, we have encountered two ways for the linguistic context to provide a plurality of events over which jeweils could quantify: (i.) by conjunction of two or more atomic sentences as in (35ab); or (ii.) by means of an atomic sentence with plural participants as in (31).

Quantification with adverbial jeweils is also possible following an adverbially quantified sentence, as in (36).

(36) John schlief fünfmal/ oft / selten. Er hatte jeweils süße Träume.

John slept five times often seldom He had each time sweet dreams

This means that we have to include adverbial quantification in our list of linguistic contexts that create pluralities of events.

The distinction between atomic events and pluralities of atomic events also helps to solve the puzzle of 'maximal' events raised by Brisson (1998). Brisson (1998:131ff.) argues that (37a), with the logical representation in (37b), can be made true by many different events.

(37) a. John ate beans.
   b. ∃e [∃y beans'(y) & ate'(john, y, e)]

According to Brisson, (37b) is made true not only by the event of John eating beans, but also by the (materially) complex event (in her terminology a ‘plural event’) of John eating beans and the Yankees’ winning the World Series in 1996. Another complex event that makes (37b) true is – according to Brisson - the event consisting of John eating the beans, of the Yankees winning the World Series, and of Nixon’s visit to China. Nevertheless,

17 The present analysis requires us to treat plural arguments of collective predicates as plural or group individuals. This leads to the analysis in (ib) for (ia).

(i) a. The boys gathered in the hallway. b. ∃e [gathered'(the_boys', e) ∧ IN(x, hallway'(x), e)]

18 Again, I assume that the plural set of events E’ that serves as the restriction for jeweils is formed by the operation of abstraction (cf. fn.14). The value for E’ in (ib) is determined on the base of the flattened discourse representation structure in (ia):

(i) a. [e element E’]<5e>[John slept in e]
   b. E’ = ∑ c: [e element E, John slept in e]

The restricting set E must be contextually given. The semantics of fünfmal ‘five times’ ensure that only maximal temporally complex sleeping events are counted.
there is a clear feeling that (37a) is only a statement about the simple event of John eating beans. So how to prevent events from becoming too big? Brisson suggests to use Kratzer’s idea of an ‘event for a proposition’ in order to solve the problem of excluding events that are too big. I would like to suggest a different approach and argue that the problem of maximal events is only apparent. It arises because Brisson does not make a distinction between materially complex events (i.e. a dinner eating by Ede), which can consist of material subparts, and plural events, which are sets of individual (possibly materially complex) events. For her, all complex events are materially complex (and consequently mereologically structured) events, which she calls ‘plural events’. As a result, the disparate events of John eating beans, the Yankees winning the World Series, and Nixon visiting China can combine to form a rather unnatural materially complex event.

I do not subscribe to this view. Citing Link (1998:240), it was already pointed out in fn. 15 that “… not every such collection [of events, MZ] can in a significant sense be considered a coherent part of the world: for that to be the case it is necessary that a sum of events be closed or saturated with respect to all lawful constraints that organize reality and hold it together”. What this means is that random collections of disparate events cannot combine to form an individual (though complex) event if they share no relevant properties (causal connection, temporal inclusion/overlap of running time, homogenous subpart etc.) in common. It follows that (37a) is not a statement about a materially complex event, but only about the individual event of John eating beans. This statement will be true in a situation containing this event regardless of whether other disparate events such as the Yankees’ victory, and Nixon’s visit form a plurality of events with it. Regarding such a plurality of events E, (37a) will be either undefined or (when interpreted distributively) false (for it is only a statement about an individual event). I conclude that the apparent puzzle of maximal events raised by (37a) disappears as soon as we discard the possibility that random collections of events can combine to form a materially complex event. Following Link, I take this to be a plausible assumption.

Observe finally, that (38) confirms the singular status of the event described by (37a). Adverbial jeweils cannot distribute over the denotation of (37a) because the latter does not introduce a plurality of events into the discourse.19

(38) #John aß Bohnen. Jeweils schien die Sonne.
    John ate beans   each time shone the sun

Summing up, it has been shown that events can be complex in different ways and that it is important to be aware of these differences. Adverbial jeweils can only quantify over participant complex events. On the natural assumption that adverbial quantifiers range over pluralities of events – just as adnominal quantifiers range over pluralities of individuals – this difference argues for a treatment of participant complex events as pluralities of atomic events. It was also shown that the plurality of events that serves as the domain of quantification for jeweils must be introduced overtly in the preceding discourse, either by the presence of a plural argument, or by sentence conjunction, or by adverbial quantification. In the normal case, adverbial jeweils picks up its domain across a sentence boundary. This makes adverbial jeweils a discourse phenomenon that should be accounted for in a dynamic semantic framework such as DRT, or Groenendijk &

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19 The only way to interpret (38), albeit marginally, is on an iterative reading, as in (i):
   (i) John ate beans repeatedly/ several times. Each time, the sun was shining.
Stokhof’s (1990, 1991) dynamic semantics. The dynamic semantic behaviour of adverbial *jeweils* is discussed in section 2.3.

1.2.4 The Structure of Plural Events

In the previous section, we have motivated the inclusion of pluralities of events into our semantic model. Without plural events, it is difficult to account for the different kinds of event complexity, as well as for the possibility of quantification over events. However, I have remained deliberately vague as to the semantic representation of such plural events that consist of two or more atomic subparts or elements – apart from the sporadic use of set theoretic terminology. The semantic literature on plurals provides us with two alternatives: Plural events could be construed as algebraic sums (Link 1983, Bach 1986). Alternatively, they could be construed as sets of atomic elements.

On the set approach, two or more atomic elements can be organized in sets, which are unordered collections of these elements. For instance, the atomic events $e_1$, $e_2$, $e_3$ can form the four sets in (39) (disallowing for singleton sets which consist of one element only):

\[
\begin{align*}
\{e_1, e_2, e_3\} & \quad \text{set union} \\
\{e_1, e_2\} & \quad \{e_1, e_3\} & \quad \{e_2, e_3\} & \quad \text{set formation} \\
e_1 & \quad e_2 & \quad e_3
\end{align*}
\]

‘Set formation’ combines the three atomic events into the three sets on the middle level. The atomic events are the members of these sets. In order to get from the middle to the upper level, we need another operation. ‘Set union’ takes the members of two sets and forms a new set with them. On the set view on plural entities, adverbial quantifiers such as *jeweils* quantify over the atomic elements of such sets of events.

On the algebraic sum approach, the operation which combines two or more atomic events into a plural event is not set formation, but (algebraic) sum formation, which is indicated by ‘$\oplus$’. Sum formation combines the atomic events into a ‘plural individual’ that has the atomic events as its atomic parts. Such plural individuals are also referred to as ‘algebraic sums’, ‘plural sums’, or ‘groups’. The three events $e_1$, $e_2$, $e_3$ can be combined into the following plural individuals, forming the semi-lattice in (40):\(^{20}\)

\[
\begin{align*}
e_1 \oplus e_2 \oplus e_3 & \quad \text{sum formation} \\
e_1 \oplus e_2 & \quad e_3 \oplus e_3 & \quad e_1 \oplus e_3 & \quad \text{sum formation} \\
e_1 & \quad e_2 & \quad e_3
\end{align*}
\]

Sum formation can apply repeatedly, forming ever larger plural individuals. The smaller individuals stand in an individual part-of relation (i-part relation) to the larger ones. On

\(^{20}\) See the appendix in Link (1998) and Szabolcsi (1997) for an introduction to Boolean structures, algebraic sums, and lattice theory.
the algebraic view on plural events, adverbial quantification ranges over the i-parts of such plural individuals.

The two representations of plural entities – as presented here – are more or less equivalent. For the purpose at hand - to give an adequate semantic account of adverbial and adnominal jeweils - both approaches will do since both can model the existence of plural events. As seen, plural events seem to be the required semantic input for the adverbial quantifier jeweils.

A potential difference between the set approach and the sum approach lies in the fact that sum formation does not change the ontological or logical type of the input. Ontologically, plural individuals, are still individuals, albeit non-atomic ones. Type-logically, plural and atomic individuals are both of type $<$e$. In contrast to this, the sets formed by set formation differ from their members both ontologically, and type-logically. Ontologically, a set of events could e.g. be an Event type, i.e. a property of events. Type logically, sets are of type $<$e,t$. They are equivalent to characteristic functions from individuals into truth-values. Repeated application of set formation leads to the formation of ever more complex set structures (sets of sets of sets of…).

Summing up, there are two possible ways to represent pluralities of atomic events (and pluralities in general). They can be treated as sets with the atomic events as their members. Or, they can be treated as plural individuals with the atomic events as their i-parts. In the literature, we find a certain bias towards the algebraic sum approach to plural individuals (cf. Bach 1986, Junker 1995, Moltmann 1997). For our purposes, it is immaterial which representation we choose, and I will alternatively speak of ‘sets’ or ‘groups’ (= plural individuals). Nevertheless, I will mostly use set theoretic notation in formalising the semantics of jeweils. One reason for this is that accounts of (adverbial) quantification commonly involve sets. The second reason is practical in nature and based on the (perhaps unjustified) assumption that most readers will be more familiar with set notation than with algebraic sum notation. The decision in favour of set theory is therefore above all a decision in favour of legibility and clarity. Nevertheless, readers are free to translate the set theoretic formulas into algebraic formulas at their own will.

1.3 The Semantics of Adverbial Quantification

Above, it was argued that adverbial jeweils denotes an adverbial quantifier, and that this quantifier ranges over pluralities of events. On the null hypothesis, this is also the case for other adverbial quantifiers, e.g. always, sometimes, usually. There is a vast literature on the topic of adverbial quantification (cf. e.g. Lewis 1975, Kamp 1981, Heim 1982, Berman 1987, Heim 1990, deSwart 1991, von Fintel 1994, Percus 2000, among many others). A large part of the literature deals with adverbial quantification in connection with so-called donkey sentences of the form (Always), if a farmer owns a donkey, he beats it. Since donkey sentences are only of marginal interest for the current discussion, and since the issues involved are rather complex and not uncontested (cf. Heim 1990 for discussion), I will set aside a detailed discussion of them for now. Instead, I will argue in this section (i.) that adverbial quantifiers must be taken to quantify over events at least in some cases; (ii.) that adverbial quantification involves the introduction of a new dependent event into the semantic representation; (iii.) that a proper account of adverbial quantification necessitates the assumption that verbal predicates can optionally come along with two event variables. An obligatory one, which is indefinite and existentially closed, and an optional one, which is bound anaphorically to the event in the restriction of the quantifier.
It seems clear that adverbial quantifiers must range over something like sets of events at least in cases where no other free variables (expressed by indefinite NPs) are present (cf. Chierchia 1992:147, Dekker 1994:16f.). Consider (41).

(41) Always/ usually/ often / sometimes when John takes a bath, he sings.

(41) is a statement about events of John taking a bath. It says that always / in most cases/ often / sometimes if there is a bath taking by John, there is also a singing by him. In other words, the adverbial quantifier takes the set of events expressed by the when-clause as its restriction, and the set of events expressed by the matrix clause as its ‘nuclear scope’ (Heim 1982). The structure of adverbial quantification is schematised in (42ab).

(42) a. $Q_{abh}$ (Restriction, Nuclear Scope)
   b. $Q_{abh} (\{[\text{John takes a bath}]\}, \{[\text{he sings}]\})$

(42) shows that adverbial quantifiers relate two arguments. In this they do not differ from adnominal quantifiers. Adverbial quantifiers also behave like adnominal quantifiers in that their arguments denote sets, in this case sets of events.

What about the truth-conditions of the adverbial quantifiers in (42)? Is (41) a unifying statement about a single event, as indicated by the logical representation (for the case of always) in (43a)? Or is (41) a statement about two disparate events that stand in a particular relation to one another? The second option is formalised in (43b). The first position is found in Kratzer (1995). The second position is essentially that found in Berman (1987), Heim (1990), and Kamp & Reyle (1993). In what follows, I argue that the second option is correct both for theoretical, and for empirical reasons. In particular, adopting (43a) will have some unwelcome consequences concerning the nature of events.

(43) a. $\forall e [\text{take}_a\text{bath}'(john, e) \rightarrow \text{sing}'(john, e)]$
   b. $\forall e [\text{take}_a\text{bath}'(john, e) \rightarrow \exists e' [R_{j}(e', e) \wedge \text{sing}'(john,e')]]$

(43a) reads as ‘Each event in which John takes a bath, is also an event in which he sings.’ In other words, two different (event) properties are ascribed to one and the same particular event $e$. (43b) reads as ‘For each event $e$ which consists of John taking a bath, there is an event $e'$ of him singing and $e'$ is related to $e$ in a certain way’. Both structures have in common that the universal quantifier binds a variable $e$ in the consequent of the material implication. I stress this fact here, because it will be relevant in connection with event-related readings of adnominal jeweils, to be discussed in chapter V. There, I argue that adnominal jeweils in subject position can also (under certain conditions) bind an event variable in the consequent, resulting in a reading that is truth-conditionally equivalent to an adverbial reading.

The difference between (43a) and (43b) is found in the consequent of the material implication. In (43a), there is only one event variable, which is bound by the universal quantifier. In (43b), an additional event variable $e'$ is introduced. This additional variable $e'$ is bound by an existential quantifier, and linked to the variable $e$ by a relation variable.

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21 Kratzer’s examples are of the type in (i). It appears plausible to assume the existence of only one event for (i).

(i) Always, when Kemal speaks Turkish, he speaks it well.

22 Berman (1987), Heim (1990), and Kamp & Reyle (1993) coin their analyses in terms of (minimal) situations rather than events.
The existential operator in (43b) is introduced by existential closure, which applies to the nuclear scope of the quantifier (Heim 1982, Kratzer 1995).

As mentioned above, I claim that (43b) is the correct semantic analysis of adverbial quantification for theoretical and for empirical reasons. Theoretically, adopting (43b) is more in line with the general quantificational scheme for donkey sentences. Consider (44).

(44) Always [if a farmer loves a donkey] [he builds it a stable].

Leaving events aside for the moment, the restriction in (44) contains two free variables (introduced by the two indefinite NPs *a farmer* and *a donkey*), while the nuclear scope contains three variables (introduced by *he*, *it*, and *a stable*). The adverbial quantifier binds the first two of these, while the last one is bound by existential closure. On a Lewis-Kamp-Heim-style analysis, this reads as follows:

(45) \( \forall x,y [(\text{farmer}'(x) \land \text{donkey}'(y) \land \text{love}'(x,y)) \rightarrow \exists z [\text{stable}'(z) \land \text{build}'(x,y,z)]] \)

Generally speaking, when the restriction of an adverbial quantifier contains \( n \) variables, and when the nuclear scope contains more than \( n \) (i.e. \( n+m \)) variables, the additional variables must be bound by existential closure. There is no way for them to be bound by the adverbial quantifier, since they lack an adequate antecedent in the restriction. Notice that the bold faced parts in (45) correspond to those in (43b). A universal quantifier binds the two variables \( x \) and \( y \) in the restriction and in the nuclear scope. In addition, an existential quantifier binds the variable \( z \), which is introduced by the indefinite expression *stable*. If we consider verbal predicates as indefinite expressions that introduce event variables, we expect these event variables to be bound by existential closure, in analogy to \( z \) in (45). This gives us the expression in (43b). The event variable \( e' \) is related to the event variable \( e \), which is bound by the adverbial quantifier, by the relation \( R \), just like \( z \) in (45) is related to the anaphorically bound variables \( x \) and \( y \) by the relation \( \text{build}' \). In other words, adopting the quantificational scheme in (43b) allows us to treat donkey sentences as a special instance of adverbial quantification without indefinite NPs, or vice versa. In any event, one semantic mechanism accounts for all the observable cases.24 By adopting (43b) as the semantic analysis of (41), we therefore achieve a maximum degree of generality.

The second reason for adopting (43b) is empirical in nature and perhaps even more compelling. As mentioned above, an adoption (43a) would imply that one particular event is ascribed two event properties. In the terminology introduced above, one and the same event belongs to two different Event types. This may be unproblematic in the case of (41), but consider the examples in (46):

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23 Relation variables that get their value from the context are found in analyses of pre- and postnominal genitives (cf. Partee 1983/97, Partee & Boroschew 1999, Barker 1998, Storto 2000). Relation variables will play an important role in the analysis of adverbial and adnominal jewell to be presented below.

24 This holds even for the analysis of donkey sentences in Heim (1990), who treats them in terms of quantification over situations plus an E-type strategy that resolves the anaphoricity of the pronouns in the nuclear scope by means of copying parts of the restriction into the nuclear scope. Without going into details, an analysis of (45) along the lines in Heim (1990) would run as follows:

(i) \( \forall \delta [\exists x \text{man}'(x,\delta) \land \exists y \text{donkey}'(s,y) \land \text{love}'(s,x,y)] \rightarrow \exists z [s \leq s' \land \exists x \text{stable}'(x) \land \text{build}'(s',x,\delta) \land \exists y \text{donkey}'(s',y) \land \exists z \text{man}'(s',z)] \)

The newly introduced variables \( s' \) and \( z \) are bound by an existential quantifier. In addition, the newly introduced situation variable \( s' \) is related to the anaphorically bound situation variable \( s \) by means of the subpart relation \( \leq \).
(46)  a. Always/ usually/ often, when John sings, Mary leaves.
    b. Always/ usually/ often, when the wind blows, a window breaks.
    c. Always/ usually/ often, when Mary leaves, John leaves five minutes later.

On the analysis in (43a), (46a-c) receive the logical representations in (47a-c) (illustrated for always).

(47)  a. \( \forall e \ [\text{sing'(john, e)}] \rightarrow [\text{leave'(mary, e)}] \)
    ‘All events e that are singing events by John are also leaving events by Mary.’

b. \( \forall e \ [\text{blow'(t{x.wind'(x', e)}, e)}] \rightarrow [\exists y \text{window'(y)} \land \text{break'(y, e, e)}] \)
    ‘All events e that are wind blowing events are also window-breaking events.’

c. \( \forall e \ [\text{leave'(mary, e)}] \rightarrow [\text{leave'(john, e)} \land \text{later'(e, e, 5minutes)}] \)
    ‘All events e which are leaving events by Mary are also leaving events by John and take place five minutes later (than what?).’

But would we really want to say that a singing event by John is simultaneously a leaving event by Mary, or that a wind-breaking event is simultaneously a window-breaking event? I think not.

First, notice that the representations in (47) violate the restriction of non-collective events to one participant per argument. If we allow the atomic events in (47) to have more than one participant, we will lose our explanation for why jeweils can only quantify over participant complex events (see section 1.2).

Second, it can be shown that the event pairs in (46) behave differently regarding modification with a manner adverbial. Following Davidson (1969), Parsons (1990) and Eckardt (1998), this is a clear indication that the two events in question are distinct. Consider what happens if the second clause in (46a) contains an event-modifying manner adverb like secretly, as in (48a). Without going into the details of event modification with manner adverbs (cf. Eckardt 1998), (48a) will have a semantic representation along the lines of (48b).

(48)  a. Always when John sings, Mary leaves secretly.
    b. \( \forall e \ [\text{sing'(john, e)}] \rightarrow [\text{leave'(mary', e)} \land \text{MANNER(secretly, e)}] \)

But now we run into a problem. Since the two events of John singing and Mary leaving are taken to be identical in (47a) and (48b), we can infer that John’s singing must also occur in secret, unnoticed by Mary. After all, the individual event e is specified as occurring in a secret manner in (48b). But this is not how (48a) would normally be interpreted, if ever. Therefore, the two events in (48a), and also in (46a), must be distinct.

Finally, notice that the scheme in (43a) cannot be implemented in (47c) at all. (47c) contains a temporal adverbial later whose semantic function is to relate the occurrence times of two successive events. Since (47c) contains only one event variable, such a relation cannot be established.

In contrast, the scheme in (43b) accounts for (46a-c) in a straightforward manner. This is shown in (49a-c).

(49)  a. \( \forall e \ [\text{[sing'(john, e)]} \rightarrow [\exists e'[ (\tau(e') = \tau(e)) \land \text{leave'(mary, e')}]]] \)
    ‘For each singing event by John e, there is a leaving event by Mary e’ that occurs at the same time as e.’
I conclude that adverbial quantification relates two events as in (43b). The bold-faced parts in (49a-c) fix the relation between the two events $e$ and $e'$. It is obvious, that the abstract relation $R$ in (43b) can take on a variety of values including identity of time of occurrence (49a), causation (49b), temporal succession (49c), but also temporal overlap, temporal inclusion, and others. I assume that $R$ is a free variable over relations whose value is fixed pragmatically by the context, and by our knowledge of how two events can relate to one another in the world, as we know it.

There is still one lose end to tie up, namely the question of how the relation variable $R$ enters the logical representation in (43b). I assume that $R$ is an event modifier that combines optionally with the lexical ‘core’ entry of a verb, e.g. in the presence of an adverbial quantifier. This is similar to other optional modifying relations, such as Eckardt’s (2002) ‘Moved-Object’, ‘Resulting-State’, and ‘Degree’ from section 1.1.1. These enter the logical representation in the presence of additional lexical material, mostly adverbial modifiers. The representation of the (optionally) modified lexical entry of the verb leave in (46a) is found in (50). The relation variable $R$ brings along an ‘old’ event variable $e$ to which it relates the event predicated by the verb. The context dependency of $R$ is indicated by the index $j$.

\[(50) \quad \lambda x \lambda e'.[\text{leave}(x,e') \& R_j(e',e)]\]

The value of $e$ in (50) can be fixed in two ways. In the presence of an adverbial quantifier, it is anaphorically related to the event expressed by the antecedent. In this case, the same adverbial quantifier binds both event variables after $\lambda$-abstraction over $e$ has applied along the lines in (50a-c). In section 2, I show how this works for adverbial jeweils. The second way to fix a value for $e$ is to assign it a value deictically. In my view, this possibility accounts for coherence phenomena across sentence boundaries. As with adverbial quantifiers, the value of $R$ is fixed contextually in (51a-c). Likely candidate values for $R$ are given in brackets.

\[(51) \quad a. \quad \text{The teacher came in. The children got up.} \quad \text{(temporal succession, causation)}
\]
\[\quad b. \quad \text{The sun is shining. The birds are singing.} \quad \text{(simultaneity)}
\]
\[\quad c. \quad \text{Bill yelled at Maria. She started to cry.} \quad \text{(causation)}\]

---

25 This scheme also holds for Kratzer’s (1995:129) sentence (ia), which seems to be about a single event, or a variation thereof in (ib):

\[(i) \quad a. \quad \text{When Mary speaks French, she speaks it well.}
\]
\[\quad b. \quad \text{When Mary speaks French, she speaks it at home.}\]

(iab) can be subsumed under the general scheme in (43b) if we assume that the relation variable $R$ can be assigned the value of the identity relation ‘$=$’. The logical representation of (ia) is given in (ii):

\[(ii) \quad \forall e[\text{speak'(mary, french, e)}] \Rightarrow e'(e = e') \& \text{speak_well'(mary, french, e')}]\]

On this view, the sentences in (iab) are special instances of a more general scheme of adverbial quantification.
It is important that the event modifier $R(e,e')$ in (50) be optional. Otherwise, we could not account for the possibility of out-of-the-blue utterances, which stand in no relation to any preceding discourse whatsoever (simply because there is no preceding discourse).

(52) Maria has called.

However, since the majority of utterances form part of a larger discoursive whole, (50) can be taken to be the norm, rather than the exception. Presumably, the different coherence relations expressable by $R$ can be summarised under the term ‘discourse relation’ from Asher (2000).²⁶

I conclude this section by summing up the semantic properties of adverbial quantification. Adverbial quantifiers take two arguments like adnominal quantifiers. Both arguments express event properties, or sets of events. Instead of ascribing two event properties to a single event, adverbial quantification relates two events $e$ and $e'$ by means of the following general scheme:

\[
(53) \quad \text{General Scheme of Adverbial Quantification:} \\
Q_{\lambda e, \lambda e'} (p)(r) = 1 \iff Q_{\lambda e} (p(e))(r(e)) = 1 \\
= 1 \iff Q_{\lambda e} (p(e))(\lambda e' [R(e, e') \land q(e')](e)) = 1
\]

(with $p,q,r$ variables over sets of events, and $r = \lambda e, \exists e' [R(e, e') \land q(e')]$)

The adverbial quantifier binds an event variable in the antecedent, and an anaphorically bound event variable in the consequent. Anaphoric binding is indicated by co-indexation. The additional event variable $e'$ in the consequent is bound by existential closure. For the sake of illustration, some values for $Q$ are given in (54).

\[
(54) \quad \text{a. } Q = \text{[[always]]} = \lambda p \lambda r. \forall e [ p(e) \implies r(e)] \\
\text{‘For all events } e, \text{ if } p(e) \text{ then } r(e).’
\]

\[
\text{b. } Q = \text{[[usually]]} = \lambda p \lambda r. [ \lambda e. (p(e) \land r(e))] > [ \lambda e. p(e) \land \neg r(e)] \\
\text{‘The number of events that are } p \text{ and } r \text{ exceeds than that are } p \text{ and not } r.$
\]

\[
\text{c. } Q = \text{[[sometimes]]} = \lambda p \lambda r. \exists e [ p(e) \land r(e)] \\
\text{‘There are some events which are both } p \text{ and } r.$
\]

Usually, the first argument $p$ is not explicitly stated, but restricts the quantifier implicitly in form of a ‘resource domain variable’ (von Fintel 1994). In such a case, $p$ simply stands for a plurality of events which is provided by the context, and which is picked up anaphorically by the adverbial quantifier. I will consequently replace the condition $p(e)$ with $e \in E$, where $E$ stands for the implicit plurality of events. The quantificational scheme illustrated in (53) and (54) will be applied to adverbial *jeweils* in section 2.

The quantifiers in (54) all take two sets of atomic events as semantic arguments. Under certain conditions, it looks as if adverbial quantifiers can also take sets of pluralities of events (i.e. sets of sets) as arguments. This happens in the case of iterated adverbial quantification, as illustrated in (55a). Sentences like (55a) involve a large amount of contextual information and interpretive effort for a felicitous interpretation. Presumably it

is for this reason that they often appear slightly strange. (55b) shows that the order of quantifiers can be reversed in many cases.

(55)  

a. Peter hat always lost sometimes.  
b. Peter has sometimes always lost.

The presence of two adverbial quantifiers leads to the construal of two event layers or event frames, one of which subsumes the other. A plausible scenario for (55a) would be one in which Peter went to the horse racing several times, and each time he placed a number of bets. The smaller event layer, quantified over by sometimes, is constituted by the number of bets that Peter places on a single racing day. The bigger event layer, quantified over by always, is constituted by the collection of Peter’s bettings on his separate visits to the racecourse. In this scenario, (55a) is true if Peter has lost a few bets on each of his visits to the racecourse. (55b) is true if Peter, on several unfortunate visits to the horse racing, has lost all of his bets.

The possibility of iterated adverbial quantification is theoretically interesting because the higher quantifier ranges over a complex event (e.g. the collection of all the bettings on an individual racecourse visit) which forms the restriction for the lower quantifier over the individual betting events. This naturally raises the question if the complex bigger event is a plurality (a set of events) as illustrated in (56a), or if it should rather be analysed as a complex individual event, with the smaller events forming material parts of the superevent. The second option is illustrated in (56b). On the latter approach, the individual bettings stand in the same relation to the collection of bettings on a given racing day, as do the individual events of cutting the meat, raising the fork, and pouring the wine to the specific dinner-eating event by John from section 1.2.

(56)  
a. \[\forall E \in E' \exists e \in E \land \text{lost'(peter', e)}\]  
   ‘For all sets of events E that are elements of a set of sets of events E’’ there is at least one event e ∈ E such that e is a losing by Peter.’

b. \[\forall e' \in E \exists e \leq e' \land \text{lost'(peter', e)}\]  
   ‘For all events e’ in E, there is at least one event e such that e is a part of e’ and e is a losing by Peter.’

Unlike the question whether pluralities should be represented as sets or as sums of events, the choice between (56a) and (56b) is not trivial, for it determines the internal structure of the complex events resulting from repeated adverbial quantification. Intuitively, this question is difficult to answer. Theoretically, however, there is an important difference between the two analyses.

Adopting (56a) with quantification over pluralities has the – at first sight - unwelcome consequence that it leads to a hierarchy of types in the representation of plural events. Additional event layers will be of ever higher semantic types, and – correspondingly – adverbial quantifiers over these higher types will have to be of a higher type, too.

In order to avoid the potential problems arising in connection with hierarchies of event types, Eckardt (1998) opts for the second strategy in (56b), which treats higher event layers as complex individual events consisting of material subparts. As a result, repeated adverbial application does not raise the semantic type of the (materially complex) events involved. For (55ab) with a singular participant, this approach gives the desired result and keeps the semantic event structure flat at the same time.
Despite this, there seems to be evidence that iterated adverbial quantification does quantify over pluralities (i.e. sets) of events, at least in some cases. Evidence for this claim comes in form of iterated adverbial quantification with plural participants, as illustrated in (57):

(57) The boys, always tₙ slept sometimes.

In section 1.2.2, it was concluded that plural participants always induce a plurality of events (at least with inherently distributive predicates like sleep), based on the semantic behaviour of adverbial jeweils. It follows that sometimes in (57) should quantify over a set of events of individual boys sleeping, and always should quantify over a higher order set of events of individual boys sleeping sometimes.27 Without this assumption, we are forced to reconsider our assumptions about the nature of participant complex events from 1.2.2, and treat them not as pluralities of events, but as materially complex events. In light of the different semantic behaviour of participant complex events and materially complex events, such a move does not seem warranted. In the discussion of the semantics of adnominal jeweils in section 4, we will encounter more examples that plausibly involve adverbial quantification over pluralities of events. Given this, I tentatively conclude that adverbial quantification can range over pluralities of events, at least sometimes.28

The treatment of iterated adverbial quantification concludes the discussion of adverbial quantification.

1.4 Stage-Level and Individual-Level Predicates and the Semantics of Jeweils

In this subsection, we turn back to the beginning and provide a refinement of the discussion of events from section 1.1. At the same time, the discussion is a further step towards the final semantic analysis of adverbial jeweils. Taking up remarks in fn.3 and at the end of section 1.1, it is shown that not every predicate introduces an event argument into the logical representation of a sentence. Based on this, adverbial quantifiers, and adverbial jeweils in particular, are shown to occur only with those predicates that introduce an event argument. This is as expected if adverbial quantifiers quantify over atomic events. Finally, the data from this section provide further support for the analysis of adverbial quantifiers as binding an event variable in their restriction and their nuclear scope.

Kratzer (1995) observes a difference between individual-level and stage-level predicates wrt adverbial quantification, the possibility to extract from subject position (in German), and the interpretation of bare plural arguments in subject position. Based on the evidence cited, Kratzer (1995) concludes that only stage-level predicates introduce an event argument, whereas individual-level predicates do not. I will quickly recapitulate her discussion concerning adverbial quantification.

The distinction between individual- and stage-level predicates goes back to Carlson (1977) and is illustrated in (58):

(58) a. Kemal speaks Turkish (on the phone right now).

b. Kemal knows Turkish.

27 On this interpretation, (57) can be paraphrased as ‘For all sets of sets of events E’, there are some sets of events E ∈ E’ such that E is a plurality of events of individual boys sleeping.

28 This conclusion implies that verbal domain and the nominal domain may differ with respect to the existence of a hierarchy of individual or event types. As shown by Schwarzschild (1992), there is no need to assume a hierarchy of types in the nominal domain, as is argued in Landman (1989).
The stage-level predicate *speak Turkish* in (58a) denotes a more transient property of Kemal. It only holds of Kemal at certain points of time. Other examples of stage-level predicates are *being furious*, *being happy*, *being asleep*. The individual-level predicate in (58b), on the other hand, denotes a property that holds of Kemal over time. Other examples of individual-level predicates are *be smart*, *be 6ft tall*, *be altruistic*.29

Now consider (59ab). In (59a), the adverbial quantifier *always* is combined with a stage-level predicate in its restriction and its nuclear scope, and the sentence is grammatical. In (59b), the adverbial quantifier is combined with an individual-level predicate, and the sentence is ungrammatical (Kratzer 1995:129).

(59)  
a. Always, [when Kemal speaks Turkish], [he speaks it well].  
b. *Always, [when Kemal knows Turkish], [he knows it well].

Interestingly, (59b) becomes grammatical if the proper noun *Kemal* is replaced with an indefinite NP (ibid.).

(60)  
Always, when a Kurd knows Turkish, he also knows Kurdish.

Kratzer accounts for the difference between (59a) and (59b), on the one hand, and between (59b) and (60) on the other, by means of the following four assumptions.

(61)  
i. Stage-level predicates introduce an event variable, individual-level predicates do not. (ibid.:131)  
ii. Indefinite NPs have no quantificational force of their own. They introduce a variable that is bound by an overt quantifier, or by existential closure. (ibid.:130)  
iii. Existential closure applies to the nuclear scope of a quantifier. It binds all non-anaphoric (i.e. free, or novel occurrences of variables in its scope. (ibid.:143)  
iv. Every quantifier Q must bind (at least one occurrence of) a variable x, both in its restriction and in its nuclear scope. (ibid.:131)

All but (61i) are independently motivated in connection with other phenomena. (61ii) is the analysis of indefinite expressions in the DRT-tradition (Kamp 1981, Heim 1982), which was already utilised in the syntactic analysis of German numeral expressions in chapter I.2.4.2. (61iii) is from Heim (1982). It was already – more or less implicitly – present in our discussion of adverbial quantification in section 1.3. (61iv) is Kratzer’s ‘Prohibition on Vacuous Quantification’. It says that quantifiers cannot apply vacuously (see also Chomsky 1982).

With (61i-iii), and using the general scheme of adverbial quantification in (53), (59ab) and (60) are analysable as in (62a-c):

---

29 Note that predicates, including predicates like *speak English* as in *Do you speak English?*, can be ambiguous between stage- and individual-level readings. The ambiguity of *be stupid* in (iab) is determined by the linguistic context, in particular the presence of *never* and *that day*:

(i)  
a. John was stupid. He never knew any answers at school.  
b. John was stupid that day. He always regretted this particular mistake. It was his only one.

In general, there is a certain amount of vagueness involved in the categorisation of particular predicates as stage- or individual-level, which is mostly based on contextual information or our knowledge of the world. See Kratzer (1995:125-126) for discussion.
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(62)  a. $\forall e \ [\text{speak}'(\text{kemal}, \text{turkish}, e) \rightarrow \exists e'[(e=e') \land \text{speaks\_well}'(\text{kemal}, \text{turkish}, e')]]$

b. $\forall e \ [\text{know}'(\text{kemal}, \text{turkish}) \rightarrow \text{know\_well}'(\text{kemal}, \text{turkish})]$

c. $\forall x \ [\text{kurd}'(x) \land \text{know}'(x, \text{turkish}) \rightarrow \text{know}'(x, \text{kurdish})]$

In (62a), the universal quantifier binds the event variable $e$ in restriction and nuclear scope, obeying the prohibition on vacuous quantification (61iv). In (62c), the universal quantifier binds an individual variable $x$ in its restriction and its nuclear scope, again obeying the prohibition on vacuous quantification. In (62b), however, there are no variables to be bound. The proper name Kemal does not introduce an individual variable, nor does the individual-level predicate know Turkish (well). This follows on Kratzer’s assumption (61i). As a consequence, the quantifier has no variables to bind, and (62b) is ungrammatical because it violates the ‘Prohibition on Vacuous Quantification’ in (61iv). Hence, the assumption that only stage-level predicates introduce event variables into the logical representation of a clause provides an account for the data in (59ab) and (60).

The ungrammaticality of (59b) remains even if we replace the individual-level predicate in either the restriction or in the nuclear scope with a stage-level predicate.

(63)  a. *Always, [when Kemal speaks Turkish], [he knows it].

b. *Always, [when Kemal knows Turkish], [he speaks it well].

(63ab) support the claim that adverbial quantifiers must bind an event variable, not only in their restriction, but also in their nuclear scope. The same holds for adverbial jeweils, which cannot co-occur with an individual-level predicate, as shown by (64b).

(64) a. Peter hat jeweils Finnisch gesprochen.
    ‘Each time, Peter spoke Finnish.’

b. *Peter hat jeweils Finnisch gekonnt.
    ‘Each time, Peter knew Finnish.’

I conclude that jeweils behaves like other adverbial quantifiers. It cannot occur with individual-level predicates because it has to bind an event variable in its nuclear scope.

1.5  Events as External Arguments

The importance of events for quantification with adverbial quantifiers raises the question where they are located in the logical representation. In this subsection, I briefly summarise Kratzer’s argument that the event variable is the (implicit) external argument of stage-level verbs. As such it is the outermost argument of the verb, located outside the VP.

Empirical evidence for the external argument status of events comes from the interpretation of bare subjects with stage-level predicates in German. (65a) is ambiguous between a generic reading and an existential reading for the subject. In contrast, the bare subject must be interpreted generically with an individual-level predicate (cf.65b).

(63ab) are grammatical under an interpretation that treats to know as a stage-level predicate, i.e. under the assumption that one can sometimes know and sometimes not know the same thing.
(65)  a. … weil Hunde bellen.
   because dogs bark
   ‘…because dogs bark/ dogs are barking.’

b. … weil Hunde dumm sind.
   because dogs stupid are
   ‘…because there are stupid dogs.’

On the generic reading, the variable introduced by the bare subject is bound by a generic operator. On this reading, (65a) means that dogs generally bark. On the existential reading, it means that there is an event of dogs barking. On this reading, the variable introduced by the bare subject is bound by an existential operator introduced by existential closure, which applies at the edge of VP (see also Diesing 1992). In order to get into the scope of the existential quantifier, the bare subject NP must reconstruct at LF into its base position inside VP. Without reconstruction, the subject remains in its base position, and can only be bound by a generic operator. The emergence of the two readings is schematised in (66ab).

(66)  a. No reconstruction:
   \[ \text{IP} \text{dogs} \text{VP} \text{t bark} \] \( \rightarrow \) Gen, \[ \text{dogs'(x)} \] [x barks] \( \rightarrow \) generic reading

b. Reconstruction:
   \[ \text{IP} \exists \text{VP dogs bark} \] \( \rightarrow \) \( \exists_{e,x} \) [dogs'(x)] [x barks in e] \( \rightarrow \) existential reading

The possibility of an existential reading shows that the base position of the subject in (65a) must be inside the VP below the locus of existential closure. Since the external argument is by definition that argument which is base-generated outside the VP, it follows that the subject argument cannot be the external argument. It follows by exclusion that the implicit event argument must be the external event argument.

This conclusion is supported by the non-ambiguity of (65b). Stage-level predicates do not introduce an event argument. Therefore the subject NP is the external argument of the verb and must be base-generated outside the VP. It follows that the subject cannot reconstruct to a position inside the VP. Hence it cannot get into the scope of the existential quantifier at the edge of VP. And therefore the existential interpretation is impossible for (65b).

1.6 Summary
The preceding discussion has delivered the following results concerning the semantics of events in general, and the semantics of adverbial quantification and of adverbial jeweils in particular:

(67)  i. Events are semantically real (though syntactically implicit) entities. Stage-level predicates introduce them as event variables into the logical representation of sentences.

ii. The event is realised as the external argument of a stage-level predicate.

iii. Event variables can be bound in two ways: (i.) by adverbial quantifiers, or (ii.) by existential closure (in the absence of adverbial quantifiers, or in the nuclear scope of an adverbial quantifier).

iv. Events can be complex in various ways. Atomic events can form material parts of other events, or they can combine to form plural events. Adverbial
quantifiers, including adverbial jeweils, operate only over such pluralities of events, which can be represented as sets.

v. Adverbial quantifiers take two sets of events as arguments.

vi. Adverbial quantifiers, including adverbial jeweils, must bind an event variable in their restriction and their nuclear scope.

This provides the necessary background for the semantic analysis of adverbial jeweils.

2 The Semantics of Adverbial Jeweils

This section presents the semantic analysis of adverbial jeweils. The analysis is compositional, with jeweils being interpreted in its surface position. This approach is in line with methodological principle (M2): Interpret elements in their surface position if this can be done compositionally. In chapter III.1, adverbial jeweils was argued to be located in VP-adjoined position. The syntactic structure, which provides the input for interpretation, is repeated as (68).

(68) … weil [IP Peter t [VP jeweils [VP t lachte]]],

because Peter each.time laughed

The analysis is based on the assumption that adverbial jeweils is an adverbial quantifier. The relevant observations supporting this assumption are repeated in (69):

(69) i. Jeweils is distributed like adverbial quantifiers. It is adjoined to VP (or higher)

ii. Jeweils is incompatible with other adverbial quantifiers

iii. Jeweils distributes over sets of events from the preceding discourse.

iv. Jeweils binds an event variable in its nuclear scope

The semantic analysis of adverbial jeweils as an adverbial quantifier follows directly. In section 2.1, I show how the general scheme of adverbial quantification in (53) applies to adverbial jeweils. However, jeweils is argued to be a special instance of an adverbial quantifier in section 2.2. This claim is based on the special morphosyntactic shape of jeweils. In chapter III.4.2.1, the s-suffix on jeweil-s was analysed as a genitive marker that licenses a phonetically empty prepositional head. In 2.2, I argue that this empty preposition has semantic content. It provides a relation variable R that establishes a relation between two events. As shown in section 1.3, the presence of a relation variable in the semantic representation must be assumed for adverbial quantification anyway. In my view, jeweils differs from other adverbial quantifiers in that it contributes the relation variable itself. In section 2.3, I discuss the context dependency of jeweils. In particular, I will support the view that the morpheme –weil- denotes a pronoun over sets of individuals. Arguments for this claim come from the parallel behaviour of jeweils and the plural pronoun sie 'they' regarding their discourse anaphoric properties. Finally, I show that the semantic analysis of adverbial jeweils accounts for all its syntactic properties, which were laid out in chapter III.1.
2.1 Interpreting adverbial jeweils

As a quantifier, adverbial jeweils requires a restriction and a nuclear scope argument semantically. In chapter III.4.2.2, it was shown that adnominal jeweils has incorporated its restriction in form of the proform –weil-. The proform refers to a set of entities over which adnominal jeweils distributes. It is natural to assume that the same holds for adverbial jeweils.31 In the case of adverbial jeweils, the proform –weil- refers to a set of events that is recoverable from the preceding discourse. As with adnominal jeweils, the quantificational force lies in the quantifier je-.

This assumption together with the general scheme of adverbial quantification from section 1.3 allow for a first representation of the meaning of adverbial jeweils as in (70).

In section 2.2, the expression in (70) will be subject to a slight revision.

(70) The Interpretation of Adverbial Jeweils (to be revised):

\[
[[\text{jeweils}]] = \lambda_{x<e_1,e_2>.} \forall e [e \in E \Rightarrow T(e)]
\]

As indicated by the subscript, the semantic type of adverbial jeweils is \(<<v, \Delta v, \Gamma>\). This makes adverbial jeweils a generalised quantifier in the domain of events. A typical argument of this generalised quantifier is of the form \(\tau = \lambda e. \exists e' [R(e, e') \land q(e')]\), which is a set over events. This shows that adverbial jeweils does not directly combine with the VP-denotation even though VP is the syntactic sister of jeweils. Two semantic processes must apply at the level of VP before a composition with the meaning of jeweils is possible. The first is existential closure of the event variable \(e'\) that is introduced by the main verb. From Diesing's 'Mapping Hypothesis', which states that the VP-denotation is mapped into the nuclear scope of a quantifier, and the assumption that existential closure applies to the nuclear scope (Heim 1982, Kratzer 1995), it follows that existential closure applies at the VP-level under normal circumstances. The existentially closed VP-denotation provides the input for the second semantic process that must apply. This process involves \(\lambda\)-abstraction over an event variable that is co-indexed with the syntactic sister of VP, i.e. jeweils. The process of \(\lambda\)-abstraction over indices of syntactic sisters has been argued for in Bittner (1994). The interpretation of moved elements by means of \(\lambda\)-abstraction over the moved element's index, as explicated in Heim & Kratzer (1998) is only a special instance of this rule. We will later encounter this semantic operation in another context, and discuss it in more detail. For the time being, I assume its application without further argument.

(71) and (72) illustrate how the meaning of (68) is derived in a step-by-step procedure. Numbers on the nodes in the tree show where the respective semantic process applies:

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31 The claim that the restriction of adverbial quantifiers is realised (morpho-)syntactically, is not new. Doetjes (1997:226f.) observes that adverbial quantifiers in French, Dutch, and English are often morphologically complex, with the second part being nominal in nature: Compare French tous-jours (all-days) ‘always’, English some-times, and Dutch dik-wijls (manifold-while+GEN) ‘often’. Note that Doetjes’ analysis of Dutch dikwijls matches our analysis of jeweils.
(72) a. $1 = \lambda x \lambda e'. R_j(x, e') \land laughed'(x, e')^{32}$ = [[]laughed]
    b. $2 = x_1$
    c. $3 = \lambda e'. \exists e' [R_j(x_1, e') \land laughed'(x_1, e')]
    d. $4 = \forall e [R_j(x, e') \land laughed'(x_1, e')]$
    e. $5 = \lambda x_1. \exists e' [R_j(x_1, e') \land laughed'(x_1, e')]
    f. $6 = \lambda e. \forall e [e \in E \Rightarrow R_j(x_1, e')]
    g. $7 = \forall e [e \in E \Rightarrow \exists e' [R_j(x_1, e') \land laughed'(x_1, e')]]$
    h. $8 = \lambda x_1. \forall e [e \in E \Rightarrow \exists e' [R_j(x_1, e') \land laughed'(x_1, e')]]$
    i. $9 = \lambda e. \exists e' [R_j(x_1, e') \land laughed'(x_1, e')]$
    j. $10 = \forall e [e \in E \Rightarrow \exists e' [R_j(x_1, e') \land laughed'(x_1, e')]]$

(72j) is true iff for all events $e$ that are elements of a given set (of events) $E$, there is an event $e'$, such that $e'$ stands in a (contextually determined) relation $R$ to $e$, and $e'$ is a laughing by Peter. This adequately captures the truth-conditions of (68).

Despite its yielding a correct result, the analysis of adverbial jeweils will be subject to a slight revision in the next section. The revised analysis will not affect the overall result of the semantic derivation, but only the way of getting there.

### 2.2 Adverbial jeweils as a Double Quantifier

Motivation for a revision of the above analysis comes from the special morphological shape of jeweils, which is marked for genitive case. In chapter III.4.2.1, it was argued that genitive case on jeweil- licenses an empty prepositional head in line with Emonds’ (1987) Invisible Category Principle. The internal structure of jeweils is presented again as (73).

(73) $[\text{PP} \text{P}^0 [\text{QP} \text{je} [\text{NP weil}]-s]]$

The PP-status of adverbial jeweils is not surprising, given the existence of overt PP-adverbials in German. $^{33}$ (74a-c) repeat examples with locative, temporal, and instrumental PP-adverbials respectively.

(74) a. $[\text{PP} \text{an} [\text{DP} \text{diesem Abend}]]$
    b. $[\text{PP} \text{in} [\text{DP} \text{Hamburg}]]$
    c. $[\text{PP} \text{mit} [\text{DP} \text{dem Messer}]]$

32 See the discussion in connection with (50) for the status of $R$ as an optional modifier to the verb.
33 Analogous proposals to explain all adverbials on the basis of prepositional phrases are found in Steinitz (1969:72) and Bartsch (1976:362).
In (74a-c), the prepositions contribute to the meaning of the PP. They specify whether a locative, or temporal, or instrumental relation is established between an event and the individual denoted by the DP. It therefore appears plausible that the empty prepositional head in (73) also contributes to the overall meaning of the PP-adverbial. This means that $P^0$ should introduce a relation into the meaning of jeweils. In the absence of any phonological features that could specify a particular relation, I assume that $P^0$ is reduced to its core prepositional meaning. It provides a free relation variable $R$. $R$ is assigned its value from the context. Since adverbial jeweils is an adverbial quantifier relating two sets of events, we expect $R$ to establish a relation between two events, in line with the general scheme of adverbial quantification in (54). However, since $R$ is a transitive relation, it must come along with two event variables, only one of which (the ‘old’ event) is bound by the universal quantifier. I conclude that the ‘new’ event variable must be bound by an existential quantifier in the nuclear scope of the universal quantifier. The revised lexical entry for adverbial jeweils is found in (75), with the newly added meaning components highlighted in bold.

(75)  The Interpretation of Adverbial Jeweils (final version): 

$$[[ P^0 \text{jeweils}_i ]] = \lambda q_{\forall v,t}. \forall e [ e \in E \rightarrow \exists e' [ q(e') \land R(j,e') ]]$$

The existential quantifier which binds the additional event variable $e'$, and the relation variable $R$ are familiar from the general scheme of adverbial quantification in (54), and from the first lexical entry for adverbial jeweils in (70). Their presence is semantically motivated. The only difference between (70) and the revised representation in (75) is the source of existential quantifier and relation variable. In connection with (54), it was assumed that $R$ was added to the verb meaning as an optional modifier whose basic function is to establish discourse coherence. The existential quantifier was introduced at the VP-level in the presence of the adverbial quantifier in order to bind the event variable of the verb. In contrast, both relation variable and existential quantifier are part of the semantics of the sequence $P^0$+jeweils in (75), which I take to be a lexicalised semantic unit. Since the introduction of relational modifier and existential closure at the VP-level were triggered by the presence of the adverbial quantifier on the old approach anyway, locating them as part of the semantics of jeweils only seems logical. In addition, the revised representation in (75) accounts for the genitive morphology on adverbial jeweils, and allows it to combine directly with the VP-denotation. Existential closure and $\lambda$-abstraction at the VP-level (steps 4 and 5 in the derivation in (72)) become unnecessary. I take this to be sufficient reason for treating adverbial jeweils as a double adverbial quantifier that has an existential quantifier in the nuclear scope of the universal quantifier.

On the revised semantic analysis of adverbial jeweils in (75), the derivation of the meaning of (68), repeated as (76), proceeds as shown in (77):

(76) a. … weil [IP Peter$_1$ [VP jeweils [VP$_1$ t$_1$ lachte]]].

because Peter each.time laughed
(77a) 1 = λxλe. laughed’(x,e’)
   = [[laughed]]

b. 2 = x₁
   meaning of trace

c. 3 = λe’. laughed’(x₁,e’)  = [[VP]]
   FA

d. 4 = λqᵥᵥᵥᵥᵥ. ∀e [e∈E₁ → ∃e’ [laughed’(x₁,e’) ∧ R(e,e’)]]
   = [[jeweils.]] = (75)
   FA

e. 5 = ∀e [e∈E₁ → ∃e’ [laughed’(x₁,e’) ∧ R(e,e’)]]
   λ-abstraction over ‘₁’
   = [[Peter]]
   FA

f. 6 = λx₁. ∀e [e∈E₁ → ∃e’ [laughed’(x₁,e’) ∧ R(e,e’)]]
   λ-abstraction over ‘₁’
   = [[Peter]]
   FA

g. 7 = peter

h. 8 = ∀e [e∈E₁ → ∃e’ [laughed’(peter,e’) ∧ R(e,e’)]]
   FA

(77h) is true iff for all events e that are elements of a given set (of events) E, it holds that there is an event e’, such that e’ stands in a (contextually determined) relation R to e, and e’ is a laughing by Peter. The truth-conditions are the same as for (72j) above. This shows that the derivation with the revised meaning of jeweils has the same output as the one using the general scheme of adverbial quantification. At the same time, the revised analysis of adverbial jeweils puts fewer burdens on the compositional component, which combines the meanings of syntactic constituents. This is reflected by the fact that the derivation in (77) comprises fewer steps. The simplification in the compositional component is bought at the price of locating more meaning components in the meaning of adverbial jeweils itself. In particular, it involves adding a relation variable and treating adverbial jeweils as a double quantifier that introduces an existential quantifier over events. As seen, the first move is motivated independently by overt morphological case on jeweils. The relation variable is provided by the empty preposition P⁰. The second move follows from the first, since the additional event variable introduced by the relation needs to be bound in the scope of the universal quantifier. 34

Summing up, I have suggested treating adverbial jeweils as a double quantifier that contains a relation variable in its semantic representation. The analysis proposed allows for a surface compositional derivation of the meaning of sentences with adverbial jeweils. In addition, it accounts for the genitive marking on jeweils. In section 4, it will be shown that the semantic analysis of adverbial jeweils carries over to adnominal jeweils.

34 One may speculate if adverbial jeweils is the only adverbial double quantifier. Historically at least, there are other candidates if overt genitive marking is a reliable diagnostic (as argued in the main text). Grimmelshausen (17th century) consistently uses the genitive form aller-wegen (allGEN,pl-wayGEN,pl) in place of immer ‘always’. Other genitive quantifiers that are still in use in contemporary (formal) German are des öfteren (theGEN more.frequentGEN) or öfters (more.frequentGEN), meaning often. The existence of other genitive adverbial quantifiers shows that adverbial jeweils is not as exotic as appears on first sight.
2.3 The Dynamic Behaviour of Adverbial *jeweils*

This section is devoted to the context dependency of adverbial *jeweils*, for which there are two sources. The relation variable $R$ must be assigned a value from the context. And the restriction variable $E$, which ranges over a set of atomic events, must anaphorically pick up an appropriate antecedent from the preceding discourse. In the previous section, it was argued that the source of $R$ is the covert preposition $P^0$, while the source of $E$ is the pronominal element *weil*. We look first at how $R$ can get varying values depending on the context. After that, the set variable *weil* is shown to behave like other set variables found in natural language. In particular, it is shown that the context dependency observed with adverbial *jeweils* parallels that of the plural pronoun *sie* ‘they’. The latter is analysed as a variable over sets in the individual domain in Kamp & Reyle (1993). I will take the parallel behaviour of *jeweils* and *sie* as evidence for the present analysis of *jeweils*, and in particular for the pronominal status of the morpheme *weil*.

The following examples illustrate the context dependency of $R$.

(78) a. Die Jungen kamen nacheinander herein. Die Mädchen lachten *jeweils*.
    The boys came after another in the girls laughed each time
    ‘The boys came in one after the other. Each time, the girls laughed.’
b. Die Jungen machten viele Witze. Die Mädchen lachten *jeweils*.
    the boys make many jokes the girls laughed each time
    ‘The boys cracked many jokes. Each time, the girls laughed.’
c. In jedem Land fand ein Radrennen statt. Es gewann *jeweils* ein Italiener.
    In every country found a bike race place it won each time an Italian
    ‘A bike race took place in every country. An Italian won in each case.’

The value for $R$ differs depending on the context. In (78a), the two sets of events are most plausibly temporally related. In (78b), the events of girls laughing follow the events of cracking jokes (temporal relation). Alternatively, they may be caused by the first events (causal relation). Finally, *jeweils* seems to establish an inclusive relation between the bike racing events and the respective winning events in (78c). I take the examples in (78a-c) as sufficient evidence for the context dependency of *jeweils* along the relational dimension.

Turning next to the discourse anaphoric behaviour of *jeweils*, it turns out that *jeweils* is licensed in the same contexts as the plural pronoun *sie* ‘they’. These are either a plural DP or a coordination structure in the preceding clause. Examples are given in (79) and (80).

    Peter and Hans came after another in They saw tired
    ‘Peter and Hans came in one after the other. They looked tired.’
b. Peter und Hans kamen nacheinander herein. Die Mädchen lachten *jeweils*.
    Peter and Hans came after another in The girls laughed each time

(80) a. Peter, schrie und Hans sang. Sie waren sehr betrunken.
    Peter shouted and Hans sang They were very drunk
    b. Peter schrie und Hans sang, Die anderen Gäste beschwerten sich *jeweils*.
    Peter shouted and Hans sang The other guests complained each time

The parallel behaviour of *jeweils* and *sie* in (79) and (80) supports the analysis of *jeweils* as containing a set-denoting proform which is anaphorically linked to an appropriate antecedent in the context.
It is not quite clear how the antecedent of *sie* and *–weil* is identified. The interesting case is provided by (80): The plural pronoun *sie* ‘they’ is anaphorically related to a pluralic group of individuals, although these individuals are not introduced into the discourse by a single constituent. It appears that an appropriate plural value for *sie* is construed by collecting the different atomic individuals in the context and turning them into a plural entity. Whatever the exact status and working of this process, (80b) shows that a similar process applies in the domain of events.

An account of the discourse anaphoric behaviour of *jeweils* in terms of Groenendijk & Stokhof’s (1990, 1991) ‘Dynamic Montague Grammar’ does not appear to solve the problem. Groenendijk & Stokhof analyse the meaning of clauses in terms of their discourse change potential. On this analysis, every clause contains a variable \( p \) over possible continuations in its semantic representation. In addition, every ‘static’ quantifier has a dynamic counterpart that can take scope across sentence boundaries. So, if an existential quantifier were to introduce a set of events into the preceding discourse, the variable \( E \) in the semantic representation of *jeweils* could get into its scope. Unfortunately there is no overt quantificational element introducing a set of events in the first sentences in (79) and (80). To the contrary, the set of events is construed only later, out of the separate conjuncts. This shows that the anaphoric behaviour of *jeweils* cannot be accounted for by placing it in the scope of a dynamic existential quantifier over sets of events, simply because this quantifier is not present.

Instead of Dynamic Montague Grammar, I would like to propose a DRT-style account for the discourse anaphoric behaviour of *jeweils*. In order to account for the plural reference of the personal pronoun *sie* ‘they’ in (79a) and (80a), Kamp & Reyle (1993:306ff.) propose the semantic operation of ‘summation’. This operation collects several individual discourse referents from the context and turns them into a plural discourse referent. I propose that summation can also apply in the domain of events. Let us assume that each verb introduces its own event discourse referent in coordinated structures such as (80b). Summation will turn these singular discourse referents into a plural discourse referent \( E \) that can be referred to in subsequent discourse. As a result, the proform *–weil* is free to pick up \( E \) as its value. Looking back at (78), it turns out that the assumption of summation cannot account for these cases. The separate individual events are located in the scope of a universal quantifier (an overt one in (78c), and – arguably – the covert distributivity operator \( \text{DIST} \) in (78ab)) and cannot be collected by summation. For cases like these, Kamp & Reyle (1993:309ff.) propose a second semantic operation of ‘abstraction’, which is able to form a set from entities in the scope of quantifiers. If abstraction also applies in the domain of events, the discourse anaphoric behaviour of adverbial *jeweils* in (78a-c) is accounted for (see also section 1.2.2, fn.14 for a related discussion).

In this section, I have discussed the context dependency of adverbial *jeweils*. The value for the relation variable \( R \) is not dependent on a specific linguistic context, and the assignment of an appropriate value depends to a great extent on the language user’s knowledge as to which relations can plausibly hold between two sets of events. In contrast, the value for the restriction variable \( E \) is denoted by the proform *–weil*, whose antecedent must be recoverable from the context. It was shown that the same contexts

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35 I simplify somewhat. To be more precise, dynamic quantifiers have a variable over possible continuations in their scope. As the discourse proceeds, the variable is replaced with the semantic representation of subsequent sentences. As a result, any free variables contained in these representations will get into the scope of the dynamic quantifier.
license the construction of antecedents for the plural pronoun *sie* and *–weil*-, supporting
the analysis of *–weil* as a proform. Finally, I have suggested that the construction of
appropriate plural antecedents for *jeweils* happens by means of the two dynamic semantic
operations of summation and abstraction from Kamp & Reyle (1993). These processes
take place at the discourse level of semantic representation and form plural events out of
individual events. The plural events can be picked up anaphorically by *jeweils*.

2.4 Accounting for the Distribution of Adverbial *Jeweils*

The semantic analysis of adverbial *jeweils* accounts for its syntactic distribution as well.
This is important because one of the underlying assumptions of this thesis is that lexical
elements occur only in positions where they can be interpreted (compositionally). It has
already been shown that adverbial *jeweils* can be interpreted in VP-adjoined position. It
still needs to be shown how *jeweils* can also be interpreted in higher positions, namely in
IP-adjoined position or in SpecCP, and why it cannot be interpreted in lower positions,
that is, inside VP.

I will start by recalling why adverbial *jeweils* can be interpreted in VP-adjoined
position. Adverbial *jeweils* denotes a generalised quantifier over events. It is of type
<<v,t,t>> and needs an argument of type <<v,t,t>>, i.e. a set of events. This type is the logical
type of VPs on the subject internal hypothesis. That VPs uniformly denote sets of events
follows on Kratzer’s claim that the event argument is the external argument of the verb,
which – by definition – must be realised outside the verb’s maximal projection. Since the
VP-denotation is of the right type to serve as semantic argument for the meaning of
*jeweils*, the two expressions can combine by functional application.

It also follows from the external argument status of the event argument that adverbial
*jeweils* cannot be located inside VP, say adjoined to V (81a), or adjoined to V’ (81b).

(81) a. */[vp tsubj [v· DO [v jeweils V]]]
   b. */[vp tsubj [v· jeweils [v· DO V]]]

The semantic type of the bare transitive verb in (81a) is <<e<v,t,t>>>. Transitive verbs
establish a ternary relation between two individuals (subject and object) and an event. The
semantic type of the verb is not of the right kind to combine with the quantifier meaning
of *jeweils*, resulting in type mismatch. By the same token, adverbial *jeweils* cannot be
interpreted in V’-adjoined position in (81b). The semantic type of V’ after functional
application of the verb denotation to the object denotation is <<e<v,t,t>>>. This type cannot
serve as argument to the generalised quantifier *jeweils* either, again causing a type
mismatch. The same reasoning applies to intransitive verbs, which are of the same
semantic type as V’. The impossibility of adverbial *jeweils* inside VP therefore follows
from the semantic type of *jeweils*.

Regarding the possibility of *jeweils* to occur adjoined to IP, or in SpecCP, I assume
that *jeweils* has moved there from its base position, which is adjoined to VP. The structure
after movement is shown in (82).

(82) *[cp jeweils1 hat [ip Peter2 [vp1 t1 [vp2 t2 gewonnen]]]]
   each.time has Peter won
   ‘Each time, Peter won.’

It seems implausible that the content element *jeweils* is base generated in the functional
left periphery of the clause, which functions as the landing site of topicalised elements and
question words. Not surprisingly, jeweils in (82) has topic status, like other elements that have moved to the left periphery. (82) is interpretable on the assumption that the moved jeweils leaves behind a trace of type \(<\nu>\) (event). The situation is parallel to the situation found with moved generalised quantifiers in the individual domain, which leave behind a trace of type \(<\varepsilon>\) (individual). The meaning of (82) is composed as follows.

\[
(83) \begin{align*}
(83a) \quad [\text{VP}_2 \text{t}_2 \text{gewonnen}]] &= \lambda e. \text{won}'(x_2, e) \quad \text{FA of } [\text{VP}] \text{ to } [\text{t}_2] \\
(83b) \quad [\text{VP}_1 \text{t}_1 \text{gewonnen}]] &= \text{won}'(x_2, e_1) \quad \text{FA of (83a) to } [\text{t}_1] \\
(83c) \quad [\text{VP}_1 \text{t}_1 \text{gewonnen}]] &= \lambda x_2. \text{won}'(x_2, e_1) \quad \lambda\text{-abstraction over } '2' \\
(83d) \quad [\text{IP Peter} \text{t}_1 \text{t}_2 \text{gewonnen}]] &= \text{won}'(\text{Peter}, e_1) \quad \text{FA of (83c) to } [\text{Peter}] \\
(83e) \quad [\text{IP Peter} \text{t}_1 \text{t}_2 \text{gewonnen}]] &= \lambda e_1. \text{won}'(\text{Peter}, e_1) \quad \lambda\text{-abstraction over } '1' \\
(83f) \quad [\text{CP jeweils}_1 \text{hat Peter} \text{t}_1 \text{t}_2 \text{gewonnen}]] &= \lambda q_{\text{q,v}r}, \forall e [e \in \text{E}_i \Rightarrow \exists e' [q(e') \land R(e,e')]] \\
(83g) \quad [\text{CP jeweils}_1 \text{hat Peter} \text{t}_1 \text{t}_2 \text{gewonnen}]] &= \forall e [e \in \text{E}_i \Rightarrow \exists e' \text{[won}'(\text{Peter}, e') \land R(e,e')]] 
\end{align*}
\]

(83g) is true iff for each atomic event of a contextually determined set of events E, there is an event e’ such that Peter won in e’ and such that e’ is (temporally, causally, etc.) related to e. This adequately specifies the truth-conditions for (82), showing that adverbial jeweils can be correctly interpreted after overt movement.

2.5 Summary
Summing up, it has emerged that jeweils is compositionally interpretable in its base position, which I take to be a VP-adjoined position. Jeweils denotes a double quantifier which universally quantifies over a plurality of atomic events, and which introduces an additional event in its nuclear scope. An existential quantifier in the scope of the universal quantifier binds this new event. It is related to the event bound by the universal quantifier by means of a free relation variable R whose value is contextually determined. The relation variable is the denotation of the empty preposition P0, which forms a semantic unit with the QP jeweils. The discourse anaphoric behaviour of adverbial jeweils was put down to the anaphoric nature of the proform –weil-. The antecedent of –weil-, a set of events, is usually construed by means of the DRT operations of summation and abstraction, or some such process. Finally, it was shown that the syntactic distribution of adverbial jeweils follows directly from its semantics. Adverbial jeweils occurs only in those surface positions where it can be interpreted.

3 The Semantics of Adnominal Jeweils - Preliminaries

In the previous section, adverbial jeweils was analysed as a generalised quantifier over events. This section prepares the semantic analysis of adnominal jeweils (and its counterparts in other languages), to be presented in section 4. I start with a few remarks concerning some general objectives of the semantic analysis of adnominal jeweils in section 3.1. In section 3.2, I give an overview over existing semantic accounts of adnominal jeweils or its distance-distributive counterparts in other languages.

3.1 Desiderata for the Analysis
In chapter II, adverbial and adnominal jeweils have been shown to occur in different syntactic configurations. Adverbial jeweils is adjoined to VP. Adnominal jeweils forms
part of a complex DP. The position and internal structure of jeweils-DPs is repeated in (84ab):

(84)  a. ..., weil [IP die Jungen, [VP t₁ [DP jeweils zwei Würstchen] gekauft haben]].
    b. [DP [PP P₀ jeweils] D₀ [NP zwei Würstchen] t₂]]

In III.4.3, I have presented arguments to the extent that adnominal jeweils does not move at LF, and should therefore be interpreted in situ. This result fits in nicely with the requirements of surface compositionality and leaves us with a first desideratum for the semantic analysis of adnominal jeweils: The semantic analysis of adnominal jeweils should take surface structures as in (84ab) as its input.

A second desideratum results from the co-existence of adverbial and adnominal jeweils. We have seen that the two occur in different syntactic configurations. But from this it does not automatically follow that they differ in lexical meaning. The difference in meaning could also be due to the proposed difference in syntactic position. Such a claim has been made e.g. by von Stechow (1996) for ambiguities observed with German wieder ‘again’. Obviously, an analysis in terms of structural ambiguity that assigns adnominal jeweils a reading as close as possible to that of adverbial jeweils is to be preferred. Ideally, adnominal jeweils should be analysed as denoting a generalised quantifier as well.

On the other hand, we have to account for the d(istance)-distributive behaviour of adnominal jeweils, which poses a considerable challenge for a surface compositional analysis, and which led Choe (1987:27) to postulate a special semantic treatment of d-distributive each in English: “since s-each [= d-distributive each, MZ] is not affected by QR, it is like type 3 in that it requires special semantic interpretation.” What Choe means is that the special semantic behaviour of each (its d-distributivity, the clausemate constraint on its antecedent etc.) should be handled not in the syntactic component of the grammar, let’s say by applying QR, but by some semantic interpretation rule (ibid.:28). In section 4.2, it will become apparent that a special semantic procedure is indeed necessary for an in situ interpretation of jeweils, albeit not along the lines proposed in Choe.

The objectives of section 4 are threefold, then: First, to develop a semantic analysis for adnominal jeweils that takes surface structures as those in (84ab) as input, and that is as close as possible to that of adverbial jeweils. In addition, given the observed similarities between adnominal jeweils and its d-distributive counterparts in other languages (binominal each, French chacun(e)), we should aim at a cross-linguistically unifying analysis. A second objective is to account for the d-distributive behaviour of adnominal jeweils, in particular its occurrence together with the DistShare inside a complex DP. The third objective is to forge disparate claims that the distributive effect with d-distributive elements involves either universal quantification or a special distributive relation into a uniform account.

In brief, the analysis of adnominal jeweils in section 4 is based on the following claims:

(85)  i. It is possible to interpret adnominal jeweils in surface position.
    ii. Adnominal and adverbial jeweils have (almost) the same semantics: both are generalised quantifiers.
    iii. Distance-distributivity does not exist as an independent semantic phenomenon (follows from 85ii)
    iv. The additional semantic complexity of adnominal jeweils that leads to its d-distributive behaviour is due to the complex structure of its embedding DP.
The (all-)quantificational force observed with adnominal jeweils is due to the QP jeweil- itself. The relational part of its meaning is due to the presence of P0.

Before turning to the actual analysis, I give an overview over existing accounts of the semantics of d-distributivity, and of adnominal jeweils in particular. A discussion of the strengths and merits, as well as the weaknesses and shortcomings of the various proposals will provide a useful background for the discussion to follow.

3.2 Existing Accounts of D-Distributivity

There are not too many detailed semantic analyses of adnominal jeweils, or d-distributive elements in general. To my knowledge, four different semantic analyses have been proposed for German adnominal jeweils or its short form je: Link (1986/98), Moltmann (1991), Moltmann (1997), and Sauerland (2001).

As discussed in chapter III.2.1.2, Link (1986/98) treats adnominal je(weils) as an overt instance of the distributivity operator, i.e. as denoting a universal quantifier adjoined to VP. A number of empirical arguments against such an analysis were listed there, and I shall set Link’s approach aside.

As discussed in III.4.2.6, Sauerland (2001) treats adnominal je(weils) as a universal quantifier with deleted NP-complement, which obligatorily moves at LF. Given the empirical and conceptual arguments against movement of adnominal jeweils at LF, I will set Sauerland’s analysis aside as well.

This leaves us with the two analyses of German je(weils) in Moltmann (1991) and (1997), to which we will turn shortly. The semantic analyses of d-distributivity in other languages are, to my knowledge, equally scarce in number. Most accounts (Safir & Stowell 1988, Choe 1987, Moltmann 1991,1997) are about English binominal each. Junker (1995) is an interesting study of the semantics of French d-distributive chacun.

In the following subsections, I briefly present and criticise each analysis in turn. The purpose of these subsections is threefold: First, I will show that none of the existing analyses is surface compositional in the strict sense. Even stronger, with the exception of Moltmann (1997), none of the analyses is compositional at all. It is the non-compositionality of the existing analyses, then, which legitimates the search for a new, surface compositional analysis. At the same time, the conspicuous lack of compositional analyses underlines the problem posed for (surface) compositionality by the existence of d-distributive elements. Second, the discussion of previous analyses will bring to light that most of them suffer from other shortcomings besides their being non-compositional. Again, this is meant to motivate the search for an alternative analysis. Third, the survey of the existing analyses will bring to light that two central assumptions are found repeatedly in most analyses. The first is the contention that d-distributive elements are essentially ‘relational’ in nature. This means that their key function seems to be to establish a relation between members of the DistKey and members of the DistShare. The second assumption found in most analyses is that the distributive effect is due to the presence of a universal quantifier. Below, I argue that both assumptions are essentially on the right track. Consequently, both notions of a distributive relation and of universal quantification form part of the surface compositional analysis of jeweils to be presented in section 4.

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36 The same holds for other theories of distributivity which make crucial use of overt or covert distributivity operators, e.g. that of Roberts (1987).
3.2.1 Safir & Stowell (1988): D-Distributive Each as a Binary Quantifier

As discussed in chapter II.5.3, Safir & Stowell’s (1988) analysis of d-distributive each focuses on LF-movement. Since the authors are mainly interested in the syntax of the construction, a detailed semantic analysis is lacking. Nevertheless, a brief look at their analysis will prepare the scene for the discussion of subsequent analyses.

Safir & Stowell argue that d-distributive each is relational in nature. For them, it relates elements of the DistKey and elements of the DistShare by means of a 1:1-function. For instance, in (86), each seems to map each member of the set of boys onto a different ball such that the two stand in a kicking-relation.

(86) The boys kicked one ball each.

Formally, Safir & Stowell capture the relational nature of binominal each by treating it as a binary quantifier that quantifies over pairs of (elements of) two sets such that a particular relation obtains between the two members of the pair. The two sets are denoted by DistKey and DistShare respectively. (87) is a tentative formalisation of (86) in the spirit of Safir & Stowell (cf. the formal reconstruction of Safir & Stowell’s idea in Moltmann 1991:287):

(87) each_{binom} :<[[the boys_{DistKey}]], [[one ball_{DistShare}]]> \ (\lambda x \lambda y. y \text{kicks} x)

Given an appropriate definition for the binary quantifier each_{binom}, (87) will be true iff each element of the set of boys stands in a kicking relation with an element of the set of singletons of balls, and no two boys kick the same ball.

The semantic content of each is reflected to a certain extent in the syntactic analysis of Safir & Stowell (1988). They take each to project a QP by combining with expressions that are co-referent with DistKey and DistShare respectively. This QP is base-generated in a position adjoined to the DistShare, and then raised and adjoined to IP at LF. (88ab) show base and LF-structure (after additional LF-movement of the DistKey subject) of the construction (see chapter II.5.3 for further discussion).

(88) a. [IP the boys_i [VP kicked [DP [DP one ball_j] [OP PRO] [each_e]]]]
   b. [IP the boys_i [OP PRO] [each_e]] [t_i [VP kicked [DP [DP one ball_j] t_j]]]]

Safir & Stowell’s analysis captures some important insights into the semantic nature of d-distributive each. Nevertheless, a number of problems remain. The first problem is empirical in nature. As will be shown in connection with the discussion of Moltmann (1991) in section 3.1.3, there is reason to doubt the assumption that each always maps elements of the DistKey onto elements of the DistShare in 1:1-fashion. This is unproblematic for the semantic analysis in (87), though, which does not explicitly express the 1:1-restriction. An appropriate definition of each_{binom} should be able to solve this problem.

The second problem stems from treating each as a binary quantifier that takes a pair of sets as its first argument. It differs in meaning from D(eterminer)-each, which ranges over sets only. Stowell & Safir’s account therefore leaves us with no explanation for the formal similarity between D-each and d-distributive each. By the same token, extending Safir & Stowell’s account to German jeweils would leave us with no account for the
formal identity of adnominal *jeweils* and adverbial *jeweils*. The latter was shown to be a generalised quantifier over events in IV.2.

The third problem arises in connection with compositionality. It remains somewhat mysterious how to get to the logical representation in (87) from the LF-structure in (88b). The following questions arise in particular. How is the trace of the raised QP interpreted, or how does its value combine with the meaning of the object DP? How can the VP denote a relation, as it should if the logical representation in (87) is on the right track? In this connection, it is also not clear to me how the object argument slot can be “opened up” by λ-abstraction, without losing the descriptive content expressed by the object DP *one ball*.

Summing up, it shows that a compositional interpretation of binominal *each* is at best problematic on Safir & Stowell’s analysis, perhaps impossible. It also shows that the analysis does not allow for a uniform account of d-distributive *each* (or *jeweils* for that matter) and D-*each* on the one hand, and adverbial *jeweils* on the other. On a positive note, Safir & Stowell are the first to point out the relational character of d-distributive constructions with *each*. Let us keep this part of their analysis in mind.

3.2.2 Choe (1987): A Bipartite Analysis of D-Distributivity

Choe (1987) also stresses the relational nature of distributivity. The basic idea is to factor out the distributive meaning aspects of a sentence from its propositional content. On this view, the distributive sentence in (86) denotes a bipartite structure, namely a conjunction of two parts. The first part is the propositional meaning, the second part specifies the distributive relation.

(89)  kick’([[[the boys]], [[one ball]]]) & Dist([[the boys]], [[one ball]])

(89) says that there is a kicking of balls by the boys *and* that elements of the set of boys and elements of the set of balls stand in a distributive relation to one another. Unfortunately, Choe (1987) is forced to step back from the representation in (89) for technical reasons that need not concern us here (cf. ibid.:115). Nevertheless, he succeeds in maintaining the split between propositional and distributive aspects of a sentence’s meaning, albeit in a different form. Choe proposes to build the split into the semantic component of the grammar. On this view, the semantic component is a step-by-step procedure, which first sees the construction of a propositional core that is underspecified concerning possible distributive relations between arguments of the same predicate. On this propositional structure, a distributive relation is superimposed in a second step. Crucially, the distributive relation is restricted to co-arguments. This restriction accounts for the clausemate restriction observed with d-distributive elements in chapter II.1.7). It is important that, contrary to what Choe (1987:76) claims, the distributive relation is not factored in by means of ‘conjunction’, but rather through binding of variables by insertion of appropriate quantifiers (ibid.:114). In a third step, any remaining free variables are bound by existential closure. The resulting picture is shown in (90).

(90)  1st step:  construct the propositional core meaning
    ⇒ logical representation underspecified as to distributivity

2nd step: introduce a distributive relationship into the logical representation by inserting appropriate quantifiers, thus binding free (argument) variables

3rd step: bind the remaining free variables by means of existential closure.
    ⇒ logical representation fully specified as to distributivity
To illustrate, consider Choe’s example (91):

(91)  Two examiners marked six scripts.

(91) is at least three-ways ambiguous between the readings in (92a-c).37

(92)  a. A group of two examiners marked a group of six scripts.
    b. Each of two examiners marked a group of six scripts.
    c. Each of six scripts was marked by a group of two examiners.

The so-called ‘group reading’ in (92a) establishes no distributive relation between the two arguments of the verb. In (92b), groups of six scripts are distributed over the parts of a group of two examiners. In (92c), the inverse distributive relationship holds. Groups of two examiners are distributed over the parts of a group of six scripts. How do we get from (91) to the different readings in (92)? In Choe’s system, the first interpretive step in (90) assigns (91) the preliminary propositional meaning in (93):

(93)  M( E_2, S_6)

$E_2$ and $S_6$ are free variables introduced by the numeral indefinites in (91). $E_2$ is a variable for plural individuals consisting of two examiners. Likewise, $S_6$ is a variable for plural individuals consisting of six scripts (ibid.:111). If no distributive relation is established, step two in (90) is left out, and the two variables are bound by existential closure. This leaves us with (94) as the semantic representation for the group reading in (92a).

(94)  $\exists E_2 \exists S_6 [M( E_2, S_6)]$

When a distributive relation between the two arguments is established, step 2 in (90) applies. It introduces a universal and an existential quantifier into the representation.38 It is important that the existential quantifier always occurs to the right of the existential quantifier. Depending on which variable is bound by universal and existential quantifier respectively, we arrive at the logical representations in (95ab) (where $i$-part stands for the individual part-relation):

(95)  a. $\forall [i\text{-part}(e, E_2)]: \exists S_6 [M( e, S_6)]$
    b. $\forall [i\text{-part}(s, S_6)]: \exists E_2 [M(E_2, s)]$

(95ab) still contain one unbound variable each: $E_2$ in (95a), and $S_6$ in (95b). In step 3 of the interpretive procedure, these are bound by existential closure, as shown in (96ab):

(96)  a. $\exists E_2 [\forall [i\text{-part}(e, E_2)]: \exists S_6 [M( e, S_6)]]$
    b. $\exists S_6 [\forall [i\text{-part}(s, S_6)]: \exists E_2 [M(E_2, s)]]$

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37 Cf. Kempson & Cormack (1981) and Gil (1982b) for a more detailed discussion of such sentences and what they can mean.

38 In addition, the upper key variable bound by the universal quantifier must be replaced with a corresponding lower key variable that ranges over $i$-parts. See Choe (1987:116) for details.
(96a) is the logical representation of (92b), and (99b) the logical representation of (92c). Both formulas adequately specify the truth-conditions of (92bc).

The two core features of Choe’s analysis are the bipartition in propositional meaning and distributive meaning and the derivation of the distributive effect from the interaction of a universal quantifier and an existential quantifier in its scope. Furthermore, the analysis seems to give an adequate account of sentences of the kind in (91).

A number of problems remain, though, some of them not trivial. To begin with a technical problem, Choe’s analysis implies the existence of a potentially infinite number of variable types. This is because he does not separate the variable provided by indefinites from their descriptive content, as is done for instance in Heim (1982) or Kamp (1981). Instead of assuming one variable type for atomic individuals and another one for plural entities, he assumes the existence of variables that stand for groups of a particular kind and of a particular size. In the example above, $E_2$ is a variable that stands for groups of two examiners. That way, Choe must assume a different variable type for every possible description of a group of individuals (examiners, scripts, tables, dogs, women, man, children, professors etc.). Thus, the mechanism leads to a system with a potentially infinite number of different variables for entities of the same logical type (group or set), instead of a system in which the variables differ only with respect to the logical type (entity, set, group etc.) of the things they replace. I leave it open here, if this unwelcome consequence can be overcome, possibly by teasing apart the variable content and the descriptive content (the restriction of the variable) along the lines proposed in Heim (1982) or Kamp (1981).

Turning to the compositionality or non-compositionality of the analysis, Choe (ibid.:76, fn.2) acknowledges that his analysis of distributivity is not in line with standard compositional semantics. This is so because his analysis first factors out the distributive aspect of the meaning from the propositional content of a sentence, and brings it back in later on in the interpretive procedure. For multiply ambiguous sentences such as (91), which are plausibly analysed as being underspecified regarding distributivity, such an approach might seem feasible. First, we interpret the verb and its two arguments, which are overtly expressed. A second step factors in the distributive relation, which is not overtly expressed. It should be clear, though, that such an account runs into problems as soon as a sentence is disambiguated (for distributivity) by the presence of an overt distributive element. In (97), the presence of d-distributive each forces distribution of the object denotation over the subject denotation:

(97) Two examiners marked six scripts each.
a general instruction to the semantic component: “Whatever I form a constituent with, must be interpreted as DistShare”. Perhaps, it is because of this semantic emptiness that Choe does not feel obliged to discuss the semantics of d-distributive each in detail (cf. also Junker 1995:113).

Summing up, in Choe’s non-compositional framework it is impossible to ascribe a specific meaning to d-distributive elements such as binominal each and jeweils. In addition, the formal resemblance between D-quantifiers and d-distributive quantifiers in many languages would appear to be a mere accident. On the positive side, the distributive effect is derived from the interaction of a universal quantifier with an existential quantifier in its scope. This is reminiscent of the discussion of the semantics of adverbial jeweils in section 2, suggesting a uniform analysis of the two items. Furthermore, Choe (1987) suggests a semantic split in the construction of propositional and distributive parts of the meaning. Some special mechanism seems to be required to combine the basic meaning of the verb with the distributive meaning of the d-distributive element, which forms a constituent with the DistShare. The final analysis in section 4 will feature just such a special mechanism.

3.2.3 Moltmann (1991): A Bipartite Function Analysis

Three features of Safir & Stowell’s (1988) and Choe’s (1987) analyses are found back in Moltmann’s (1991) analysis of English d-distributive each, which is formally much more explicit than the previous two. From Safir & Stowell, we find back the analysis of each as a binary distributive quantifier, and the assumption that distribution with binominal each involves a 1:1-function from elements of the DistKey onto elements of the DistShare. From Choe, we find back the assumption that the semantic representation of sentences with binominal each is bipartite, i.e. split into a propositional and a distributive part. Both parts are joined by conjunction. The semantic representation of (98) is given in (99) (ibid.:287f.), where $P$ denotes the ‘relevant part of’-relation, $domf$ the domain of $f$, and $ranf$ the range of $f$.

\begin{align*}
(98) & \text{ The singers sang one song each.} \\
(99) & \exists e \left[ \text{sing}(e, [[\text{the singers}]], x) \land \text{songs}(x) \land \exists f \left[ \text{f is 1-1} \land \text{ranf } = \left\{ z \mid zP[[\text{the singers}]] \right\} \land \text{domf } \subseteq \left\{ [[\text{one song}]] \right\} \land f \subseteq \left\{ <z,y> \mid \exists e' \text{Pe & sing}(e', z, y) \right\} \right] \\
\end{align*}

(99) reads as ‘There is an event $e$, and an individual $x$ such that $e$ is a singing of songs by the singers and there is a function $f$ such that $f$ is a 1:1-function, its domain constituted by the set of singleton sets of songs, its range constituted by the set of singers, and $f$ relates individual singers and songs in the relation of singing.’

This treatment adds two new aspects to the discussion of d-distributivity. To begin with, Moltmann considers distributive 1:1-functions to be semantically relevant entities. The distributive effect is attributed to the 1:1-function, and not to universal quantification. I therefore refer to Moltmann’s analysis as ‘function analysis’. On this treatment, (98) involves two event layers, a lower one of individual singers singing one song, and a higher one of a complex superevent that has the individual singing events as its (material) parts. The assumption of two event layers will be found back in the semantic analysis of adnominal jeweils to come. However, as indicated at the end of section 1.3, I will capture the relation between the atomic events and the higher event level in terms of

\[39\] To be fair, the two items have no formal resemblance in Korean, on which Choe’s analysis is partly based. They do, however, in English, on which his analysis is based as well.
the element-of, rather than the material part-of relation. This is because sentences containing adnominal jeweils invariably have a plural participant because of the plurality condition on adnominal jeweils from section II.1.5. If I am correct in analysing the presence of a plural participant as indicating the presence of a plural event (see section 1.2.2), it follows directly that the presence of adnominal jeweils indicates the presence of a plural event.

Moltmann’s (1991) analysis is formally explicit and seems to adequately capture the truth conditions for sentences containing d-distributive each. In addition, the analysis incorporates events and functions as semantically significant entities. Furthermore, the analysis succeeds in giving a unified account of sentences involving d-distributive each and sentences involving event-related quantifiers. Consider (100).

(100) John wrote the book in chapters

The semantic representation of (100) is similar to that of (98) in (99). The relevant difference is that the range of the 1:1-function in (100) is not constituted by individuals participating in a superevent, but by a group of subevents of the superevent of John writing the book.

Since Moltmann’s analysis can deal with individual (i.e. participant) and event related quantifiers, it may look tempting to apply it to adverbial jeweils as well. After all, distributing over events is just what adverbial jeweils does. However, there are a number of reasons not to do so. First, it was shown in section 2 that adverbial jeweils can be analysed as an adverbial quantifier over events. There is no need, then, to replace this analysis with a more complicated analysis à la Moltmann. Second, Moltmann does not extend her analysis of binominal each to adnominal jeweils because of a purported difference between the two items concerning their scopal behaviour concerning indefinite arguments in their c-command domain. In a nutshell, Moltmann claims that such arguments obligatorily take wide scope over each in English, while they can take scope under jeweils in German.

(101) a. The men gave one flower each to two women. (ibid.:289, ex. 41.b)

‘There are two women, such that each of the men gave them a flower.’

b. Die Männer gaben je eine Blume einer Frau. (ibid.:291, ex. 45b)

the men gave each one flower one woman

‘The men gave a flower each to a different woman.’ (M.’s paraphrase)

According to Moltmann, the obligatory wide scope of the indefinite prepositional object in English is accounted for since it enters the first conjunct of the bipartite structure qua its status as argument. Being located inside the first conjunct, it cannot get into the scope of the function in the second conjunct. Since narrow scope is possible for the indirect object in German, Moltmann (1991:291) argues that the analysis of German jeweils must be different. She proposes to treat jeweils as a binary universal quantifier over individuals. I will leave aside the details of her analysis. I will also leave aside the question of whether the indefinite prepositional object must take scope over each in (101a).46 What makes

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46 Moltmann (1991:289) concedes that not all English speakers share this judgment. If so, there is no reason to treat each and jeweils in a different manner, at least not for these speakers. Alternatively, one could argue that the prepositional object is not in the c-command domain of binominal each in (101a). If so, the difference between English and German would be structural in nature.
Moltmann’s proposal somewhat unappealing as an analysis of je(weils) is that it does not allow for a unified treatment of English and German d-distributive elements. Given that the two items behave alike in many respects, this is not a welcome result.

Turning back to the formal analysis of each, observe that Moltmann’s analysis is not surface compositional. It is not clear how to get from the surface structure of (98) to the semantic representation in (99). For convenience, the two structures are repeated as (102ab).

\[(102)\]
\[\begin{align*}
\text{a. } & [\text{IP The singers } [\text{VP sang [DP one song each]]}]. \\
\text{b. } & \exists x \text{ [sing(e, [[the singers]], x) & songs(x) & } \exists f \{ 1 \text{-} 1 & \text{ ranf } = \{z\in P[[\text{the singers}]] & \text{ domf } \subseteq \{[\text{one song}] & f \subseteq \{<z,y>| \exists e’(e’P e & \text{ sing(e’,z,y))}\}]}\]
\end{align*}\]

In particular, it remains unclear what the lexical meaning of each is and how it combines with the other elements of the sentence. In addition, there are a number of technical questions of which I will mention two.

First, the value of the direct object one song enters the semantic representation in (102b) twice. In the first conjunct it provides the plural restriction songs for the variable x. In the second conjunct, it helps to define the domain of f. The question is how the object can enter the semantic composition twice, and how the plural restriction songs is abstracted from the concrete phrase one song.

The second question regards the nature of the function as being necessarily a 1:1-function. The 1:1-status is based on a claim that is repeatedly found in the literature and which was already discussed in connection with Safir & Stowell’s analysis (see also Choe 1987). According to the cited studies, d-distributive each has a property which is not shared by D-each, or floated each. D-distributive each is considered to impose a ‘co-variation’ or ‘distinctness’ condition on its DistShare. Consider (103ab):

\[(103)\]
\[\begin{align*}
\text{a. } & \text{The boys kicked one ball each.} \\
\text{b. } & \text{Each boy kicked one ball.}
\end{align*}\]

It is true that (103a) is preferably interpreted in such a way that each boy kicked a different ball, i.e. the balls vary with the kicking boys. The same does not hold for the D-quantifier each in (103b), which is ambiguous between a reading on which the same ball is kicked by all the boys (wide scope for one ball), and a reading on which different balls are kicked (narrow scope), and a number of intermediate readings. The 1:1-restriction on the function in the formal representation in (102b) is meant to capture this distinctness condition. However, Moltmann (1991:285) also observes that the distinctness condition (encoded by the 1:1-restriction) is too strong when applied to actual entities in a model. She argues, correctly I think, that (104) can be uttered felicitously in situations in which some of the films are watched by more than one child.

\[(104)\] The children watched five movies each.

In response to (104), Moltmann suggests that the distinctness condition should not hold between actual entities, but between discourse referents (Kamp 1981, Heim 1982). In other words, the use of d-distributive each in (103a) “does not imply that the actual movies are distinct, but rather that the movies as they are represented in the universe of discourse are distinct” (ibid.). Even if this explanation could be made to work, it remains unclear why the distinctness condition should still form part of the truth-conditions in
(102b). As it stands, (102b) is too strong because it excludes the existence of an overlapping reading for (104).

To conclude, Moltmann's analysis is not compositional. It leaves open the question of how the object denotation can enter the semantic representation twice (and in different form). And it makes an incorrect empirical prediction regarding the distinctness condition. In addition, the analysis does not allow for a uniform account for English each and German jeweils. On the positive side, Moltmann points out the existence of two event layers in connection with d-distributive elements.

3.2.4 Junker (1995): A Conceptual Function Analysis

Junker discusses the semantics of the French counterpart of jeweils and each, chacun(e). Her analysis is cast in the semantic framework of Jackendoff's conceptual semantics (Jackendoff 1983). In this framework, syntactic units (words and maximal projections) are mapped onto conceptual entities such as (sets of) entities, events, processes etc. Nevertheless, Junker's analysis incorporates concepts similar to those we have encountered above. In particular, she also takes a relational view on distributivity. The analysis relates elements of the conceptual counterparts of DistKey and DistShare by means of a function.

Junker analyses d-distributive chacun(e) as consisting of a distributive operator chaque and a pronominal element un(e). The pronominal element ranges over sets and denotes (is co-indexed) with the DistKey, the distributive ‘domain’ in her terminology. So far, the analysis is in line with the analysis of jeweils from chapter III, where it was argued that jeweils consists of a quantifier je, and a proform –weil-, which ranges over sets. The meaning of d-distributive chacun(e) is given in (105), with \( X \) the domain, \( Y \) the co-domain (i.e. the DistShare), and \( P \) standing for the relation 'a relevant part of':

\[
\forall x \in X \exists y \in Y \,(f(x) = y) 
\]

(105) \( \text{lexical entry for chacun(e)} \) (Junker 1995:126):

(105) reads as 'for each relevant part \( x \) of the domain (the DistKey), there is a relevant part \( y \) of the co-domain (the DistShare) such that \( x \) is mapped onto \( y \) by function \( f \).

Again, we encounter the concept of 'function' in connection with distributivity. And again, the distributive operator seems to demand two sets (here \( X \) and \( Y \)) as arguments. Presumably, the value of the domain \( X \) is identified through co-indexation of pronoun and an appropriate antecedent. The value of the co-domain \( Y \) is established structurally. It is provided by the maximal projection that forms the syntactic sister of chacun(e), or by the constituents dominated by this maximal projection. In the case of d-distributive chacun(e), which forms a constituent with the DistShare expression, it is this DistShare expression that provides the co-domain. On Junker's analysis, (106a) has the semantic representation in (106b):

(106) a. Les garçons, ont acheté [[deux livres] chacun].

(106b) a. \( \forall x \in \text{[the boys]} \exists y \in \text{[two books]} \,(f(x) = y) \)

‘For each \( x \) which forms an individual part of the group of boys, there is an individual \( y \) of the set of groups of two books, such that \( x \) is mapped onto \( y \) by function \( f \), which here is the function of ‘being bought by’ applied to \( x \).’
The paraphrase of (106b) should not be understood as a truth-condition. Rather it indicates that certain syntactic entities (here domain and co-domain) are mapped distributively onto conceptual entities such that these stand in a particular relation, e.g. a relation of buying.

The merit of Junker’s analysis lies in its unifying force regarding the semantics of D-chaque ‘D-each’, floated chacun(e), and d-distributive chacun(e). They all have the same underlying lexical entry in (105). They differ concerning the syntactic complement of the quantifier itself (D-chaque: full NP, floated and binominal chacun(e): pronominal element), and they differ concerning the syntactic sister of the entire QP (D-chaque: IP, floated chacun(e): VP, binominal chacun(e): DP). Differences in interpretation of the various elements derive from differences in the interpretation of their syntactic sisters. This highlights the importance of structural factors. Apart from providing a unified analysis for the different distributive quantifiers of French (which seems easily transferable to English), the sensitivity to syntactic structure is a second merit of Junker’s analysis. Unfortunately, compositionality does not go all the way through. Only the determination of domain and co-domain is compositional, while the function part itself is not (cf. Junker 1995:124).

3.2.5 Moltmann (1997): Binary Distributive Quantifiers - Modified

Moltmann (1997) revises her earlier analysis of d-distributive each and jeweils. These elements are still analysed as binary distributive quantifiers, but the details of the analysis have changed considerably. There are two major differences to the analysis in Moltmann (1991). First, the distributive effect is not due to the working of a 1:1-function, but results from the interaction of universal and existential quantification (as in Choe 1987). Second, adnominal jeweils is analysed as always (universally) quantifying over (parts of) events.

Moltmann’s argument for the inherent event-quantificational nature of adnominal jeweils is based on sentences like (107), which were introduced in chapter II.1.8 under the heading ‘Moltmann’s observation’.

(107) Peter hat Maria aus jeweils zwei Gründen gelobt und kritisiert.
    Peter has Maria for each two reasons praised and criticised
    ‘Peter praised and criticised Maria for two reasons respectively.’

In (107), jeweils seems to distribute over the parts of a complex event that consists of the two subevents of Peter praising Maria and Peter criticising Maria. Based on (107), Moltmann extends the analysis of adnominal jeweils as an event-quantifier to (108), which so far has been analysed as involving quantification over the DP-denotation, a plurality of children.

(108) Die Kinder bekamen jeweils ein Geschenk. (ibid.:207, ex. 108c)
    the children got each one present
    ‘The children got one present each.’

In Moltmann’s semantic system, events are assumed to be complex along the temporal, the local, and the participant dimension. According to Moltmann, jeweils targets the participant dimension in (108). jeweils distributes over a complex receiving event, which is denoted by the ‘D-term’ (= DistKey) bekamen ‘got’, and which consists of several subevents of individual children getting a present. Unlike German jeweils, English each cannot distribute over events, but only over individuals denoted by DPs (ibid.:207).
Therefore, the English counterpart of (108) is well-formed, while the English counterpart of (107) is not.

At first sight, the analysis of adnominal jeweils as a universal quantifier over parts of events looks appealing. With adverbial jeweils quantifying over parts of events as well, a single operation of event quantification seems to account for both instances of jeweils. Differences between the two occurrences of jeweils concern the context dependency of adverbial jeweils, and the way the distributive relation is established semantically. Therefore, a word of caution is in order before we go on to look at the formal implementation of Moltmann’s proposal. In the next subsection, it will be shown that an analysis of adnominal jeweils as obligatorily quantifying over events faces certain problems and should not be maintained.

Moltmann (ibid.:206) spells out the formal details of her analysis for the sentence in (109), possibly the most complex instance of adnominal jeweils that can be found. The complexity of (109) is also reflected in the final analysis proposed in section 4.3.4.

(109) Maria kritisierte und lobte jeweils zwei Bücher. (ibid.: ex. 108a)
Maria criticised and praised respectively two books
‘Maria criticised and praised two books respectively.’

According to Moltmann (1997:208), (109) has the following denotation, with s standing for situations:

\[
\lambda s. \exists x ([\text{kritisierte und lobte}]^s (e, \text{maria}, x) = 1 \& \forall e', e'' [([e' \leq s] e \land [e'' \leq s] e \land e' \neq e'']) \rightarrow \exists x', x'' ([x' \leq s] x \land [x'' \leq s] x \land [\text{zwei Bücher}]^s (x') = 1 \& [\text{zwei Bücher}]^s (x'') = 1 \land x' \neq x'' \land [\text{lobte und kritisierte}]^s (e', \text{maria}, x') = 1 \land [\text{lobte und kritisierte}]^s (e'', \text{maria}, x'') = 1)]
\]

(110) describes “situations in which there is an event e of Mary’s criticizing and praising an entity x such that for any two distinct parts e’ and e’’ of e there are two distinct groups x’ and x’’ of two books that are part of x such that e’ is a praising and criticizing of x’ and e’’ is a praising and criticizing of x’’” (ibid.).

It is unnecessary to go through all the details of (110). A few points seem worth mentioning, however. First, the bipartition into propositional content and distributive content shows up again in form of a conjunction. The main proposition is expressed by the first conjunct, the distributive relation is expressed by the second conjunct. Secondly, the descriptive content of the DistShare-DP zwei Bücher ‘two books’ enters the semantic representation only in the distributive part (unlike in the earlier version, see the discussion of Moltmann (1991) above). In the propositional part, the object to be praised or criticised is expressed by a variable x. Third, the distinctness condition is now weakened to the non-overlap condition x’ ≠ x’’, which requires any two groups of two books to be non-identical.\(^{41}\) The last two points can be seen as improvements on the earlier analysis in Moltmann (1991).

A serious problem, at least in my eyes, comes from the fact that the distribution is over parts of a complex event, but not over the descriptive content of these subevents. The three-place relation that is predicated of the triple consisting of event, Mary, and a group

\(^{41}\) This condition allows for the same book to be part of both groups of two books in principle. In other words, (109) should be also true in a situation in which Mary praises ‘Absalom, Absalom’ and ‘To kill a Mockingbird’ (for their imagery of the South) and criticises ‘Absalom, Absalom’ and ‘Moby Dick’ (for their complexity).
of two books is still complex after distribution. It still denotes a conjunction of two Event types, a praising and a criticising. Consequently, the two (distributed) subevents $e'$ and $e''$ are still events of praising and criticising, against our intuition. Moltmann sees this problem and argues that “an event can be a praising and criticizing even if it consists only of a praising or only of a criticising event” (1997:208). In other words, the truth conditions come out correctly if the second instance of [kritisierte und lobte] in (110) is applied to a praising event alone, and if the third instance is applied to a criticising event alone. Thus, (110) will be true in situations in which Mary praises two books and criticises two other books. However, with this extra assumption, the truth conditions become too weak for (109). If the conjoined relation [kritisierte und lobte] can apply to criticising or praising events in isolation, (109) will have to be true also in cases where Mary praises two books and praises two books in addition, i.e. where she praises four books in total. The same holds for Mary’s criticising four books (possibly in pairs of two), which should also come out as true. I do not see how to avoid this unwelcome consequence if we maintain that conjoined Event types can be instantiated by events that fulfil only part of the description. If we drop this additional assumption, however, the distributive effect will disappear, for then the subevents $e'$ and $e''$ (after distribution) will still be complex events of praising and criticising.

A second problem regards surface compositionality. Moltmann’s (1997) analysis is compositional in the sense that the meanings of smaller syntactic units combine to form the meanings of larger units. However, the analysis is not surface compositional because it is forced to treat subject and verb as a syntactic unit (ibid.:208). This assumption is not in line with most work on the syntactic structure of German in the generative tradition (see e.g. Fanselow 1987a, Grewendorf 1988 among others). Clearly, a surface compositional analysis, which does not treat subject and verb as forming a constituent, is to be preferred.

The biggest problem for Moltmann’s analysis lies somewhere else, though. As mentioned already, the problem comes from the general claim that adnominal jeweils always distributes over events (as arguments of verbs). In the following, I present a number of empirical arguments that cast doubt on this claim.

### 3.2.6 Adnominal Jeweils Does Not Always Distribute over Events

There are three empirical arguments which cast doubt on the assumption that adnominal jeweils always distributes over parts of events. The base line of all three arguments is the same. I show that adnominal jeweils is possible in contexts that either provide no event argument, or in which an adverbial quantifier competes for the same event argument. The possibility of adnominal jeweils in these contexts argues against an analysis as an (obligatory) event quantifier.

The first occurrence of adnominal jeweils that is not easily reconciled with an event-distributive analysis is already familiar from chapter II. There, it was shown that adnominal jeweils can occur inside a PP that is embedded inside another DP. Consider (111).

(111) Nur [DP [NP Autoren [PP von jeweils zwei Bestsellern]] wurden eingeladen.  
‘Only authors of two bestsellers were invited’

---

42 To be fair, Moltmann (1997:207) seems to assume an analysis different from the one above for jeweils in constructions like (111). Consider her comment above (107b). Unfortunately, no details are given.
In (111), jeweils seemingly distributes over a group of authors, each of whom is the author of two bestsellers. Jeweils does not distribute over the event argument of the main verb eingeladen ‘invited’. Such a construal would lead to the implausible statement that each of a group of invitations of an author involves two books. There also seems to be no event argument inside the DP over which jeweils could plausibly distribute. If a ‘hidden’ secondary event of writing was located inside the DP, (111) would incorrectly state that there is a set of writing events by a group of authors such that the individual writing events by individual authors result in two bestsellers, and that only authors involved in writing two bestsellers in one go were invited.\footnote{Even if an analysis in terms of hidden events could be made to work for (111), it is easy to find structurally parallel examples, where an analysis of the head noun in terms of a hidden event argument seems highly implausible. Consider (i):} I conclude that adnominal jeweils in (111) does not distribute over a group of events, but over a group of authors.

The second empirical argument against the analysis of adnominal jeweils as necessarily distributing over events comes from its co-occurrence with individual-level predicates. As shown in section 1.1.4, individual-level predicates do not take event arguments. It was also shown that adverbial jeweils is impossible with individual-level predicates for this reason. There is no event variable for the universal quantifier to bind in its nuclear scope. The impossibility of adverbial jeweils with individual-level predicates is shown again in (112ab):

\begin{enumerate}
\item *Die Jungen haben jeweils Finnisch gekonnt.*
\item *Die Soldaten von der 5. Kompanie waren jeweils kurzsichtig.*
\end{enumerate}

In contrast, adnominal jeweils can co-occur with individual-level predicates without problem. This is shown in (113ab), where jeweils must be taken to distribute over the plural subject DP, due to the lack of events with individual-level predicates.

\begin{enumerate}
\item Die Jungen können jeweils zwei Fremdsprachen.
\item Die Soldaten hatten jeweils nur ein Bein.
\end{enumerate}

The insensitivity of adnominal jeweils to the absence of an event argument in (113) argues against its analysis as an event quantifier, especially when contrasted with the ungrammaticality of adverbial jeweils in (112).

The final argument against an analysis of adnominal jeweils as distributing over events comes from its co-occurrence with other event quantifiers. In section 1.3, it was shown that the co-occurrence of two (or more) event quantifiers leads to additional semantic...
complexity. An extra event layer must be construed, and the higher quantifier quantifies over the restriction of the lower quantifier. Relevant examples are given in (114ab).

(114) a. The boys always slept sometimes.
   b. ?The boys sometimes always slept.

Similar facts obtain for adverbial jeweils, as shown in (115).44

(115) Die Jungen haben immer jeweils geschlafen.
the boys have always each.time slept
? ‘The boys always slept each time.’

Like its English paraphrase, (115) requires considerable interpretive effort. In my view, this is due to the fact that the plurality of the subject induces a hierarchy of event types. The lower quantifier, jeweils ‘each time’, quantifies over a plural event of the individual boys sleeping. The higher quantifier immer ‘always’ quantifies over a set of sets of events.

If adnominal jeweils quantified over events like its adverbial counterpart, we would expect the former to interact with adverbial quantifiers in the same way. In particular, we would expect the higher quantifier to quantify over the restriction of the lower, with the corresponding semantic complexity. This expectation is not borne out, as witnessed by (116).

(116) Die Jungen haben immer jeweils zwei Frauen gemocht.
the boys have always each two women liked
a. ‘The boys have always liked two women each.’
   b. ??‘The boys have always liked two women each time.’

In chapter II.2, sentences such as (116) were analysed as structurally ambiguous between an adnominal structure with an adnominal reading (116a), and an adverbial structure with an adverbial reading (116b). The adverbial reading of (116b) is very difficult to get. On the adverbial reading, (116) would be true in a situation where year after year (the effect of immer ‘always’), there are four balls, and on each of these balls (the effect of jeweils ‘each time’), each of the boys liked two women. In other words, the higher quantifier, immer, quantifies over the restriction of the lower quantifier, jeweils, which in turn must quantify over a plural event because of the plurality of die Jungen ‘the boys’ and the inherent distributivity of the predicate mögen ‘liked’.45

In contrast, the adnominal reading does not involve double quantification over a plurality of events. (116a) only states that for all plural events E (in a contextually given

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44 Note that the restricting set of events for adverbial jeweils need not be construed from the context in (115). It is provided by a plural event introduced by the higher quantifier immer ‘always’.

45 The contrast between adverbial and adnominal reading is predicted to be not so clear with predicates that allow for a collective construal, e.g. kaufen ‘to buy’. This is because events with collectively acting participants are not plural events (cf. section 1.2.1, fn.17). It follows that the higher quantifier need not quantify over a set of plural events, but only about a plural event. The prediction seems to be borne out, as witnessed by the fact that (i) allows for an adverbial reading more readily than (116).

(i) Die Jungen haben immer jeweils zwei Würstchen gekauft.
   the boys have always each.time two sausages bought
  ‘All plural events E (of relevant kind) are such that the boys have bought two sausages together in e.’

It seems, then, that the data in (116) and (i) support the claim that event quantification involves hierarchies of event types.
set of plural events $E'$), it holds that $E$ consists of the infatuations of the individual boys with two women each. The reduced interpretive complexity seems to follow from the fact that the higher quantifier immer ‘always’ does not quantify over the restriction of the lower quantifier jeweils ‘each’. Instead, both quantifiers seem to select their restriction independent of one another, which is accounted for if adnominal jeweils distributes over the set of boys (the subject denotation) in (116), and not over a set of (sets of) events. I take this as evidence that both quantifiers distribute over different entities, a set of events in the case of immer, and a set of individuals in the case of jeweils.

Summing up, this section has adduced arguments against an analysis of adnominal jeweils as obligatorily distributing over parts of events. I have presented three kinds of evidence: (i) The possibility of adnominal jeweils inside larger DPs where no event argument is accessible; (ii) the possibility of adnominal jeweils with individual-level predicates, where no event argument is present at all; (iii) the non-interference of adnominal jeweils with other event quantifiers. I conclude that adnominal jeweils is free to distribute over entities other than events.

3.3 Summary

The overview over existing analyses of d-distributive elements has delivered the following results. There is no satisfactory surface compositional analysis so far. Second, all existent analyses attribute the observable distributive effect to the interaction of universal and existential quantifier, or to a distributive relation, or both. Third, adnominal jeweils does not obligatorily quantify over events.

In the following, I present a surface compositional analysis of adnominal jeweils which treats it as a generalised quantifier on a par with its adverbial counterpart. The analysis makes use of a universal quantifier and a relational part, and it does not treat adnominal jeweils as necessarily quantifying over events. Instead, adnominal jeweils is argued not to be subject to any constraints regarding its domain of distribution. In principle, any plurality can form the restriction for adnominal jeweils.

4 Interpreting Adnominal Jeweils: The Semantics of Distance-Distributivity

The survey of previous analyses of adnominal jeweils and its counterparts in other languages has brought to light that there is no working surface compositional analysis to date. Furthermore, the discussion has suggested that a distributive relation should be present in the semantic analysis of these elements, apart from universal quantification. The semantic analysis of adnominal jeweils should therefore contain such a relational component.

The objective of this chapter is to interpret clauses containing adnominal jeweils in compositional fashion from surface structure. The structure for sentence (117a) has been identified in chapter III.4, and is repeated in (117bc). (117b) shows the structure for the entire clause on the adnominal reading. (117c) shows the internal structure of the jeweils-DP.

(117) a. ..., weil die Jungen jeweils zwei Bücher gekauft haben. 
   ‘... because the boys each two books bought have'

b. ..., weil [DP die Jungen [VP t1 [DP jeweils, zwei Bücher] gekauft haben]].

c. [DP [DP P jeweils], D [NP [NP zwei Bücher] t1]]
The semantic analysis must provide an answer to the two questions in (118):

(118) i. How is the jeweils-DP in (117c) interpreted?

ii. How does the meaning of the DP compose with the meaning of the remaining parts of the clause in (117b)?

In what follows, I will first give an answer to (118i), and then to (118ii).

As pointed out above, the two concepts of universal quantification and distributive relations play a crucial role in the analysis of jeweils-DPs. I argue below that the meaning of the constituent \([P^0 \text{jeweils}]\) provides for both - as was the case with adverbial jeweils. The quantifying element je provides the universal quantifier. The empty preposition \(P^0\) provides a relational variable \(R\). This way, the semantic values of adverbial and adnominal jeweils are identical. Adnominal jeweils differs from adverbial jeweils in that the value for \(R\) is not assigned by the context. Instead, it is provided by an overt relation-denoting element in the clause. The upshot of the discussion will be that jeweils-DPs do not denote entities of type \(<e>\), or generalised quantifiers of type \(<et, t>\), but propositions of type \(<t>\). Section 4.1 shows how this works in detail.

As for the question of how the proposition denoted by the jeweils-DP combines with the meaning of the rest of the clause, I will argue for a new semantic rule in 4.2. This semantic rule can be viewed as a more constrained version of Bittner’s (1994) rule of \(\lambda\)-abstraction. At the same time, it can be viewed as a more general version of Heim & Kratzer’s (1998) rule for interpreting moved constituents. That is, the semantic rule responsible for the interpretation of jeweils-DPs is motivated independently. As shown below, it is this rule that is responsible for assigning a value to the relation variable \(R\).

In applying the analysis to d-distributive jeweils, I adopt the strategy of simplest cases first. We begin with the interpretation of jeweils-DPs in object position of transitive individual-level predicates (cf.119a), and jeweils-DPs embedded inside another DP (119b). In both cases, jeweils occurs in an event-free environment (see section 3.2.6). The discussion then moves on to jeweils-DPs in object position of stage-level predicates, which take an event as argument. This case is illustrated by (117a) above. The presence of the event argument makes an additional assumption necessary, namely that the event argument of the verbal predicate can be bound by existential closure before the meanings of verb and jeweils-DP combine. In section 4.3, the analysis is extended to jeweils-DPs in indirect object position of ditransitive clauses (cf.119c), to jeweils-DPs inside PP-adverbials (119d), and finally to instances of Moltmann’s observation in (119ef).

(119) a. Die Jungen haben jeweils zwei Tätowierungen.
    the boys have each two tattoos
    ‘The boys have two tattoos each.’

b. Listen mit jeweils drei Namen wurden herumgereicht.
    lists with each three names were passed around
    ‘Lists with three names on (each of) them were passed around.’

---

46 See Lipták & Zimmermann (2000) and Zimmermann (to appear, a) for earlier accounts of an in situ interpretation of d-distributive jeweils. In the cited studies, the required semantics were written into the lexical entry for d-distributive jeweils. This move generated the correct overall meaning, but made a unified treatment of adverbial and adnominal jeweils impossible. In comparison, the present analysis allows for a unified analysis of adverbial and adnominal jeweils, while at the same time deriving the correct readings from independent principles.
c. Die Jungen haben jeweils zwei Mädchen Rosen geschenkt.  
   ‘The boys gave two girls each roses.’  

The semantic analysis of adnominal jeweils to be developed in this chapter presents a unified and coherent picture of the constructions in (119). All sentences with jeweils-DPs are compositionally interpreted from surface structure in uniform fashion. All interpretations are based on the same semantic value for adnominal jeweils.

Despite this welcome result, it will become clear at the beginning of section 4.3 that there are still more syntactic occurrences of jeweils-DPs that need accounting for. Most prominently, these include jeweils-DPs in underlying subject position as discussed in chapter II.1.6. The interpretation of jeweils-DPs in subject position is postponed to chapter V, where one additional piece is added to the analysis. The general picture is not changed by this addition. All instances of adnominal jeweils are interpretable in surface position in a uniform manner.

The structure of section 4 is as follows. In 4.1, I discuss the interpretation of jeweils-DPs. In 4.2, I introduce the λ-abstraction rules that are responsible for combining the meaning of a jeweils-DP with the meaning of its syntactic sister, and apply it to the basic cases in (119ab) and (117a). In section 4.3, I extend the analysis to the more complex cases in (119c-f).

4.1 The Interpretation of Jeweils-DPs
In this section, I lay out how jeweils-DPs can be interpreted compositionally. The syntactic input for the semantic component is repeated as (120).

\[
(120) \quad [\text{DP} \ [\text{PP} \ P^0 \ \text{jeweils}], \ D_0 \ [\text{NP} \ \text{zwei Bücher} \ t_1]]
\]

In a first step, we interpret the structure of jeweils-DPs before overt movement of jeweils to SpecDP (cf. chapter III.4.2.4) The base structure is repeated in (121a). It corresponds to the surface structure of English each-DPs in (121b). Accordingly, the semantic analysis of adnominal jeweils should carry over directly to English binominal each, or French chacun(e).

\[
(121) \quad \text{a. } \quad [\text{DP} \ D^0 \ [\text{NP} \ \text{zwei Bücher} \ [\text{PP} \ P^0 \ \text{jeweils}]]]
\]
\[
\text{b. } \quad [\text{DP} \ D^0 \ [\text{NP} \ \text{two books} \ [\text{PP} \ P^0 \ \text{each}]]]
\]

Having interpreted (121a), I show that the meaning of the jeweils-DP is the same after overt movement of jeweils to SpecDP.
4.1.1 Basic Assumptions

In this section, I lay out the basic assumptions on which the surface compositional semantic analysis of jeweils-DPs is based. The assumptions are listed in (A1) – (A5).

(A1) Adnominal jeweils has the same meaning as adverbial jeweils. It denotes a generalised quantifier, like ‘normal’ QPs. It takes a set as argument and maps it onto a truth-value.

As with adverbial jeweils, the restriction of adnominal jeweils is expressed by the proform weil-, which is co-indexed with a plural DistKey. As with adverbial jeweils, the denotation of the empty preposition contributes to the meaning of the PP consisting of P₀ and jeweils.

As with adverbial jeweils, adnominal jeweils denotes a double quantifier. An existential quantifier in the nuclear scope of the universal quantifier asserts the existence of elements of the DistShare. The lexical entry for the PP [P₀ jeweils] is given in (122).

(122) \[[PP P₀ jeweils] = \lambda P. \forall z [z \in Z_i \rightarrow \exists x [P(x) \land R_j(z,x)]]\]

The analysis of adnominal jeweils in (122) allows for a unified treatment of adverbial and adnominal jeweils. Both have the categorial status of PP and both denote a (double) quantifier. The difference lies in the ontological category of the entities over which they quantify. Adverbial jeweils quantifies exclusively over events (cf. section 2), whereas adnominal jeweils can, but need not quantify over events (cf. section 3.2.6)

(A2) The distributive relation between elements of DistKey and elements of the DistShare is specified by the relation variable R.

R is necessary in order to control for the distributive relation that holds between the elements of DistKey and DistShare. In the case of (117a), where the boys buy two books each, it is the presence of R which ensures that the distributive relation between individual boys and groups of two books is one of buying, not one of borrowing, lending, selling,

---

47 The syntactic complexity of the PP in (122) raises the question of how its meaning is composed from its parts. One could use brute force and assume that the meaning of the QP jeweils in isolation is a function from relations into functions from properties into truth-values. This is compositional, but a rather uncommon denotation for a QP. Alternatively, one could assume that the meanings of QP and P₀ combine non-compositionally, and form a complex generalised quantifier that has the meaning of P₀ as one of its parts. Such an analysis was suggested for ILCs in chapter III.3.4.2, and was implicitly assumed to hold for adverbial jeweils as well.

Zimmermann (to appear, c) presents a semantic analysis of jeweils-DPs that combines the values of P₀ and jeweils compositionally, while treating jeweils as a generalised quantifier. The analysis involves Skolem functions of type <e,e> and is based on a DP-internal small clause structure like the one discussed in chapter III.3.6 for ILCs. The derivation is illustrated for the each-DP three sausages each in (i). The distributive relation is established by a Skolem function f, which is part of the denotation of the head of the small clause Pr, and which maps elements of the DistKey onto elements of the DistShare:

(i) a. \[[Pr+P] = \lambda Q\alpha. \lambda P\alpha. \lambda f\alpha. \lambda x. \lambda z. [\forall z [z \in Z_i \rightarrow P_\alpha(z) \land R_j(f(z))(x)]]\]
   b. \[[P₀+P₀ each-ei] = \lambda P\alpha. \lambda z. [\forall z [z \in Z_i \rightarrow P_\alpha(z) \land R_j(f(z))(x)]]\]
   by FA of \[[each-ei]\] to \[[P₀]\]
   c. \[[P₀+P₀ each-ei] = \lambda P\alpha. \lambda f\alpha. \lambda x. \lambda z. [\forall z [z \in Z_i \rightarrow (P_\alpha(f(z)) \land R_j(f(z))(x)]]\]
   by FA of (ia) to (ib)
   d. \[[P₀ three sausages each-ei] = \lambda P\alpha. \lambda f\alpha. \lambda x. \lambda z. [\forall z [z \in Z_i \rightarrow (3\text{sausages'}(f(z)) \land R_j(f(z))(x)]]\]
   by FA of (ic) to \[[three sausages]\]
   e. \[[D₀ three sausages each-ei] = \exists f [\forall z [z \in Z_i \rightarrow (3\text{sausages'}(f(z)) \land R_j(f(z))(x)]]\]
   by FA of \[[D₀]\] to (id) (with \[[D₀]\] = \lambda f. \exists x[\exists y[\ldots]]\]

(i) states that there is a function f which maps each element z of a (so far) unspecified set into a set of three sausages f(z) such that f(z) stands in some (distributive) relation to z.
devouring etc. As argued above, \( R \) is provided by the empty preposition \( P^0 \). The precise value for \( R \) is specified in the course of the derivation by a co-indexed relational expression. In the case of (117a), the value for \( R \) is provided by the denotation of the transitive verb \( \text{kaufen} \) ‘buy’. Observe again that the variable status of \( R \) corresponds to the empty status of \( P^0 \) in the syntax. Apparently, the only semantic effect of an empty prepositional head is the contribution of a relation variable, whose value is determined either by an overt relation denoting expression (under co-indexation), or by the context. In this respect, relation variables do not differ from other pronominal expressions. In the case of adnominal \( \text{jeweils} \), the value of \( R \) is fixed under co-indexation with a clausemate expression. With adverbial \( \text{jeweils} \), the value of \( R \) is determined by the context.

(A3) The indefinite NP that forms the DistShare denotes a predicate.

According to one’s view on the semantics of plurals, indefinite NPs can be construed as first-order predicates (type \(<\text{et}>\) over (mereological) plural individuals (Link 1991), or as a second-order predicates (type \(<\text{et,i}>\) over sets (Winter 1998). Since nothing hinges on the choice, I will go on treating pluralities as sets. Plural predicates such as \( \text{two books} \) are consequently treated as second order predicates over sets. The numeral \( \text{two} \) denotes the property of being a set of two elements (Higginbotham 1987). The complex predicate \( \text{two books} \) denotes the complex property of being a set containing two books. The denotation of the numeral NP \( \text{two books} \) is formalised in (123). I use Link’s (1983) ‘*’-operator and upper case variables in order to indicate that the predicate ranges over plural individuals.

\[
(123) \quad \left[\text{zwei Bücher}\right] = \lambda X. \text{two}'(X) \land \text{*book}'(X)
\]

In what follows, I will often abbreviate the expression for the complex predicate on the right-hand side in (123) as \( \lambda X. \text{two_books}'(X) \), or even as \( \lambda X. \text{2books}'(X) \), for the sake of brevity.

(A4) The distributive effect is due to the interaction of universal quantifier and the existential quantifier in its scope.

The predicate denoted by the numeral NP is the semantic argument of the universal quantifier denoted by \( \text{jeweils} \). It predicates a property of a set variable that is bound by the existential quantifier in the nuclear scope of the universal quantifier. This way, elements of the DistShare are distributed over elements of the restriction of the universal quantifier, the DistKey.

(A5) \( \text{jeweils} \)-DPs denote (open) propositions.

The present analysis is based on the assumption that DPs can denote propositions. This claim will be qualified and elaborated upon in the following section. A treatment of \( \text{jeweils} \)-DPs as proposition denoting has the advantage of accounting for the intuition that sentences with d-distributive elements express two propositions in one: A core propositional part in which the main event is expressed, and a distributive part in which elements of the DistKey and elements of the DistShare are distributively related to one another. This intuition is reflected by the choice of a bipartite semantic representation in Choe (1987) and Moltmann (1991, 1991). In the present proposal, it is the \( \text{jeweils} \)-DP that contributes the distributive aspect of the meaning in form of a proposition. Nevertheless,
contrary to Choe (1987) and Moltmann (1991, 1997), I assume the eventual semantic representation to consist of one proposition only. Section 4.2 demonstrates how the two propositions are forged into one.

4.1.2 On Proposition-Denoting DPs
Before going on, let us dwell a little on the assumption that DPs can denote propositions. This may seem surprising in light of the fact that nominal expressions are often thought of as being restricted to denote entities of type `<e>` (individuals), `<e,t>` (set of individuals), and `<et,t>` (generalised quantifiers) (cf. Partee 1987).

There seems to be no principled reason why DPs should not denote propositions of type `<t>` as well, at least not in the theory of semantic types. If we look at CP, the other category of arguments, we see that it can denote entities of a variety of semantic types. A CP can be interpreted as a proposition `<t>` in form of a main clause (cf. 124a), or as a property `<et>` in form of a restrictive relative clause (cf. 124b), or as a ‘fact’ or event in form of an embedded clause (cf. 124c)\(^48\), or as a generalised quantifier in form of a free relative clause (cf. 124d), or as an individual in form of a so-called definite relative clause (cf. 124e) (cf. Capinagro 2001).

(124) a. `[CP Not one word was he willing to say].
   b. I read the book `[CP which you recommended].
   c. I know `[CP that you bought a Porsche]
   d. `[CP Whoever comes in first] will win.
   e. I have exactly `[CP what you are looking for].

In light of the type variability displayed by CPs, one may wonder if DPs are equally flexible in semantic type. The existence of a number of DP-constructions with propositional properties, both in English and cross-linguistically, forms an argument in favour of this assumption.

In English, DP-internal clausal structures that are selected by a D-head have been postulated by Abney (1987:141f.) for gerundive ACC-ing constructions (125), by Kayne (1994:87) for DPs with restrictive relative clauses (126), and by den Dikken (1998:191) for the N-of-a-N construction (127). The postulated underlying and surface structures for the respective DP-constructions are given in the (b)- and (c)-examples.

(125) a. John singing the Marseillaise
   b. `[DP [D' - ing [IP John t1, I0 [VP sing- the Marseillaise]]]]
   c. `[DP John [D' [D+V singing] [IP t1 [I1, I0 [VP tV the Marseillaise]]]]

(126) a. the man that is standing in the corner
   b. `[DP the [CP [c that [IP Bill t1, I0 [VP saw picture]]]]]
   c. `[DP the [CP pictures [c that [IP Bill t1, I0 [VP saw t1]]]]

(127) a. that idiot of a doctor
   b. `[DP that [FP F0 [XP a doctor [X: X0 [NP idiot]]]]]\(^49\)
   c. `[DP that [FP [NP idiot] [F+X of [IP a doctor [X: Fx t1]]]]

\(^48\) ‘Facts’ are frequently analysed as special propositions. In this case, there is no difference between (124a) and (124c) (Ede Zimmermann, p.c.).

\(^49\) den Dikken (1998:191) is not explicit about the categorial nature of X. It seems to have the same status as the overt predication marker (copular) be. For our purposes, X could possibly be identified with I.
The reader is referred to the cited studies for further details. What is relevant for the purpose at hand is that a functional D-head selects for a proposition-denoting constituent in all the analyses in (125) – (127). The proposition-denoting constituent consists of a subject-predicate structure, meaning that there is an expression which functions as semantic subject, and an expression that predicates a property of this subject. A parallel situation is found with jeweils-DPs where jeweils is a second order predicate (qua its nature as a generalised quantifier) over the set denoted by the DistShare (= the semantic subject of the proposition). (125) is of particular interest because the DP as a whole seems to make an existential statement about an event (‘John is singing the Marseillaise’), a property usually associated with clauses (see section 1.1). Or as Abney (187:143) puts it: “The only noun-phrase property of ACC-ing [gerund, MZ] if its structure is as in [125b] is its external distribution.” That is, the D-head does not so much add semantic content, but carries the D-features (gender, number, person, case) that determine the external distribution of ACC-ing gerunds. I assume that the empty D-head in jeweils-DPs has the same syntactic function.

The foregoing remarks are intended to show that (overt or covert) determiners are able to select for proposition-denoting constituents. This assumption is also supported by the fact that DPs in the shape of inverse linking constructions (ILCs) can function as the semantic input for propositional operators. This is illustrated in (128).

(128) [One apple on every plate] is too much / necessary / possible.
   = It is too much/ necessary / possible / that there be one apple on every plate.

Sentential operators such as too much, necessary, and possible operate over propositions (Thomason & Stalnaker 1973, Bartsch 1976). They evaluate the state of affairs expressed by the proposition, or they determine its epistemic status as necessary, possible, probable etc. If this view on sentential operators is correct, the propositional argument for the operators in (128) must be provided by the ILC in subject position.50 In chapter III.4, jeweils-DPs were analysed as a special instance of ILCs. Therefore, it is natural to assume that jeweils-DPs denote propositions as well.

Cross-linguistically, many languages exhibit constituents that are clause-like in expressing a propositional content, but which feature characteristic syntactic properties of nominal constituents, such as case-marking or nominal classifiers. In Finnish, proposition-denoting expressions that are embedded under a believe-type verb can be realised with accusative marking on a non-finite verb (129a). The synonymous clausal equivalent is given in (129b). (129c) shows that the same ACC-marker -n occurs on simple accusative objects.

(129) a. Luul-i-n [teidän tunte-va-n isoglossin käsitteen].
   believe-past-I youpl-GEN know-ptc-ACC isoglosses notion
   ‘I thought that you knew the notion of isoglosses.’
   (Hakulinen & Karlsson 1979:187, ex.157)
b. Luulin [että te tunnissite isoglossin käsitteen].
   believe-past-I that youpl-NOM know-past-2pl isoglosses notion

---

50 See section 7 and Zimmermann (to appear,a) on the interpretation of proposition-denoting ILCs.
51 The construction in (129a) is referred to as lauseenvastike ‘clausal equivalent’ in Hakulinen & Karlsson (1979:187).
In my view, the accusative marking in (129a) indicates that propositions can be denoted by DPs in Finnish.\footnote{In Turkish, this is the unmarked way for expressing embedded clauses. The verbal stems in this kind of embedded clause carry nominalisation markers and nominal suffixes such as nominal person agreement markers and case suffixes (cf. Kornfilt 1997:45f.). Examples of a (nominalised) embedded subject clause and a corresponding simple noun phrase are given in (iab) (Kornfilt 1997:50, exs.215 & 216):

(i)

\begin{itemize}
  \item a. \[\text{Ahmet-in \ circle\-ya yahnu\-nu \ bına\-na \ git\-me -si} \text{ ben-i çok \ üz -dù.}\]
  \text{Ahmet-GEN \ circle- \ DAT \ alone \ go-Nom -3sg \ I-ACC \ very \ sadden-past}
  \text{That Ahmet went to the movies by himself made me very sad.}
  
  \item b. \text{Ahmet \ ben-i çok \ üz -dù.}
  \text{Ahmet \ I-ACC \ very \ sadden-past} \text{ \ ‘Ahmet made me very sad.’}
\end{itemize}

The case marking on the verbal stem in (ia) indicates that propositions can be expressed by means of a nominal constituent in Turkish.}

In Tsez, a Daghestanian language, the verb in embedded clauses can appear with a noun class marker.

(130) \[
\text{Enir \ [užā \ magalu \ bùc’ruli] \ t-iyxo.}
\]
\text{mother \ boy \ bread.III.abs \ ate.IV \ IV-know}

‘The mother knows that that the boy ate the bread.’

(Bobaljik 2001, ex.14a, quoting from Polinsky & Potsdam 2001)

In (130), the embedded clause is marked with the noun class suffix for the fourth noun class (agreeing with the matrix verb), just as the noun magalu is marked for the third noun class. Again, I take the expression of noun class suffixes on embedded clauses to indicate that propositional content can be expressed in the shape of a DP.

If analysed correctly, the examples from Finnish, Turkish and Tsez show that DPs can denote propositions at least in these languages. I take this observation and the additional evidence concerning proposition-denoting expressions in English as sufficient support for the claim that German jeweils-DPs denote propositions as well.

4.1.3 Interpreting jeweils-DPs

With (A1) – (A5) in place, we can proceed to compose the meaning of a jeweils-DP on the base of the meaning of its parts. We begin by interpreting the base structure of the jeweils-DP, with jeweils in postnominal position. The denotation of the PP \[P^0_jeweils\] in (122), repeated as (131a), combines with its argument, the value of the numeral NP \[zwei Bücher\] in (131b) by functional application. The result is given in (131c).

\begin{align*}
(131) \ a. \ [\{P^0_jeweils]\] &= \lambda P. \forall z \ [(z \in Z_i) \Rightarrow \exists X \ [P(X) \land *R_j(z,X)]] \\
\ b. \ [\{ \text{zwei Bücher} \}] &= \lambda X. \text{two books’}(X) \\
\ c. \ [\{ \text{zwei Bücher P^0_jeweils}\}] &= \forall z [(z \in Z_i) \Rightarrow \exists X[\text{two books’}(X) \land *R_j(z,X)]]
\end{align*}

The expression on the right-hand side in (131c) reads as ‘For every individual \(z\) of a given set \(Z_i\) there is a set \(X\) of two books such \(z\) and \(X\) stand in relation \(R_j\) to one another.’ This

\footnote{Like unary predicates, relational predicates can be second order predicates over sets. The ‘plurality’ of the relation is indicated using Link’s star operator (cf. Sternefeld 1998).}
proposition is the meaning of the jeweils-DP. What still needs to be shown is that overt movement of adnominal jeweils to SpecDP does not affect the meaning.

Moving to SpecDP, jeweils leaves behind a trace. Since the moved constituent denotes a generalised quantifier of type \(<et,t>\), we expect its trace to be of type \(<e>\). This is a standard assumption in analyses that assume that QPs of type \(<et,t>\) raise covertly at LF in order to avoid type mismatch and to ensure interpretability (cf. May 1985, Heim & Kratzer 1998, Fox 2000). The second standard assumption is that movement of an element with index ‘i’ triggers \(\lambda\)-abstraction over ‘i’ on the syntactic sister of the moved element’s landing site (here on \(D'\)). Third, I assume \(D^0\) to be semantically empty in indefinite DPs.

With these assumptions, the derivation of the meaning of the jeweils-DP in (132) proceeds as in (133).

(132) \([DP [P^0 jeweils]] D^0 [NP [NP zwei Bücher] t_1]]\)

(133) a. \([[[NP zwei Bücher t_1]]]] \quad \text{by FA of (131b) to \([t_1]]\)}
\(= (\lambda X. \text{two_books}'(X))(Y_1) = \text{two_books}'(Y_1)\)

b. \(=[[NP zwei Bücher t_1]]] = \lambda Y_1, \text{two_books}'(Y_1) \ \lambda\)-abstraction over ‘i’

c. \(=[[DP^0 jeweils D^0 zwei Bücher t_1]]]] \quad \text{by FA of (131a) to (133b)}
\(= (\lambda P. \forall z [(z \in Z_i) \to \exists X [\#P(X) \land \#R(z,X)]])(\lambda Y_1, \text{two_books}'(Y_1))\)
\(= \forall Z [(z \in Z_i) \to \exists X [\text{two_books}'(X) \land \#R(z,X)]]\)

The final expression in (133c) is identical to (131c) above, showing that the semantic value of the jeweils-DP is not affected by movement of jeweils.

(133c) shows that a jeweils-DPs denotes an open proposition that expresses a distributive relation between DistKey and DistShare. The proposition contains two free variables, \(Z_i\) and \(R_j\), which need to be assigned a value in the course of the derivation. In the next section, it will be shown how \(Z_i\) and \(R_j\) are assigned their semantic values, and how the meaning of the jeweils-DP in (133c) combines with the meaning of its syntactic sister, the main verb gekauft ‘bought’. In the process, it will emerge that providing the content for \(R\), and combining the meanings of jeweils-DP and its sister are really just two sides of the same coin. They are the result of the same semantic operation. An analogous operation is later responsible for assigning \(Z\) its value, in this case the denotation of the subject DistKey expression.

4.2 Composing the Meanings of Jeweils-DP and its Sister

This section presents the basic mechanism behind the semantic analysis of d-distributive quantifiers. To that end, two semantic rules of \(\lambda\)-abstraction are introduced. The first rule can be viewed as a variant of Bittner’s (1994) rule of \(\lambda\)-abstraction for avoiding type mismatch. At the same time, it can be viewed as a generalisation of the idea behind Heim & Kratzer’s interpretation rule for moved constituents. The rule is independently motivated because it also accounts for the interpretation of other syntactic configurations, including the interpretation of moved elements and the interpretation of hanging topics. The second rule of \(\lambda\)-abstraction also prevents non-interpretable values from type mismatch, but it applies only in cases where the first rule cannot apply.

In 4.2.1, I introduce the two rules. In 4.2.2, it is shown how the first rule of \(\lambda\)-abstraction allows for interpreting movement and hanging topic structures. With the rule of \(\lambda\)-abstraction in place and independently motivated, it is applied to the most basic instances of jeweils-DPs in 4.2.3. These are jeweils-DPs in object position of individual-level predicates, and jeweils-DPs which are embedded inside another DP. In both
contexts, jeweils occurs in an event-free environment (see section 3.2.6). In 4.2.4, the analysis is extended to jeweils-DPs in object position of transitive stage-level verbs, which take an event argument, making the analysis slightly more complex. Finally, the analysis is extended to other syntactic occurrences of jeweils-DPs in section 4.3.

4.2.1 Two λ-Abstraction Rules

The λ-notation of type logic has proven particularly useful in the formal semantic analyses of natural language expressions. One of its advantages is that it allows for the formal expression of complex semantic denotations (e.g. functions, functions from functions into functions, functions from functions into functions etc.) in a concise and brief manner. More important still, the type-logical operations of ‘λ-conversion’ and ‘λ-abstraction’ have proven useful in compositional semantic analyses. λ-conversion is the formal operation accompanying the semantic operation of functional application. It combines the meaning of two expressions one of which serves as argument to the other. λ-abstraction is the opposite process. It allows for a decomposition of the (known) meaning of a complex structure into the meaning of its parts. λ-abstraction filters out the semantic contribution of those parts of the structure whose meaning is known, yielding the meaning for those parts whose meaning was previously unknown. At the same time, application of λ-abstraction turns saturated expressions (in Frege’s terminology) into unsaturated expressions, i.e. into functions, which demand an argument. An example from Frege (1891) may serve to illustrate this point. Consider the DP in (134).

(134) the capital of the German Empire

In Frege’s time, the DP in (134) denoted the city of Berlin. Frege argues that this meaning can be derived on the base of the meaning of its parts. He suggests to decompose the DP into two parts of which we know the meaning of one (the German Empire). He further proposes to analyse the meaning of the remaining part of the DP, the capital of, as a function which takes countries as input and maps them onto their respective capital. The functional nature of the meaning of the capital of is illustrated in (135). (135a) shows the functional nature of the expression. Choosing different countries as argument to this function yields different values (cf. 135b-c).

(135) a. \([\text{the capital of}]\ (x) = y\)
    b. \([\text{the capital of}]\ (\text{germany}') = \text{berlin}'\)
    c. \([\text{the capital of}]\ (\text{finland}') = \text{helsinki}'\)

The functional nature of the meaning of the capital of can be derived by applying λ-abstraction to the meaning of the DP the capital of the German Empire in (134). By factoring out the known meaning of German Empire, we arrive at the semantic representation for \([\text{the capital of}]\) in (136).

(136) \([\text{the capital of}]\) = \(\lambda x.\text{the unique city which is the capital of } x\).

The expression on the right-hand side of the equation represents a function and reads as ‘a function from individuals x (of type <e>) into the unique city which is the capital of x’. By convention, expressions to the left of the dot, stand for the arguments of the function. Expressions to the right of the dot stand for the function values. These are, typically, an
individual (as in the case at hand), a truth value (represented by the truth conditions), or another function.

What is of general interest here is that λ-abstraction is a process that creates unsaturated expressions from saturated ones. As such, it can be employed in semantic derivations in order to ensure interpretability. Bittner (1994:69) postulates the rule of λ-abstraction as a cross-linguistic universal.

(137) Bittner’s Rule of λ-Abstraction (simplified version):
Let α have have a translation [[α]], and let the index ‘i’ be the index of either α or a sister of α, and let [[α]] contain a variable u with index ‘i’. Then λu,[[α]] is a translation of α.

Stated in simple terms, the rule applies by adding a λ-operator to the denotation of α, thus binding a variable which has an index identical to an index on either α or α’s sister. Applying λ-abstraction results in ‘opening up’ an argument position in the denotation of α. Thus, λ-abstraction turns saturated expressions which contain a free variable into functions which can apply to arguments of the same type as the variable. On this view, λ-abstraction enters the semantic derivation in order to ensure the interpretability of otherwise uninterpretable configurations. A typical non-interpretable configuration obtains when two syntactic sisters are of the ‘wrong’ semantic type, i.e. when they cannot be combined with each other. Such situations are generally grouped under the label of ‘type mismatch’. Type mismatch arises in three cases: (i) both sisters denote saturated expressions such that none can take the other as its argument; (ii) both sisters are functions, but none is of the right kind to serve as argument to the other; (iii) one sister denotes a function, and the other a saturated expression, but of the wrong kind. Summing up, λ-abstraction applies in order to ensure interpretability in cases of type mismatch.

Since it is meant to apply universally, (137) is stated in a very general form. For the purposes at hand, I will use a more restricted version of (137), which allows for a composition of the meaning of jeweils-DP and its syntactic sister, and which can be shown to apply elsewhere in the grammars of German and English. The restricted λ-rule is given in (138):

(138) Index-Triggered λ-Abstraction:
If the semantic types of a proposition-denoting expression α and its syntactic sister β do not match, and if [[α]] contains a free variable u that shares an index ‘i’ with β, λ-abstraction in [[α]] over index ‘i’ is licensed, and λu,[[α]] is a value for α.54,55

54 E.g., (137) is defined in such a way that it can also account for the semantic effects of syntactic head movement, which shall not concern us here.
55 At first sight, the formulation of (138) creates a problem for compositionality. The meaning of the node consisting of α and β cannot be derived by looking at the meanings of α and β alone. For λ-abstraction to be licensed, the co-indexed free variable must be visible at the stage of the derivation where α and β combine, which it is not. As a result, the semantic derivation apparently looks into the meaning of α, of which the variable forms a part, a process not in line with compositionality (and which seems to lead Bittner (1994) to assume a mechanism of variable storage). However, Dekker (1993:165f.) shows that the apparent problem for compositionality can be overcome by working with partial assignment functions. See also Dekker 1998:332, fn.5 on the special case of the assignment function assigning the empty set. (thanks to Ede Zimmermann, p.c., for pointing this out).
The application of \( \lambda \)-abstraction is limited to configurations where no interpretation is possible otherwise. A second restriction limits the application of \( \lambda \)-abstraction to proposition-denoting expressions. A third restriction specifies the conditions under which \( \lambda \)-abstraction can apply. The rule says that \( \lambda \)-abstraction can apply to a proposition if this proposition contains a free variable which is co-indexed with the syntactic sister of \( \alpha \). The idea is that saturated expressions can be “opened up” in the course of the derivation when they encounter a constituent with the right index. The rule in (138) is the basic semantic mechanism for combining the meanings of jeweils-DPs and their syntactic sisters.

Before I go on to show how (138) is applied in the interpretation of jeweils-DPs, we need to assume one more semantic rule. In the course of the discussion, we will encounter situations where \( \lambda \)-abstraction appears necessary for reasons of type mismatch, but where the licensing conditions in (138) are not met. Such situations arise when the sister of a proposition-denoting expression \( \alpha \) cannot does not carry an index which is identical to that of a free variable \( x \) contained in \( \alpha \). This happens if the syntactic sister of \( \alpha \) and the free variable contained in \( \alpha \) do not match in type. The situation is illustrated in (139), anticipating a configuration that will arise in the discussion of jeweils-DPs with stage-level predicates in section 4.2.4.

\[
\begin{align*}
\gamma & \\
\alpha_{x_{\mathsf{\ell}}} & \\
\ldots x_{\mathsf{v},v_1,\ldots} \quad \beta_{x_{\mathsf{r}},p,p_1,\ldots} & \\
\end{align*}
\]

In (139), \( x \) and \( \beta \) are of different logical types, and should not carry the same index since co-indexation here is taken to express co-reference. Co-indexation is also blocked in cases where the sister of \( \alpha \) is of the same semantic type as an indexed variable in the denotation of \( \alpha \), such that the two could be co-indexed in principle, but where the semantic type of \( \alpha \)’s sister is the result of a previous application of (index-triggered) \( \lambda \)-abstraction. Assuming that indices enter the syntactic and semantic derivation from the lexicon, and cannot enter the derivation afterwards, it is too late for indexing in such a

\[57\] As indicated by the formulation “[…] is a value for \( \alpha \)”, the rule in (138) does not ensure an unambiguous mapping from syntactic structure to interpretation. In other words, the notation ‘[[\alpha]]’ is not unambiguously defined. The problem is ameliorated by the fact that (138) only applies in cases where the combination of \( \alpha \) and \( \beta \) is uninterpretable otherwise, due to type mismatch. This ensures that the mother node of \( \alpha \) and \( \beta \) has an unambiguous reading in almost all cases (it either receives no interpretation, or it receives the interpretation resulting from \( \lambda \)-abstraction). Nevertheless, there is a configuration in which application of (138) can lead to ambiguity on the mother node – at least in principle. The situation arises when both sisters \( \alpha \) and \( \beta \) are proposition-denoting, \( \alpha \) is co-indexed with a free variable in the denotation of \( \beta \), and \( \beta \) is co-indexed with a free variable in the denotation of \( \alpha \). The situation is given schematically in (i)

\[
\begin{align*}
\text{(i)} & \\
[ [ \alpha ] [ \beta ] ] & \\
[ (x) ] \quad [ (y) ] & \\
\end{align*}
\]

In this situation, \( \lambda \)-abstraction according to (138) can apply either to \( \alpha \) (over index ‘j’) or to \( \beta \) (over index ‘i’). Independent of the question whether this configuration actually arises, we should keep in mind that applying (138) to (i) results in the derivation of a family of readings that is passed up in the semantic derivation, rather than in the derivation of an unambiguous reading. Thanks to Ede Zimmermann for discussion of this point.

\[57\] Bittner (1994), who assumes the possibility of ‘vacuous indexation’ of non-referring elements, does not share this view. If non-referring elements can be co-indexed with referring expressions, the same should be possible for two expressions of different logical types.
case. We will encounter the latter case repeatedly in connection with the process of ‘crosswise λ-abstraction’ in chapter V.2.

A possible solution for the dilemma of missing indices would be to return to Bittner’s rule in (137), which also allows for λ-abstraction over an index ‘i’ if α itself carries the index ‘i’. On the assumption that the index ‘i’ can be passed up to the level of α in (139), λ-abstraction in α would be licit. The same solution would apply to the second case of missing indices mentioned above. On the other hand, this assumption raises several non-trivial questions regarding the nature of index percolation. Also, allowing for free percolation of indices has the effect that expressions of different logical types can end up being co-indexed. In a framework that views indices as markers for (co-) reference, this assumption seems undesirable.

Instead, I suggest to meet the problem of missing indices by postulating a second rule of λ-abstraction. The rule is formulated in (140).

(140) **Type-Triggered λ-Abstraction:**
If the semantic types of a proposition-denoting expression α and its syntactic sister β do not match, and if [[α]] contains a free variable $u_i$ of type $<\sigma>$, and β is of type $<\sigma,t>$ or $<\sigma>$, λ-abstraction in [[α]] over index ‘i’ is licensed, and $\lambda u_i.[[\alpha]]$ is a value for α.58

Application of type-triggered λ-abstraction turns α into an expression which is either of the same type as β, or which takes the denotation of β as its semantic argument. The first case is illustrated in schematic form in (139), where the meanings of α (after λ-abstraction) and β can combine by predicate modification. The second case is instantiated by applications of crosswise λ-abstraction in chapter V.2. Bear in mind that type-triggered λ-abstraction can only apply if there is a type mismatch, and if index-triggered λ-abstraction does not apply (and if the other licensing conditions in (140) are also met). This essentially makes type-triggered λ-abstraction a last resort mechanism that only applies if all else fails. From this, one would expect its potential range of application to be rather restricted.

The two rules of λ-abstraction in (138) and (140) together account for the interpretation of all occurrences of adnominal jeweils. I leave it open if they can be subsumed under one general rule.

### 4.2.2 Motivating Index-Triggered λ-Abstraction

The purpose of this section is to provide independent motivation for the assumption of index-triggered λ-abstraction in (138). The rule is shown to apply in other configurations independent of jeweils-DPs. First, the rule is applied in the interpretation of structures with moved constituents, as in (141a) with passive movement. After that, the rule is applied in the interpretation of hanging topic construction in (141b) from Dutch.

(141) a. Peter₁ was attacked t₁.

58 (140) also allows for potential ambiguities in the mapping from syntactic structure into meaning. The general problem with (140) is the same as with (138), discussed in fn.56, although the number of potential configurations that may lead to ambiguity is higher with (140). Again, I am not aware of any actual situations where this could lead to problems.
b. Jan, die, heb ik gisteren ontmoet.  
Jan that-one have I yesterday met 
‘(Talking about) Jan, I have met him yesterday.’

(141ab) have little to do with jeweils-DPs structurally, except that they meet the licensing conditions in (138). The fact that the rule for index-triggered $\lambda$-abstraction in (138) can handle these cases is a welcome result. It shows that the rule is a general rule which applies to a range of configurations, and which is not exclusively designed to ensure the interpretability of jeweils-DPs.

Let us look at the movement case in (141a) first. In (141a), the underlying object Peter has moved out its base position (complement of V) to SpecIP for reasons of case. The structure of (141a) after movement is as shown in (142).

(142) $[\text{IP } \text{Peter}_1 \left[ \text{I' was} \ [\text{VP attacked } t_1] \right]]$

The semantic value of I’ is given in (143).

(143) $[[\text{v attacked } t_1]] = [[\text{I was attacked } t_1]] = \exists x \ [\text{attacked’}(x,y_1)]$

The right-hand expression in (143b) meets the licensing conditions for index-triggered $\lambda$-abstraction in (138). It is a proposition, and it contains a free variable ($y_1$) which is coindexed with the syntactic sister of I’. Therefore $\lambda$-abstraction over index ‘1’ is licit, yielding (144a). (144a) is a function from individuals into truth values. This function then applies to the value of Peter, as shown in (144b).

(144) a. $[[\text{I was attacked } t_1]] = \lambda y_1. \exists x \ [\text{attacked’}(x,y_1)]$

b. $[[\text{Peter}_1 \text{ was attacked } t_1]] = \exists x \ [\text{attacked’}(x, \text{Peter})]$

(144b) is true iff there was somebody who attacked Peter.

The working of (138) is similar to Heim & Kratzer’s (1998:186) interpretation rule for moved constituents. Heim & Kratzer’s (1998) account is also based on the assumption that movement of a constituent leaves behind a trace. This trace (a variable) is co-indexed with an index that is adjoined to the syntactic structure just below the landing site of the moved element. This is shown in (145).

\[ (145) \]

\[ \begin{array}{c}
\text{IP} \\
\text{Peter} \\
\text{I'} \ \exists x \ [\text{attacked’}(x,y_1)] \\
\text{I} \\
\text{was} \\
\text{VP} \\
\text{attacked} \\
t_1
\end{array} \]

---

59 I neglect the temporal information expressed on the auxiliary, and treat the latter as semantically zero for simplicity. I have also left out the event argument since its presence or absence has no bearing on the point to be made. For a more complete semantic representation of passive sentences see the discussion in section 1.1.3.
In Heim & Kratzer’s system, the presence of index ‘1’ as the sister of I’ triggers \( \lambda \)-abstraction over ‘I’ in the denotation of I’. Application of \( \lambda \)-abstraction results in a function which can functionally apply to the meaning of Peter. The last two steps are identical to the derivation in (144ab) above, showing that the rule of \( \lambda \)-abstraction in (138) gives the same result as Heim & Kratzer’s rule when applied to the interpretation of structures after syntactic movement.

A major difference between Heim & Kratzer’s rule and the rule of index-triggered \( \lambda \)-abstraction in (138) is syntactic in nature. Heim & Kratzer’s system requires the index ‘1’ to occupy its own syntactic position. It is inserted as a direct result of movement. Heim & Kratzer’s rule of \( \lambda \)-abstraction is therefore dependent on movement of some element, for without movement no index in the structure, and without an index in the structure no \( \lambda \)-abstraction over this index. In contrast, (138) is indifferent to whether or not movement has taken place. For (138), it is only important that the index be located on some sister position to a node that denotes an open proposition with a free variable.

The indifference to (non-) application of movement makes (138) a more general version of the rule found in Heim & Kratzer (1998). We therefore expect to find other cases of index-triggered \( \lambda \)-abstraction in configurations which satisfy the restrictions in (138), but which do not involve movement. Such cases exist, e.g. in the form of the ‘hanging topic’ construction in (141b), repeated as (146).

(146)  Jan, die, heb ik gisteren ontmoet.  [Dutch]
Jan that-one have I yesterday met
‘(Talking about) Jan, I have met him yesterday.’

Hanging topic constructions feature a topic element that is attached to the left periphery of a root clause and that is picked up by a demonstrative pronoun in preverbal position. I take this position to be SpecCP (but see Rizzi 1997). Presumably, the pronoun die has moved to SpecCP from its underlying argument position. In contrast, the hanging topic Jan does not seem to move. Rather, it seems to be base-generated as a left-peripheral ‘satellite’ (see e.g. Weerman 1988). On this analysis, (146) has the structure in (147).

(147)  a. [Jan, [CP die, [C heb [IP [VP gisteren t\_i ontmoet]]]]]
Jan the DEM have I yesterday met

b.  

\[
\begin{array}{c}
\text{Jan} \\
\text{die} \\
\text{heb} \\
\text{IP} \\
\text{VP} \\
\text{gisteren t\_i ontmoet}
\end{array}
\]

This is an oversimplification. The main difference lies in the architecture of the syntax-semantic interface. In Heim & Kratzer (1998), the insertion of an extra syntactic node for the index is motivated by the need to ensure an unambiguous mapping from each syntactic node into its interpretation (see fns. 56 and 58).
Let us look at the relevant parts of the semantic derivation. We start with the denotation of \( C' \) in (148) (again, I neglect the semantic contribution of the auxiliary in \( C^0 \)).

\[
(148) \quad \text{[[ have I yesterday t, met ]] } = \exists e \ [ \text{met}'(I, y, e) ]
\]

The expression in (148) satisfies the licensing conditions for \( \lambda \)-abstraction over index \( i \). It is a proposition, it contains a free variable \( y_i \), and its syntactic sister \( \text{die} \) is co-indexed with \( y_i \). Application of (138) to (148) yields the function in (149a), which is then applied to the denotation of \( \text{die} \), again a variable with index \( i \). The denotation of the entire CP in (149b) is equivalent to that of \( C' \).

\[
(149) \quad \begin{align*}
\text{a. } \text{[[ have I yesterday t, met ]] } &= \lambda y_i. \exists e \ [ \text{met}'(I, y, e) ] \\
\text{b. } \text{[[ that one, have I yesterday t, met ]] } &= \exists e \ [ \text{met}'(I, y, e) ]
\end{align*}
\]

Since (149b) is equivalent to (148), and since the hanging topic \( Jan \) is also indexed with \( i \), the structure meets the licensing conditions for repeated \( \lambda \)-abstraction. Repeated \( \lambda \)-abstraction creates the function in (150a), which is equivalent to (149a) and which can apply to the denotation of \( \text{Jan} \), as in (150b).

\[
(150) \quad \begin{align*}
\text{a. } \text{[[ that one, have I yesterday t, met ]] } &= \lambda y_i. \exists e \ [ \text{met}'(I, y, e) ] \\
\text{b. } \text{[[ Jan, that one, have I yesterday t, met ]] } &= \exists e \ [ \text{met}'(I, \text{jan}, e) ]
\end{align*}
\]

(150b) will be true iff I have met Jan yesterday, correctly specifying the truth conditions for (146). This shows that the \( \lambda \)-abstraction rule in (138) can apply in non-movement configurations as well.\(^{61}\)

To conclude, in this section we have seen two applications of the semantic rule of index-triggered \( \lambda \)-abstraction in (138). It was shown that an application of (138) derives the correct interpretation for structures with and without movement, given the right indexation. Hence, (138) is more general than Heim & Kratzer’s rule of \( \lambda \)-abstraction, which depends on indices introduced by movement. On the other hand, the rule in (138) is restricted in its application to certain well-defined configurations.

### 4.2.3 Interpreting \textit{Jeweils}-DPs in Event-Free Environments

With the interpretation of \textit{Jeweils}-DPs and the semantic rules of index-triggered and type-triggered \( \lambda \)-abstraction in place, it is possible to demonstrate how the meaning of the \textit{Jeweils}-DP composes with the meaning of its syntactic sister. We begin with the two basic cases where adnominal \textit{Jeweils} occurs in an event-free configuration and which are illustrated in (151ab). The \textit{Jeweils}-DP is indicated with brackets in each case. \textit{Jeweils} is co-indexed with its respective DistKey antecedents, \( P^0 \) with the relation-denoting expressions \textit{haben} ‘have’ and \textit{von} ‘of’ respectively. The reason for the second co-indexation will become apparent below.

\(^{61}\) Of course, Heim & Kratzer’s rule could apply to hanging topic constructions if these are analysed as involving movement of the topic in the left periphery. A possibility would be to treat the pronoun in SpecCP as a resumptive pronoun which acts as the phonetic spellout of an intermediate trace.
(151) a. jeweils + individual-level predicate:

..., weil die Jungen, [ [P₀ jeweils] eine Tätowierung] haben,

because the boys each one tattoo have

‘...because the boys have one tattoo each.’

b. jeweils embedded inside a DP.


lists with each three names were passed around

‘Lists each with three names on them were passed around.’

The two configurations exhibit the basic characteristics of all jeweils-DPs. First, jeweils-DPs always require a relation-denoting expression, be it a transitive verb as in (151a), or a preposition as in (151b). This relation expression provides the appropriate value for the relation variable \( R \) in the meaning of the PP \([P₀ jeweils]\). Second, jeweils-DPs require a plural expression (the DistKey) over which jeweils can distribute. The plural expression can be a plural argument as denoted by the plural subject die Jungen ‘the boys’ in (151a), or a plural predicate as denoted by the plural noun Listen ‘lists’ in (151b). The plural argument enters the semantic derivation by functional application, the plural predicate by predicate modification. We now turn to the details of the semantic derivation.

Following the discussion in section 4.1, the jeweils- DP in (151a) denotes the proposition in (152). The structure of the clause and the denotation of the syntactic sister of the jeweils- DP are indicated in (153).

(152) \([ [ [P₀ jeweils] eine Tätowierung] ] = \forall z [z \in Z \rightarrow \exists x [\text{tattoo'(x)} \land R_j(z,x)]]\)

(153)\[
\text{die Jungen}_i \quad \text{VP} \\
\text{DP} \quad \text{V}_j \lambda y \lambda x. \text{have'}(x,y) \\
P_{0j} \text{jeweils}_i \text{eine Tätow.} \text{haben}_j
\]

The problem for a compositional analysis is that the jeweils-DP denotes a saturated expression of type \(<t>\). Being of type \(<t>\), it cannot serve as an argument for the transitive individual-level predicate haben ‘have’, which is of type \(<e<e,t>>\). A type mismatch results, seemingly blocking further interpretation.

Looking at the semantic value of the jeweils-DP in (152) more closely, we see that it satisfies the licensing conditions for the application of index-triggered \(\lambda\)-abstraction in (138) above. It is a proposition, and it contains two free variables one of which is co-indexed with the transitive verb, the syntactic sister of the jeweils-DP.\(^63\) Therefore, \(\lambda\)-abstraction over index \(j\) can apply in (152). Since the expressions co-indexed with \(j\) are both relations, the result of \(\lambda\)-abstraction in (154) is a function from relations into truth values.

\(^{62}\) The talk about ‘event-free’ configurations only pertains to the immediate DP-environment here. Of course, the stage-level main verb in (151b) takes an event argument.

\(^{63}\) I assume that indices can be passed up from lexical entries to the syntactic heads dominating them, and on to the maximal projections of these heads.
(154) \[
[[P^0_j \text{jeweils}, \text{eine Tätowierung}]] = \lambda R_j, \forall z \in Z, \exists x [\text{tattoo}'(x) \land R_j(z,x)]
\]

This function applies to the verb meaning, yielding (155) as the semantic value of VP.

(155) \[
[[VP]] = \forall z \in Z, \exists x [\text{tattoo}'(x) \land \text{have}'(z,x)]
\]

(155) shows that application of index-triggered $\lambda$-abstraction achieves two things at once. It allows for combining the meanings of jeweils-DP and its sister. And it (indirectly) provides a value for the relation variable $R$. It does so by creating a function from relations into truth values which can then apply to a relation (here: the verb). It is in this sense, that combining the meaning of jeweils-DP and verb and providing a semantic value for the relation variable can be seen as two sides of the same coin. They follow from the application of a single semantic operation, $\lambda$-abstraction under co-indexation.

The VP-denotation in (155) combines with the subject (DistKey) denotation in the same way. The VP denotes a proposition with a free variable that is co-indexed with VP’s sister node (here $Z$). $\lambda$-abstraction over index $i$ yields (156a), a function from sets of individuals to truth values. Functional application to the subject denotation yields (156b) as the meaning of IP.

(156) a. \[
[[VP]] = \lambda Z, \forall z \in Z, \exists x [\text{tattoo}'(x) \land \text{have}'(z,x)]
\]

b. \[
[[IP]] = \forall z \in [[\text{the boys}]], \exists x [\text{tattoo}'(x) \land \text{have}'(z,x)]
\]

(156b) is true iff for each $z$ out of a specific set of boys there is a tattoo $x$ such that $z$ has $x$. We have seen, then, that the ‘trick’ in interpreting jeweils-DPs lies in the right co-indexation of the two free variables $R$ and $Z$ with a relation-denoting and with a set-denoting expression respectively, thus triggering $\lambda$-abstraction in line with the rule in (138).

The mechanism of co-indexation and $\lambda$-abstraction (followed by functional application) directly extends to (151b), where the jeweils-DP is embedded inside a PP inside another DP. The denotation of the jeweils-DP in (151b) is spelt out as (157). The structure of the embedding DP, including suitable indices, is given in (158).

(157) \[
[[P^0_j \text{jeweils}, \text{drei Namen}]] = \forall z \in Z, \exists X [\text{3names}'(X) \land *R_j(z,X)]
\]

As before, the jeweils-DP denotes a proposition with two free variables. As before, its sister, the relation-denoting preposition von ‘of’ cannot take the value of the jeweils-DP as its argument because of type mismatch. As before, index $j$ on the preposition licenses $\lambda$-
abstraction over \( j \) in the denotation of the jeweils-DP (cf.159a). As before, the resulting function from relations into truth-values applies to the value of the preposition, yielding the proposition in (159b).\(^64\)

\[
(159) \quad \text{a. } [\text{jeweils}_{i,j}\text{-DP}] = \lambda R_j . \forall z [z \in Z_i \to \exists X [3\text{names}'(X) \land *R_j(z,X)]]
\]

\[
\text{b. } [\text{mit jeweils}_{i,j}\text{-DP}] = \forall z [z \in Z_i \to \exists X [3\text{names}'(X) \land *\text{with}'(z,X)]]
\]

Since \( N_i \) is co-indexed with the free variable \( Z_i \) in (159b), index-triggered \( \lambda \)-abstraction over \( i \) can apply, yielding (160a). (160a) combines with the meaning of \( N_i \) in (160b) not by functional application, but by predicate modification. The result is shown in (160c).

\[
(160) \quad \text{a. } [\text{mit jeweils}_{i,j}\text{-DP}] = \lambda Z_i . \forall z [z \in Z_i \to \exists X [3\text{names}'(X) \land *\text{with}'(z,X)]]
\]

\[
\text{b. } [\text{Listen}_j] = \lambda X_i . *\text{lists}'(X_i)
\]

\[
\text{c. } [\text{Listen}_j, \text{mit jeweils}_{i,j}\text{-DP}] = \lambda Z_i . *\text{lists}'(Z) \land \forall z [z \in Z_i \to \exists X [3\text{names}'(X) \land *\text{with}'(z,X)]]
\]

The expression in (160c) stands for a set of plural entities, which is the correct interpretation for bare NPs such as \textit{lists with three names}. It is therefore free to serve as the restriction of an existential quantifier, resulting in the correct reading for (151b): There were lists, each having three names on it, which were passed around. This shows that the proposed semantic mechanism of index-triggered \( \lambda \)-abstraction gives the desired result also for jeweils-DPs that are embedded inside another DP. The only difference to the first case concerns the way in which the meanings of DistKey and its syntactic sister combine. With jeweils-DPs and individual-level predicates, the meaning of DistKey is an argument to the meaning of its sister. With jeweils-DPs that are embedded inside another DP, the meaning of the DistKey combines with that of its sister by predicate modification.\(^65\) We will encounter both processes again in the discussion of the other occurrences of adnominal jeweils.

In this section, I have shown that the first semantic rule of index-triggered \( \lambda \)-abstraction, together with well-established semantic rules such as functional application and predicate modification, allows for a correct derivation of the meaning of adnominal jeweils in event-free environments. In the next section, the analysis is extended to jeweils-

\(^{64}\) That PPs can denote propositions is supported by the existence of sentences such as (i) (from Pollard & Sag 1994:111).

(i) With [\( \text{mit Noriega [- in power]} \)] we will have to cancel our vacation.

‘Given that Noriega is in power, we will have to cancel our vacation.’

See also Heim & Kratzer (1998:227), who explore the possibility that PPs (optionally) contain a subject, which would make them proposition denoting.

\(^{65}\) The third case which is a priori possible in one in which the DistKey denotation takes the result of \( \lambda \)-abstraction over the remainder of the clause as its argument. This case seems to be instantiated by (i), in which jeweils takes a \textit{mostQP} as its DistKey.

(i) Die meisten Jungen haben jeweils zwei Würstchen gekauft.

‘Most boys bought two sausages each.’

After \( \lambda \)-abstraction over \( Z_i \), the expression containing jeweils denotes a second order predicate, or a set of pluralic entities. This expression can be an argument to the denotation of the mostQP, if mostQPs are analysed as (existential) pluralic quantifiers that quantify over sets of pluralic entities. Proposals to this extent are found in Yabushita (1989) and Lin (1998:223), where the following denotation for \textit{most} is given:

\[
(ii) \quad [\text{most}] = \lambda P,Q . \exists Z \exists X \ [P(X) \land \forall Y (P(Y) \rightarrow Y \subseteq X) \land Z \subseteq X \land Q(Z) \land (|Z| > |X| - |Z|)]
\]
DPs that occur as direct objects of stage-level predicates, which take an additional event argument.

### 4.2.4 Interpreting *jeweils*-DPs with Stage-Level Verbs

The interpretation of object *jeweils*-DPs with stage-level verbs, as in (161), faces one additional difficulty.

(161) …, weil die Jungen gerade [P\textsubscript{0}\textsubscript{j} *jeweils\textsubscript{i} zwei Würstchen] kaufen,

‘…because the boys are buying two sausages each.’

In (161), the distributive relationship between the elements of the DistKey (here: boys) and elements of the DistShare (here: sets of two sausages) is one of buying, hence the co-indexation of P and the main verb. The *jeweils*-DP is interpreted according to the semantic scheme developed in 4.1 (cf.162a). The problem lies in the meaning of the syntactic sister of the *jeweils*-DP; the transitive stage-level verb *kaufen* ‘to buy’. (162b) shows that the transitive stage-level verb *kaufen* ‘buy’ does not denote a binary, but a ternary relation between an event and two individual arguments (see section 1.4 for discussion).

\[(162) \text{a. } [[P\textsubscript{0}\textsubscript{j} *jeweils\textsubscript{i} zwei Würstchen]] = \forall z[z \in Z \rightarrow \exists X[2\text{sausages}'(X) \wedge \forall R_j(z,X)]]\]

\[(162) \text{b. } [[\text{kaufen}]j] = \lambda y \lambda x. \exists e[\text{buy}'(x,y,e)]\]

The problem is that the values in (162ab) cannot combine by a sequence of $\lambda$-abstraction plus functional application, as demonstrated in the preceding section. Applying $\lambda$-abstraction over index ‘j’ in (162a) would result in a function from binary relations into truth-values. Such a function could not take the ternary relation in (162b) as its argument, resulting in type mismatch.

The problem therefore lies in the presence of the additional event argument, which (in this case, but see the discussion in chapter V!) plays no role in establishing a distributive relation between DistKey and DistShare. In order to overcome this problem, I propose that existential closure over the event argument can apply inside the VP, at least sometimes.\(^{66,67}\) In the case of (161), this means that existential closure applies before the meanings of verb and *jeweils*-DP are combined, yielding the expression in (163).

\[(163) [[\text{kaufen}]j] = \lambda y \lambda x. \exists e[\text{buy}'(x,y,e)] \quad \text{by existential closure over ‘e’}\]

---

66 This claim is not in line with Diesing’s (1992) hypothesis according to which existential closure always applies at the level of VP. It is not clear, though, if the two proposals differ in their predictions. In any event, Eckardt (1998) shows that existential closure over higher event layers can also apply at a level above VP (see also the discussion of multiple event quantification at the end of 1.3). If so, it is not a priori impossible that existential closure over smaller event layers applies inside the VP, if the VP denotes a plurality of events. As argued at the end of section 3.2.6, presence of adnominal *jeweils* leads (indirectly) to the construal of a plural event consisting of individual boys buying two sausages. If correct, VP-internal existential closure in (161) is licensed by the need to existentially close off the lowest event layer, namely that of individual events.

67 If however the assumption of existential closure over events inside the VP should turn out to be problematic for some reason, there are at least two other possible strategies one could pursue in order to ensure the interpretability of (161). The first possibility is to assume that the existential quantifier in the nuclear scope of the universal quantifier in (162a) unselectively binds all free variables in its scope, including the event variable. The second possibility is to assume a family of denotations for the complex formed by P\textsubscript{0} and *jeweils*. The members of the family would differ in the acidity of the relation variable R (binary, ternary, …) and, corresponding to the acidity of R, in the number and kind of variables bound by the existential quantifier ‘∃’.
With (163), the meanings of jeweils-DP and its sister can combine by means of the semantic mechanism from above. The semantic derivation is given in (164).

\[(164)\]

\[a. \quad [[P^0_{j}, jeweils, zwei Würstchen]] \quad \text{by } \lambda\text{-abstraction over } 'j' \]
\[= \lambda R_j. \forall z[z \in Z_i \rightarrow \exists X[2 \text{sausages}(X) \land *R_j(z,X)]] \]
\[b. \quad [[P^0_{j}, jeweils, zwei Würstchen kaufen}]] \quad \text{FA of (164a) to (163)} \]
\[= \forall z[z \in Z_i \rightarrow \exists X[2 \text{sausages}(X) \land \exists e[*buy'(z, X, e)]]] \]
\[c. \quad [[P^0_{j}, jeweils, zwei Würstchen kaufen}]] \quad \lambda\text{-abstraction over } 'i' \]
\[= \lambda Z_i. \forall z[z \in Z_i \rightarrow \exists X[2 \text{sausages}(X) \land \exists e[*buy'(z, X, e)]]] \]
\[d. \quad [[\text{die Jungen}, P^0_{j}, jeweils, zwei Würstchen kaufen}]] \quad \text{by } \text{FA to } [[\text{the boys}]] \]
\[= \forall z[z \in ([\text{the boys}])] \rightarrow \exists X[2 \text{sausages}(X) \land \exists e[*buy'(z, X, e)]]] = 1 \text{ iff} \]
\[e. \quad \text{for each } z \text{ which belongs to a specific group of boys there is a set of two sausages } X \text{ and an event } e \text{ such that } z \text{ buys } X \text{ in } e.' \]

The result in (164e) is similar to Moltmann’s (1991,1997) analysis in that the semantic representation contains subevents of individual boys buying two sausages. These subevents, which are bound by an existential quantifier, can combine to form a plural event. Higher-level event modifiers or quantifiers should be able to modify or quantify over this plural event. (165ab) show this expectation to be borne out.

\[(165)\]

\[a. \quad \text{Die Jungen haben } [[\text{VP immer } P^0_{j}, jeweils zwei Würstchen gekauft}]]. \quad \text{the boys have always each two sausages bought} \]
\[= \text{‘The boys have always bought two sausages each.’} \]
\[b. \quad \text{Die Jungen haben } [[\text{VP im Laden } P^0_{j}, jeweils zwei Würstchen gekauft}]]. \quad \text{the boys have in the store each two sausages bought} \]
\[= \text{‘In the store, the boys have bought two sausages each.’} \]

Repeated event quantification was discussed at the end of section 1.3, and also in 3.2.6. There, it was shown that the presence of two event quantifiers leads to quantification of the higher quantifier over the restriction of the lower quantifier. It follows that the implementation of existential closure over the event variable in (163) was not precise enough in order to deal with instances of repeated adverbial quantification. As discussed in 1.3 and 3.2.6, the event bound by the existential quantifier ‘\(\exists\)’ must be part of a plural event \(E\) which provides the restriction for ‘\(\exists\)’, and which is quantified over by the higher quantifier ‘\(\text{immer}\) ‘always’. The element-of relation between individual events and the plural event is captured formally by adding the restriction ‘\(e \in E\)’ to the semantic representation.\(^{68}\)

Since the lower VP in (165a) denotes a proposition, \(\lambda\)-abstraction over \(E\) must apply before the VP-denotation can be an argument to the event quantifier. \(\lambda\)-abstraction is triggered by co-indexation of an index on \(e^*\) and the quantifier. After \(\lambda\)-abstraction, the value of the lower VP is as in (166a).\(^{69}\) Functional application of the meaning of ‘\(\text{immer}\) ‘always’ to (166a) yields (166b).

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\(^{68}\) See Eckardt (1998:123), where a similar strategy is proposed for capturing the phenomenon of repeated event modification. Eckardt’s approach differs from ours in that she utilises the (material) subpart-of relation ‘\(\subseteq\)' instead of the element-of relation in the main text, presumably in order to avoid a hierarchy of event types for sentences like (i):

\(\text{(i) In ten minutes, Erna buttered each bagel.}\)

\(^{69}\) I assume that quantifiers are co-indexed with the variable they bind.
(166a) a. \[[[\forall z \text{wjei} \text{eis}_k \text{zwei Würstchen gekauft}]] = \lambda E_k \forall z \in Z_i \exists X [2\text{sausages'}(X) \land \exists e \in E_k [*\text{buy}'(z, X, e)]]\]

b. \[[\text{immer jeweils}\text{zwei Würstchen gekauft}]] = \langle \lambda p. \forall E' \in E'' \to \exists E [*\text{R}(E', E) \land p(E)] \rangle\]
\[(\lambda E_k. \forall z \in Z_i \exists X [2\text{sausages'}(X) \land \exists e \in E_k [*\text{buy}'(z, X, e)]]])\]
\[\Leftrightarrow \forall E' \in E'' \to \exists E [*\text{R}(E', E) \land \forall z \in Z_i \exists X [2\text{sausages'}(X) \land \exists e \in E [*\text{buy}'(z, X, e)]]] \]

(166b) is true iff for all plural events \(E'\) of a contextually given set of plural events \(E''\), there is a plural event \(E\) such that \(E\) stands in a (causal, temporal, subpart) relationship to \(E'\), and for all elements \(z\) of a given set \(Z_i\) there is a set of two sausages \(X\) and there is an event \(e\) element of \(E\), such that \(z\) buys \(X\) in \(e\). \(\lambda\)-abstraction over \(Z_i\) plus FA to [the boys] gives the correct truth conditions for (165a). Similar considerations should allow for a correct derivation of (165b), which features event modification of the plural event constituted by the individual buying events. In contrast to adverbial quantifiers, the adverbial event modifier \(\text{im Supermarkt} \ 'in the store' \) in (165b) is unlikely to be co-indexed with a complex event argument. Rather, I assume that the type mismatch between the lower VP (type <t>) and the adverbial PP (type <vt,t>) is resolved by applying the second rule of (type-triggered) \(\lambda\)-abstraction from (140) to the meaning of the lower VP. It seems that repeated event modification over different event layers could be resolved by means of this mechanism in general, independent of the presence of \textit{jeweils}. After \(\lambda\)-abstraction over the VP-denotation, the denotations of the adverbial PP and its sister are of the right type (<vt,t>) to combine by way of predicate modification.

This concludes the discussion of \textit{jeweils}-DPs as objects of transitive stage-level predicates. The discussion has shown that a correct (compositional) interpretation of \textit{jeweils}-DPs in this context depends on existential closure of the event variable inside the VP.

### 4.3 Interpreting \textit{Jeweils}-DPs in other Syntactic Configurations

Taking stock, so far we have accounted for the basic occurrences of \textit{jeweils}-DPs as objects of transitive verbs (both stage- and individual) level, and as part of a PP embedded inside another DP. The correct truth conditions were derived compositionally by making use of basic semantic mechanisms such as (co-) indexation, \(\lambda\)-abstraction, functional application, predicate modification, and existential closure. On the assumption that these semantic mechanisms are universal, the analysis of abnominal \textit{jeweils} in object position should carry over directly to the counterparts of \textit{jeweils} in the other languages, e.g. English \textit{each} and French \textit{chacun(e)}. This expectation is based on the claim from chapter III that the underlying structure of d-distributive constructions in these languages is identical to that of \textit{jeweils}-DPs in German.

However, German \textit{jeweils}-DPs can occur in a wider range of syntactic configurations, some of which are unattested for languages such as French or English (see the discussion in chapters II.4 and III.5). The examples in (167) show that \textit{jeweils}-DPs and DistKey expressions are quite free in their syntactic distribution. \textit{Jeweils}-DPs in indirect object position distribute over subject DPs (167a). \textit{Jeweils}-DPs in adjunct position distribute over subject (or object) DPs (167be). Furthermore, \textit{jeweils}-DPs distribute over verb conjunctions from either adjunct position (167d) or from direct object position (167e).
   The boys have given two girls each roses.
   ‘The boys have given two girls each roses.’

   The boys have bought roses in two shops each.
   ‘The boys have bought roses in two shops each.’

c. Die Jungen haben [[jeweils; zweimal] geklopft].
   The boys have each twice knocked
   ‘The boys have knocked twice each.’

d. Peter hat Maria [aus jeweils; zwei Gründen] gelobt und kritisiert.
   Peter has Maria for each two reasons praised and criticised
   ‘Peter has praised and criticised Mary for two reasons respectively.’

e. Maria hat [jeweils; zwei Bücher] gelobt und kritisiert.
   Maria has each two books praised and criticised
   ‘Maria has praised and criticised two books respectively.’

The last two cases were grouped under the label ‘Moltmann’s observation’ and are of particular interest. They illustrate the capacity of adnominal jeweils to distribute over pluralities denoted by non-DPs. In (167de), jeweils distributes over pluralities of events or predicates. The analysis of (167e) was shown to be problematic on Moltmann’s (1997) account. Thus, a satisfactory analysis of (167de) would be an argument in favour of the present account.

Jeweils-DPs are possible in even more syntactic positions. Jeweils-DPs in subject position distribute over object DPs (168a) or over an implicit set of events (168b). Jeweils-DPs in direct object position distribute over indirect object DPs (168c), and over PP-adverbials (168d).

(168) a. [Jeweils; zwei Offiziere] begleiten die Ballerinen nach Haus.
   each two officers accompany the ballerinas to home
   ‘The ballerinas are accompanied home by two officers each.’

b. [Jeweils; zwei Jungen] standen Wache.
   each two boys kept watch
   ‘Two boys kept watch at a time.’

c. Peter hat zwei Mädchen, [jeweils; zwei Rosen] gekauft.
   Peter has two girls, each two roses bought
   ‘Peter has bought two girls two roses each.’

d. Peter hat in drei Läden, [jeweils; zwei Rosen] gekauft.
   Peter has in three stores each two roses bought
   ‘Peter has bought two roses each in three stores.’

An empirically adequate analysis of adnominal jeweils must account for all the occurrences of jeweils listed in (167) and (168). In the remainder of section 4, I show that the semantic tools introduced so far allow for a correct derivation of the readings of (167a-e). In particular, I will demonstrate that the analysis accounts for Moltmann’s observation, illustrated in (167de). Section 4.3.1 discusses jeweils-DPs in indirect object position (cf.167a). Section 4.3.2. discusses jeweils-DPs in adjunct position (cf.167bc). The discussion of (167c) raises, again, the question of whether there are really two syntactic instances of jeweils. The question is answered in the positive in 4.3.3. Finally, 4.3.4. presents the analysis of Moltmann’s observation.
The proper analysis of (168a-d) requires an additional assumption and will be postponed to chapter V. Nevertheless, the interpretation of (168a-d) is derivable by means of the same semantic mechanisms as the interpretation of (167a-e). The discussion in the remainder of this and in the following chapter will show the interpretive procedure for jeweils-DPs to be a very flexible semantic mechanism. It is the flexibility of this mechanism that accounts for the wide syntactic distribution of jeweils-DPs. As will emerge, there are only three structural conditions that need to be satisfied in order for a successful interpretation of adnominal jeweils. The licensing conditions for adnominal jeweils are summarised in (169).

\[(169) \text{Licensing Conditions for Adnominal Jeweils:}\]

- a predicate denoting expression in sister position \((\text{DistShare})\)
- a relation-denoting expression as sister of the jeweils-DP \((\text{the distributive relation})\)
- a c-commanding plural expression \((\text{DistKey})\)

Notice that (169i) and (169iii) look suspiciously close to the indefiniteness and the plural requirement on adnominal jeweils from chapter II.1.5. We now turn to the interpretation of the sentences in (167a-e).

### 4.3.1 Jeweils-DPs in Indirect Object Position

In (170) (=167a), the jeweils-DP is in indirect object position and takes the V'-constituent formed by V and direct object as its syntactic sister.

\[(170) \text{Die Jungen haben } [\left[ P_i^0 \text{jeweils, zwei Mädchen} \right] \left[ V \text{ Rosen gegeben} \right]].\]

\[\text{the boys have each two girls DAT roses given}\]

\[\text{‘The boys have given two girls each roses.’}\]

It follows from compositionality that the denotations of jeweils-DP and V' combine first. The denotation of V' is of the same semantic type as that of stage-level transitive verbs above: The ditransitive verb gegeben 'given' has already applied to its first semantic argument, the direct object denotation and denotes a ternary relation between two individuals and an event argument. We therefore expect the interpretation of (170) to be analogous to that of jeweils-DPs in direct object position of stage-level transitive verbs (see section 4.2.4). This expectation is borne out, as witnessed by the derivation in (171).

Again, existential closure over the event argument applies VP-internally before the meanings of V' and jeweils-DP combine.

\[(171) a. \left[ P_i^0 \text{jeweils, zwei Mädchen} \right] = \forall z \in Z_i \exists X \left[ 2\text{girls}'(X) \land \ast R(X,z) \right] \]
\[\lambda\text{-abstraction over R in (171a)}\]
\[\lambda \exists Y \left[ \ast \text{rose}'(Y) \land \ast \text{given}'(v, Y, u, e) \right] \]
\[\text{FA of (171c) to (171b)}\]
\[\forall z \in Z_i \rightarrow \exists X \left[ 2\text{girls}'(X) \land \ast R(X,z) \right] \]
\[\forall z \in Z_i \rightarrow \exists X \left[ 2\text{girls}'(X) \land \ast \text{given}'(z, Y, X, e) \right] \]
\[\lambda\text{-abstraction in over index i of subject (trace), plus FA}\]
\[\forall z \in [\left[ \text{the boys} \right]] \rightarrow \exists X \left[ 2\text{girls}'(X) \land \ast \text{given}'(z, Y, X, e) \right] \]
(171c) is true iff for each \( z \) which is element of a specific group of boys there is a set of two girls \( X \) and an event \( e \) and a set of roses \( Y \) such that \( z \) gave \( Y \) to \( X \) in \( e \), matching the truth conditions of (170).

The derivation in (171) shows that the analysis of jeweils-DPs in direct object position can be extended directly to jeweils-DPs in indirect object position. The denotations of the verb (a relation) and of the DistKey (a plurality) are factored in by \( \lambda \)-abstraction over their index, which is followed by functional application. Apparently, the same mechanism works for English double object constructions, as witnessed by the grammaticality of (172).

(172) The boys gave two girls each roses.

4.3.2 Jeweils-DPs in Adjunct Position

The structure of (173) (=167b) differs from the cases analysed so far in that the jeweils-DP is embedded inside an adjunct.\(^{70}\)

(173) [Die Jungen] haben [\( \text{VP}\text{PP}\text{in} j\text{zwei Läden}\)] [\( \text{VP} t\text{Rosen gekauft}\)].

\( \text{The boys have in each two stores roses bought} \)

In (173), the jeweils-DP is part of a PP-adjunct that – like all other event modifiers – is adjoined to VP (see section 1.1.1). The jeweils-DP is syntactically selected by a preposition that provides the content for the distributive relation variable \( R \).

The semantic value of the adjunct-PP in (174d) is derived from the meaning of the jeweils-DP in (174a), by \( \lambda \)-abstraction over index \( j \) (174b), and by FA to the meaning of \( \text{in} \) in (174c).

(174) a. \([\text{P}_0 j\text{jeweils, zwei Läden}] = \forall z [z \in Z_i \rightarrow \exists X [2\text{stores}'(X) \land *R_j(z, X)]]\n
b. \([\text{P}_0 j\text{jeweils, zwei Läden}] = \lambda R_j. \forall z [z \in Z_i \rightarrow \exists X [2\text{stores}'(X) \land *R_j(z, X)]]\n
c. \([\text{in} ] = \lambda x \lambda y. \exists e [\text{in}'(x, y, e)]\n
d. \([\text{PP}\text{in} j\text{jeweils, zwei Läden}] = \forall z [z \in Z_i \rightarrow \exists X [2\text{stores}'(X) \land \exists e [\text{in}'(z, X, e)]]]\n
A difficulty arises when (174d) combines with the VP-denotation in (175).

(175) \([\text{VP} t, \text{Rosen gekauft}] = \lambda E. \exists Y [*\text{rose}'(Y) \land *\text{bought'}(z_i, Y, E)]\n
The VP-denotation in (175) denotes a set of plural events (the reason for the plurality will become apparent shortly) while the adjoined PP-denotation in (174d) is of type \( <p> \). Because of the resulting type-mismatch the two values cannot combine with one another – or so it seems.

\(^{70}\) I ignore the intermediate trace of the topicalised subject in SpecIP.

\(^{71}\) I assume that the preposition \( \text{in} \) (optionally) denotes a ternary relation between two individuals and an event, saying that an individual \( y \) is located in place \( x \) in \( e \). The preposition \( \text{in} \) in (174c) is of the same type as transitive stage-level verbs. From this and from the general semantic setup, it follows that existential closure over the event argument must apply before preposition and jeweils-DP combine. The necessity for analysing \( \text{in} \) as containing an event argument in its lexical entry will become apparent shortly.
We came across a similar problem in connection with (165ab) above. There, it was shown that a VP which contains a *jeweils*-DP and which is therefore of type <t> can be subject to further modification with an event modifier over a higher event layer (of type <vt,t>). In the present case, we are presented with the mirror image of this constellation. An event modifier of type <t> (due to the presence of *jeweils*) occurs next to a VP of type <vt,t>. There, the problem was mended by applying type-triggered \( \lambda \)-abstraction to an event variable \( E \) that provided the semantic restriction for the existential quantifier over the event argument of the verb. The resulting expression was combined with the event modifying expression by predicate modification. Using the same mechanism, (174d) can be made to contain a free event variable as well. As in the above case, an event variable \( E \) should be able to restrict the existential quantifier over the event argument of the preposition. Granted this, (174d) will be able to undergo type-triggered \( \lambda \)-abstraction over \( E \). The output of \( \lambda \)-abstraction is given in (176a), the result of predicate modification is shown in (176b).

\[
(176) \quad \text{a. } \left[ [P_0 \text{in, } P_0 \text{jeweils, zwei Läden} ] \right] = \lambda E. \forall z \left[ z \in Z \rightarrow \exists X [ \text{2stores}'(X) \land \exists e \in E [ \text{in}'(z, X, e) ] ] \right]
\]

\[
\text{b. } \left[ [ \text{in, } P_0 \text{jeweils, zwei Läden Rosen gekauft} ] \right] = \lambda E. \exists Y [ \text{roses}'(Y) \land \ast \text{bought}'(z, Y, E) ] \land \\
\forall z \left[ z \in Z \rightarrow \exists X [ \text{2stores}'(X) \land \exists e \in E [ \text{in}'(z, X, e) ] ] \right]
\]

Existential closure over \( E \), followed by \( \lambda \)-abstraction over index \( i \) and FA to the subject denotation yields (177):

\[
(177) \exists E [ \exists Y [ \ast \text{rose}'(Y) \land \ast \text{bought}'([[\text{the boys}]], Y, E) ] \land \\
\forall z [ z \in [[\text{the boys}]] \rightarrow \exists X [ \text{2stores}'(X) \land \exists e \in E [ \text{in}'(z, X, e) ] ] ]]
\]

(177) is true iff there is a plural event \( E \) in which the boys buy roses and for each individual boy \( z \) there is a set of two stores \( X \) and an event \( e \) element of \( E \) such that \( z \) is in \( X \) in \( e \). I.e., each event of rose buying by an individual boy takes place in two stores.\(^72\)

\(^{72}\) At least three comments are in order. First, the atomic events \( e \) are taken to be materially complex events that are spread out locally over two stores. This indicates that individual events do not necessarily occur at one location only, but that parts of events can spread out over space (as they can over time). Second, the individual events \( e \) are elements of a plural event, which forms part of the pluralised predicate \( \ast \text{bought}' \). The star operator \( \ast \) turns the simple relation \( \text{bought}' \), which holds between individuals, into a higher-order relation between sets of buyers \( X \), bought things \( Y \), and events \( E \) such that for each element of the sets \( X \), \( Y \), and \( E \), there are elements of the other two sets such that the three stand in the (simple) buying relation (cf. Stemefeld 1998:316). That is, \( \ast \text{bought}' \) corresponds to a set of sets of ordered pairs of individual buyers, things bought, and events. These sets express all conceivable events of rose buying by the boys, be they distributive, collective, or cumulative in nature. Third, \( E \) in (176a) stands for a plural event, and – correspondingly - the result of \( \lambda \)-abstraction over \( E \) comes out as a predicate over sets of events. Since (176a) and the VP-denotation in (175) are argued to combine by predicate modification (cf.176b), it follows that the VP-denotation in (175) must also denote a predicate over plural events, and not a predicate over events as usual. In order to account for this, one has to assume that verbal predicates over events (type <v,t>) can optionally be type-shifted to verbal predicates over plural events (type <vt,t>). This type-shift operation is structurally analogous to the type-shift operation that maps individual predicates of type <e,t> into plural predicates (or generalised quantifiers) of type <et,t> in the nominal domain (cf. Partee 1987, Winter 1999). Additional support for a type-shifting operation from event predicates into predicates of pluralities of events comes from the overt existence of so-called ‘pluractionality markers’ (Lasersohn 1995) as *again and again*, *now and then* whose presence seems to effect precisely such a type-shift from <v,t> to <vt,t>. Compare the denotation of the ordinary VP in (ia) with the pluralised VP in (ib):

\[(i) \quad \text{a. } \left[ [v_0 \text{Peter whistles}] \right] = \text{the set of individual events of Peter whistling}\]
Given that the above considerations are on the right track, the existence of jeweils-DPs inside PP-adjuncts is accounted for. Again, the mechanism of type-triggered $\lambda$-abstraction plays a central role in combining the VP-denotation with that of the event modifying adjunct-PP.

A welcome result of the semantic analysis of (173) is that it provides an account for an apparent problem that was pointed out in chapter II.2.3. It is illustrated again in (178).

(178) Der Papst ist [[PP in jeweils drei Länder] [VP t1 gereist]].
the pope is in each three countries travelled

‘The Pope travelled to three countries each time / on each trip.’

The apparent problem with (178) is that an instance of adnominal jeweils (as witnessed by its being embedded inside a PP) distributes over an implicit set of events in the absence of a plural DP that could serve as DistKey. In other words, adnominal jeweils in (178) has an adverbial-like reading in the sense that it distributes over events.

The adverbial-like reading of (178) is derived as follows. The derivation parallels that of (173) up to the point where the values of PP and VP combine. The value of the PP in jeweils drei Länder ‘in three countries each’ is given in (179).

(179) $[[\text{in jeweils drei Länder}]] = \forall z [z \in Z \rightarrow \exists X [\text{3countries'(X) \land to'(X, z)]]]$

Now, the distributive effect over a set of events is achieved by interpreting $Z$ as a variable over sets of events. This move is licit since the only formal requirement on $Z$ is that it be a set variable (for entities of any kind). If so, type-triggered $\lambda$-abstraction can apply to $Z$ directly. The result combines with the VP-denotation by predicate modification, parallel to the case in (173). (180) shows the result of predicate modification.

(180) $[[\text{in jeweils drei Länder gereist}] = \lambda E. [*travelled'(z_1, E)] \land \forall z [z \in E \rightarrow \exists X [\text{3countries'(X) \land to'(X, z)]]]$}

As desired, the restriction for the universal quantifier is provided by a set of events in (180). In the next step, the subject denotation is factored in by $\lambda$-abstracting over index ‘1’ of the subject trace, and by functionally applying the result to the subject denotation. Finally, the expression applies to an implicit set of events $E$ provided by the context.

(181) $[*travelled'(the pope, E_i) \land \forall z [z \in E_i \rightarrow \exists X [\text{3countries'(X) \land to'(X, z)]]]$}

(181) is true if there is a given set of events $E$ of the pope travelling, and for each element $e$ of $E$ it holds that there are three countries that were travelled to. This adequately captures the truth-conditions for (178), showing that the proposed semantic analysis is flexible enough to deal with the existence of adverbial-like readings with adnominal jeweils on which the latter distributes over an implicit set of events. In chapter V, it will emerge that this is a general option for adnominal jeweils whenever the relevant licensing conditions are met.

(167c), repeated as (182) is interpretable in a similar way.
The only difference to the above construction is that the DistShare *zweimal* ‘twice’ in (182) is of type <vt,t> and denotes a cardinal predicate over plural events. It follows that the relation variable \( R \) contained in *jeweils* establishes a relation between individuals (here: the set of boys), and sets of events which are predicated to be of cardinality 2 by the DistShare. The *jeweils*-DP as a whole is an (adverbial) event modifier, and as such adjoined to VP.

The denotation of the *jeweils*-DP is given in (183a), that of the lower VP before existential closure in (183b). Notice that the VP must again denote a second order predicate over pluralities of events (cf. fn.72).

\[
\text{(183) a. } [[\text{DP} P^0 j \text{jeweils}_i \text{zweimal}]] = \forall z \left[ z \in Z_i \rightarrow \exists E \left[ \text{twice}'(E) \land *R_j(z, E) \right] \right] \\
\text{b. } [[\text{VP} t_i \text{geklopft}]] = \lambda E. *\text{knocked}'(X_i, E)
\]

The question of how to combine the two denotations in (183ab) presents us with the by now familiar problem of type mismatch. Once again, I suggest the by now familiar remedy of type-triggered \( \lambda \)-abstraction over a free variable in (183a). As in the case of (173), I suggest that the free variable is an event variable \( E' \) which restricts the existentially bound set of events \( E \) in (183a). However, since \( E \) stands for a plurality of events already, namely events of knocking twice, I suggest that \( E \) and \( E' \) are related to one another by the subset relation. With these assumptions, \( \lambda \)-abstraction over \( E' \) results in (184a). This expression combines with (183b) by predicate modification, yielding (184b). Finally, existential closure over \( E' \) and \( \lambda \)-abstraction over the subject’s index plus functional application to the subject denotation yield (184c).

\[
\text{(184) a. } [[\text{DP} P^0 j \text{jeweils}_i \text{zweimal}]] = \lambda E'. \forall z \left[ z \in Z_i \rightarrow \exists E \subseteq E' \left[ \text{twice}'(E) \land *R_j(z, E) \right] \right] \\
\text{b. } [[\text{VP} t_i \text{geklopft}]] = \lambda E'. *\text{knocked}'(X_i, E') \land \forall z \left[ z \in Z_i \rightarrow \exists E \subseteq E' \left[ \text{twice}'(E) \land *R_j(z, E) \right] \right] \\
\text{c. } [[\text{Die Jungen, haben jeweils, zweimal geklopft}]] = \exists E' \left[ *\text{knocked}'(\left[\text{the boys}\right], E') \land \forall z \in [[\text{the boys}]] \rightarrow \exists E \subseteq E' \left[ \text{twice}'(E) \land *R_j(z, E) \right] \right]
\]

(184c) reads as ‘There is a plurality \( E' \) of knocking events by the boys and for each individual boy \( z \), there is a subset \( E \) out of \( E' \) such that \( E \) consists of two atomic events and such that \( z \) stands in some relation to this event’. An interesting property of (184c) is that the free relation variable \( R_j \) remains free and must therefore be assigned a value from the context. In the situation depicted, the only meaningful values for \( R_j \) are values such as \( \text{IN} \) or \( \text{AT} \) (indicating that \( z \) participates in the event) or, more specifically, a relation such as \( \text{AG} \), indicating that \( z \) is the acting agens of the event. I assume that any ‘incorrect’ values for \( R_j \) are correctly excluded by contradiction with the condition *knocked’([the boys], E’) in the first part of the conjunct.

In conclusion, it was shown that *jeweils*-DPs in event modifying adjuncts can be correctly interpreted by means of the semantic tools introduced so far. The central role in

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73 I take the event modifier *zweimal*, literally ‘two times’, to be of category NP due to the nominal status of its head *mal* ‘time’. On the existence of bare NP-adverbs, cf. Larson (1985b).
the derivation is played by type-driven $\lambda$-abstraction that applies to a plural event variable $E$. The application of $\lambda$-abstraction over $E$ paves the way for combining the semantic values of adjunct and VP by way of predicate modification.

4.3.3 On the Necessity of Adnominal Jeweils in Ambiguous Sentences

The discussion of adnominal jeweils with event predicates such as zweimal ‘twice’ raises the question of whether we really need adnominal jeweils in ambiguous sentences such as (117), which is repeated as (185).

(185) ..., weil die Jungen jeweils zwei Bücher gekauft haben.

because the boys each two books bought have

a. ‘The boys have bought two books each.’

b. ‘The boys have bought two books each time.’

The problem is the following. Up until now, I have argued that (185) is structurally ambiguous. The adverbial reading (185b) involves an instance of adverbial jeweils, which combines with the VP denoting an event predicate. The adnominal reading (185a) involves an instance of adnominal jeweils, which forms the object DP together with the DistShare, and which distributes over the subject DistKey. In the preceding section, however, we have come across a case of jeweils combining with an event predicate as its DistShare, while distributing over a plural subject nonetheless. Now, if it is possible for jeweils in (182) to combine with an event predicate (zweimal ‘twice’) and to distribute over a plural subject (die Jungen ‘the boys’), why should it be impossible for jeweils in (185) to combine with a VP (also an event predicate) and distribute over a plural subject as well? If this were an option, there would be no need for postulating two different structures in (185). Both readings would fall out from the structure in (186), the difference in interpretation being due to a difference in indexation. (186) shows the supposed indexation for the ‘adnominal’ reading (185a).

(186) Die Jungen haben [\[VP jeweils, \[VP \text{zwei Bücher gekauft}\]\]\].

the boys have each two books bought

If correct, this reasoning would stand in stark contrast to the empirical evidence in favour of structural ambiguity that was adduced in chapter II.2. Fortunately, though, a closer inspection of (186) shows that the assumption of structural ambiguity need not be abandoned. It can be shown that (186) is not interpretable at all. To see this, consider the derivation in (187). (187a) shows the value for jeweils. (187b) shows the denotation of the VP. (187c) shows the denotation of the two constituents combined.

(187) a. \[\[[P^0_j, jeweils,]_i\] = \[\lambda P. \forall z [z \in Z_i \rightarrow \exists e [P(e) \land R_j(z,e)]]\]

b. \[\[[t_i, \text{zwei Bücher gekauft }]] = \lambda e. \exists Y [2books'(Y) \land \ast bought'(v_i, Y, e)]\]

c. \[\[[P^0_j, jeweils, t_i, \text{zwei Bücher gekauft}]] = \forall z [z \in Z_i \rightarrow \exists e [\exists Y [2books'(Y) \land \ast bought'(v_i, Y, e)] \land R_j(z,e)]]\]

The next step in the derivation is the crucial one. In order to factor in the subject denotation, $\lambda$-abstraction must apply over index ‘i’. This $\lambda$-abstraction is followed by functional application, incorrectly yielding (188) as a possible meaning for (185).
(188) \[\forall z[z \in \text{theboys}] \rightarrow \exists e[\exists Y[2\text{books}'(Y) \land \text{*bought'}([\text{theboys}], Y, e)] \land \text{R}_j(z, e)]\]

The problem with (188) is that universal quantification over the set of boys does not result in distribution over the boys regarding the buying event. The set of boys still features as the subject of the predicate *bought* in the nuclear scope of the universal quantifier. (188) could be paraphrased roughly as 'For each individual boy \(z\), there is an event \(e\) such that there are two books \(X\), such that all the boys bought \(X\) in \(e\), and \(z\) stands to \(e\) in an additional relation.' It is not clear to me if this paraphrase is in any way meaningful. In any event, it does not express the adnominal reading in (185a).

The problem with (188) stems from the fact that the subject variable is located in the nuclear scope of the universal quantifier in (187c). Since the subject variable is co-indexed with the DistKey, in this case the plural subject, \(\lambda\)-abstraction over index 'i' (on the variables \(Z\) and \(v\)) and functional application to the denotation of the plural subject bring it back into the nuclear scope of the universal quantifier, counteracting the (distributive) effect of universal quantification.

I conclude that adnominal *jeweils* can only take event predicates as its DistShare argument if the event predicate does not contain a variable that is co-indexed with the DistKey. Typical event modifiers that meet this condition are adjuncts like *zweimal* 'twice'. In contrast, VPs, which contain a trace of the DistKey (e.g. the subject trace) do not satisfy the condition. It follows that *jeweils* cannot directly combine with the VP in (185) in order to give rise to the adnominal reading. The structural ambiguity of (185) is therefore not only supported by empirical arguments, but also by semantic considerations.

### 4.3.4 Distribution over Plural Events and Plural Predicates

We turn now to the analysis of sentences (167de), repeated as (189ab). Both sentences are instantiations of Moltmann’s observation.

(189) a. Peter hat Sue [aus [jeweils \(i\) zwei Gründen]] [gelobt und kritisiert],
Peter has Sue for each two reasons praised and criticised
‘Peter has praised and criticised Sue for two reasons respectively.’

b. Maria hat [jeweils \(i\) zwei Bücher] [gelobt und kritisiert],
Maria has each two books praised and criticised
‘Maria has praised and criticised two books respectively.’

(189ab) stand out because *jeweils* does not distribute over a plurality of (concrete) individuals denoted by an argument DP, but over the denotation of the verb conjunction *gelobt und kritisiert* ‘praised and criticised’. Of course, the present semantic analysis of adnominal *jeweils* should capture its capacity to distribute over the denotation of non-DPs. I would like to argue that the occurrence of adnominal *jeweils* in the constructions in (189ab) is licensed by its inherent flexibility regarding the nature of its DistKey, as long as the latter denotes a plurality for *jeweils* to distribute over. In particular, I argue that *jeweils* distributes over a plural event in (189a) and over a plural predicate in (189b).

Looking at (189a) first, its structure is given in (190).

(190) \(P, \text{hat } S, [\text{VP, aus } [\text{jeweils, zwei G.}][\text{gelobt und kritisiert}]]\)

\(P\) has \(S\) for each two reasons praised and criticised
I assume that the event-modifying PP *aus jeweils zwei Gründen* ‘for two reasons each’ is adjoined to VP, as are all event-modifying expressions.\(^74\) I also assume that the object *Maria* has scrambled out of the VP at surface structure since it precedes the adverbial modifier that is adjoined to VP.

I assume that the conjoined VPs in (189a) denote a predicate over plural events that is formed by Krifka’s mechanism of predicate conjunction. Translating Krifka’s (1990) mechanism for predicate conjunction into set notation, we get the following denotation for the conjoined VP.\(^75\)

\[(191) \lambda E, \exists e_1, e_2 [E = \{e_1, e_2\} \land \text{praise}'(x_1, y_2, e_1) \land \text{criticise}'(x_1, y_2, e_2)]\]

(191) stands for a set of complex events \(E\) which consist of two subevents \(e_1\) and \(e_2\) such that \(e_1\) is a praising of \(y\) by \(x\), and \(e_2\) is a criticising of the same person \(y\) by the same person \(x\). With (191), the rest of the derivation is standard and given in (192).

\[(192)\]
\[\begin{align*}
\text{a.} & \quad \lambda E, \exists e_1, e_2 [E = \{e_1, e_2\} \land \text{praise}'(x_1, y_2, e_1) \land \text{criticise}'(x_1, y_2, e_2)] \\
& \quad \text{for each two reasons} \\
& \quad \downarrow \\
& \quad \lambda\text{-abstraction in (192a) over 'i' triggered by index on V} \\
\text{b.} & \quad \lambda E, \exists e_1, e_2 [E = \{e_1, e_2\} \land \text{praise}'(x_1, y_2, e_1) \land \text{criticise}'(x_1, y_2, e_2)] \\
& \quad \downarrow \\
& \quad \text{predicate modification of (191) and (192b)} \\
\text{c.} & \quad \lambda E, \exists e_1, e_2 [E = \{e_1, e_2\} \land \text{praise}'(x_1, y_2, e_1) \land \text{criticise}'(x_1, y_2, e_2)] \\
& \quad \downarrow \\
& \quad \forall z [z \in E \Rightarrow \exists X [\text{2reasons}'(X) \land \text{for}'(X, z)]] \\
\text{d.} & \quad \exists E, \exists e_1, e_2 [E = \{e_1, e_2\} \land \text{praise}'(x_1, y_2, e_1) \land \text{criticise}'(x_1, y_2, e_2)] \\
& \quad \downarrow \\
& \quad \forall z [z \in E \Rightarrow \exists X [\text{2reasons}'(X) \land \text{for}'(X, z)]]
\end{align*}\]

\[(192d)\] is true iff there is a complex event \(E\) which consists of a criticising of Sue by Peter and a praising of Sue by Peter and for each element \(z\) of the complex event \(E\) there is a set \(X\) of two reasons such that \(z\) happened because of \(X\). This paraphrase correctly

\(^74\) The event modifying PP *aus jeweils zwei Gründen* ‘for two reasons each’ is perhaps not the optimal choice because *P* and *NP* form a semantically non-transparent constituent. The basic meaning of the preposition *aus* is usually not ‘for’, but ‘from’. Somehow, *aus* inherits its causative flavour from the meaning of the head noun, *Gründen* ‘reasons’, which leads to the following value for the entire PP:

\[(i) \lambda E, \exists e_1, e_2 [E = \{e_1, e_2\} \land \text{praise}'(x_1, y_2, e_1) \land \text{criticise}'(x_1, y_2, e_2)] \]

Still, I will continue using this possibly non-compositional example in order to avoid additional data confusion and because the same facts are observable with regular, compositional PPs. In (ii), the preposition combines with the *jeweils*-DP on its regular reading.

\[(ii) \text{Peter hat an jeweils zwei Orten gelobt und kritisiert.} \quad \text{‘Peter has praised and criticised Sue at two locations respectively.’}\]

\(^75\) I gloss over the question if (189a) is better analysed as involving conjunction of bare verbs or of whole VPs plus across-the-board-extraction. Winter (1999:70-72) shows that Krifka’s mechanism works for predicates of type \(<e,t>\) or \(<v,t>\), the type of the conjoined VPs, but that the attempt at a recursive extension to higher types (e.g. \(<et,t>\)) fails. Since Krifka’s mechanism works fine with predicates, it should work for the present case if we assume that the conjoined entities are VPs of type \(<v,t>\). Semantic considerations therefore argue in favour of VP-conjunction in (190).

By the same argument, the structure of (189b) may differ from (189a) because *jeweils* will shortly be shown to distribute over a plural relation in (189b). It would make sense if this semantic difference were reflected in a different syntactic structure in form of bare V-contraction.
captures the truth-conditions of (189a), showing that the present semantic analysis of adnominal jeweils successfully deals with apparently problematic cases where jeweils distributes over a plural event denoted by verb (phrase) conjunction. It is worthwhile pointing out that nothing special is required except for Krifka’s mechanism of predicate conjunction, which is needed independently anyway.

It is also worth noting that the derivation in (192) resembles that of (151b), repeated as (193), in that the denotation of the DistKey enters the semantic derivation by predicate modification (see section 4.2.3).

(193) Listen mit jeweils drei Namen wurden herumgereicht.
lists with each three names were passed around

In both cases, the denotation of a PP containing the jeweils-DP combines with a plural predicate. In the case of (189a), the VP-conjunction lobte und kritisierte ‘praised and criticised’ denotes a plural predicate over events. In (193), the bare plural noun Listen ‘lists’ denotes a plural predicate over concrete individuals. Therefore, sentence (189a) can be viewed as the ‘eventive’ counterpart of (193) in the verbal domain. This shows once again that the syntactic flexibility observed with adnominal jeweils is not due to the application of different semantic processes in each case, but to the inherent semantic flexibility of jeweils regarding the nature of its DistKey.

We now turn to (189b), which is even more complex, as we will see shortly.

(189) b. Maria hat [jeweils zwei Bücher] [gelobt und kritisiert].
Maria has each two books praised and criticised
‘Maria has praised and criticised two books respectively.’

(189b) is special in that the verb conjunction does not only provide the content of the distributive relation between DistKey and DistShare, a praising or a criticising. Intuition tells us that the denotation of the conjoined verbs also provides the plurality (the DistKey) over which jeweils distributes. I would like to argue that this intuition is correct and that jeweils indeed distributes over the plural predicate denoted by gelobt und kritisiert ‘praised and criticised’ in (189b).

As indicated in fn.75, I assume that the two verbs conjoin directly. In addition, I assume that the jeweils-DP has overtly moved and adjoined to VP. The structure of the VP in (189b) is given in (194).

(194) The two conjoined verbs in (194) denote a set of relations, as indicated in (195a). For convenience, the same expression is given in set notation in (195b).
(195) a. $[[\text{gelobt und kritisiert }]]$
   
   $= \lambda R. R = \lambda x. \exists e_1[\text{praised}'(x,y,e_1)] \lor R = \lambda y. \exists e_2[\text{criticised}'(x,y,e_2)]$

   b. $\leftrightarrow \{\lambda y. \lambda x. \exists e_1[\text{praised}'(x,y,e_1)], \lambda y. \lambda x. \exists e_2[\text{criticised}'(x,y,e_2)]\}$

Notice that existential closure over the event variable(s) must take place before the two verbs conjoin. This is necessary because the two event predicates *praise* and *criticise* should not apply to the same event because of their (usually) mutually exclusive interpretation. If existential closure happened after verb conjunction, the two event predicates would apply to the same event, making it a simultaneous praising and criticising of something by someone, contrary to our intuitions concerning (189b).

In a next step, the set of relations must apply to the object trace, which is an argument to both individual relations $R_1$ and $R_2$. I assume that a set of relations consisting of $R_1$ and $R_2$ can apply to an individual entity $x$ by forming a set of unary predicates consisting of $P_1$ and $P_2$, with the relevant argument position being saturated by $x$. This way, we get (196a) as the denotation for $*V_1'$ in (194). A second application to the subject trace (using the same mechanism) gives (196b), a set of propositions, consisting of $P_1$ and $P_2$, as the denotation of the pluralised VP.

(196) a. $[[t_1 \text{ gelobt und kritisiert }]]$
   
   $= \lambda P. P = \lambda x. \exists e_1[\text{praised}'(x,y_1,e_1)] \lor P = \lambda y. \exists e_2[\text{criticised}'(x,y_1,e_2)]$

   b. $[[t_2 t_1 \text{ gelobt und kritisiert }]]$
   
   $= \lambda p. p = \exists e_1[\text{praised}'(x_2,y_1,e_1)] \lor p_2 = \exists e_2[\text{criticised}'(x_2,y_1,e_2)]$

In a next step, $\lambda$-abstraction over index ‘1’ of the moved *jeweils*-DP reverts the transition from (196a) to (196b) by opening up the object position. This gives us (197a) as the value for the sister of the *jeweils*-DP. The expression in (197a) stands for a set of predicates that is co-indexed with the free variable $Z_i$ in the denotation of the *jeweils*-DP in (197b).

(197) a. $\lambda P. P = \lambda y. \exists e_1[\text{praised}'(x_2,y_1,e_1)] \lor P = \lambda y. \exists e_2[\text{criticised}'(x_2,y_1,e_2)]$

   $\leftrightarrow \{\lambda y. \exists e_1[\text{praised}'(x_2,y_1,e_1)], \lambda y. \exists e_2[\text{criticised}'(x_2,y_1,e_2)]\}$

   b. $[[P_1^j \text{ jeweils, zwei Bücher}] = \forall P [P \in Z_i \rightarrow \exists X [2\text{books}'(X) \land *R_j(P,X)]]$

As mentioned above, adnominal *jeweils* in (198b) is special in that it distributes not over a set of individuals, but over the set of predicates in (197a), which is denoted by the sister of the *jeweils*-DP in (194). This is indicated by co-indexation of *VP*, and the DistKey variable $Z_i$ in (197b). It follows that index-triggered $\lambda$-abstraction over index ‘i’ can apply in (197b), yielding (198a). The resulting expression takes the *VP-denotation as its argument, yielding (198b).

(198) a. $[[P_1^j \text{ jeweils, zwei Bücher}] = \lambda Z_i \rightarrow \forall P [P \in Z_i \rightarrow \exists X [2\text{books}'(X) \land *R_j(P,X)]]$

   b. $[[P_1^j \text{ jeweils, zwei Bücher }[\forall P t_1 t_1 \text{ gelobt und kritisiert }]]$

   $= \forall P [P \in \lambda y. \exists e_1[\text{praised}'(x_2,y_1,e_1)], \lambda y. \exists e_2[\text{criticised}'(x_2,y_1,e_2)] \rightarrow \exists X [2\text{books}'(X) \land *R_j(P,X)]]$

The right hand expression in (198b) reads as ‘For each predicate $P$ that expresses either a being praised by somebody, or a being criticised by somebody, there is a set of two books $X$ such that $P$ stands in a certain relation $*R_j$ to $X$. Since there is no overt relation-denoting expression in the clause, a plausible candidate value for $R_j$ must be searched for
elsewhere, presumably in the extra-linguistic context. We have come across a similar case of a contextually specified value for $R_j$ in connection with (182) in section 4.3.2.

Thinking about what kind of relation can plausibly be established between a predicate (over sets) $P$ and a set $X$, candidate values that come to mind are ‘$P$ holds of $X$’, ‘$P$ functionally applies to $X$’ etc. I assume that $*R_j$ in (198b) is assigned some such value in the absence of an overt index ‘$j$’ in the syntactic structure in (194). With this assumption the bold-faced restriction $*R(P,X)$ in (198b) reduces to $*P(X)$. After factoring in the subject denotation (by applying $\lambda$-abstraction over ‘2’ and functionally applying the result to the subject denotation), we get (199) as the eventual reading for (189b).

\[(199) \forall P \{ \lambda y. \exists e_1 \{ \text{praised'}(\text{maria},y,e_1) \}, \lambda y. \exists e_2 \{ \text{criticised'}(\text{maria},y,e_2) \} \rightarrow \exists X [2\text{books'}(X) \land *P(X)] \}\]

(199) will be true if for each predicate $P$ of the set of two predicates of being criticised by Maria and of being praised by Maria, there is a set of two books $X$ such that the predicate holds of this set, i.e., the set of books is either praised by Maria or criticised by her.

This seems to adequately capture the truth-conditions of (189b). The semantic representation in (199) allows for (189b) to be true if the praised and criticised books are the same. At the same time, it excludes the possibility that (189b) is true in a situation in which Mary criticised four books without doing any praising. As shown in 3.2.5, this was the fundamental problem with Moltmann’s analysis of sentence (189b).

4.4 Summary

This concludes the discussion of the semantics of adnominal jeweils. Adnominal jeweils has been analysed as a double quantifier that introduces an existentially quantified set in the scope of a universal quantifier. It was shown to distribute over all kinds of plural entities, including individuals, events, and properties. This assumption allows for a correct interpretation of jeweils in a range of syntactic configurations, using standard semantic mechanisms like functional application, predicate modification, existential closure, predicate conjunction, and the two $\lambda$-rules from section 4.2.1. All these mechanisms are attested independently of the presence of adnominal jeweils, which gives the analysis grounding on independent principles and mechanisms.

5 Accounting for the Properties of Adnominal Jeweils

In this section, I show how the semantic analysis of adnominal jeweils accounts for the characteristic properties of jeweils, and of d-distributive elements in other languages. As shown in chapters II.1 and III.2.4.1, these are the indefiniteness restriction on DistShare, the plurality requirement on DistKey, and the clausemate-condition. For convenience, the three properties are illustrated again in (200a-c).

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76 The fact that ‘$j$’ cannot be explicitly expressed in the syntactic structure in (194) follows from the framework used here. One could think of ways to encode ‘$j$’ in the structure in (194), for instance by introducing a functional syntactic head $\text{PRED}_j$ into the structure. I will leave it open whether and how this can be made to work, and assume that $R_j$ is assigned its value as a result of a general reasoning procedure concerning possible relations between predicates and arguments.
The indefiniteness constraint on DistShare follows on the meaning of *jeweils* in (201).

\[(201) \quad [\text{\textit{P}}_j \text{ jeweils}] = \lambda P . \forall z \left( (z \in Z_i) \land \exists x \left( P(x) \land R_j(x)(z) \right) \right)\]

The denotation of *jeweils* requires one semantic argument that is provided by the syntactic sister of *jeweils*, the DistShare. Since (201) specifies that this argument must be a property (or alternatively a set of individuals), the DistShare expression must be able to denote such a property. This is usually the case with indefinite or numeral expressions.

(201) allows for any property-denoting expression as argument. It follows that definite DPs can also occur as DistShare expressions, as long as they denote a property. This is possible with non-specific (or type-denoting, cf. Vergnaud & Zubizarreta 1992) definite DPs (see also chapter II.1.5, fn.8). As a result, (202a) is interpretable and grammatical. The property denoted by the definite DP in (202a) is spelt out in (202b).

\[(202) \quad a. \quad \text{Die Mädchen haben jeweils [die beste Freundin (von sich)] eingeladen.} \quad \text{The girls have each the best girlfriend of REF'L invited} \]

\[b. \quad [\text{die beste Freundin}] = \lambda x . x \text{ is the best girlfriend (of y}_1\text{)}\]

The plurality requirement on the DistKey also follows on the meaning of *jeweils* in (201). The denotation of the DistKey expression provides the value for the set variable \(Z_i\). Since \(Z_i\) necessarily ranges over pluralities of entities, it cannot be co-indexed with a singular-denoting expression.77

To see how the clausemate-condition follows on the semantics proposed, it is necessary to look at the derivation of (200c) in detail. We start at that point in the derivation where the values of the *jeweils*-DP in (203a), and of the transitive stage-level verb in (203b) combine to yield (203c). Recall that the necessary precondition for combining the values is \(\lambda\)-abstraction over the relation variable that is contained in the denotation of the *jeweils*-DP.

\[(203) \quad a. \quad [\text{\textit{jeweils}_i \text{ einen Ballon}] = \lambda R_j . \forall z \left( (z \in Z_i) \rightarrow \exists x \left( \text{balloon'}(x) \land R_j(x)(z) \right) \right)\]

\[b. \quad [\text{\textit{gekauft hat}}] = \lambda y \lambda x . \exists e [\text{bought'}(x,y,e)]\]

\[c. \quad [\text{\textit{jeweils}_i \text{ einen Ballon gekauft hat}}]
\[= \forall z \left( (z \in Z_i) \rightarrow \exists x \left[ \text{balloon'}(x) \land \text{bought'}(z,x,e) \right] \right)\]

---

77 I assume that the element-of relation is not reflexive. I.e., an entity cannot be an element of itself.
(203c) is the denotation of $V'$, which contains the direct object and the verb. The value of this constituent cannot combine with the value of the subject trace because of type mismatch between $<\epsilon>$ (subject trace) and $<t>$ ($V'$).

\[
\begin{array}{c}
\text{VP} \\
\text{t}_{<\epsilon>} \quad ? \\
x \\
\text{DP} \\
V \\
\text{jeweils einen Ballon gekauft}
\end{array}
\]

The type-mismatch in (204) cannot be resolved. The denotation of $V'$ is an open proposition with one free variable, namely $Z_i$. Thus, it allows for $\lambda$-abstraction over $Z_i$ in principle. The meaning of the trace is an individual variable $x$, though, which cannot be co-indexed with the plural variable $Z_i$. Co-indexation is blocked by the plurality requirement (see above). Therefore, index-triggered $\lambda$-abstraction from 4.2.1 cannot apply to the denotation of $V'$. At the same time, $\lambda$-abstraction over $x$ in the left hand daughter would result in a Skolem function from individuals to individuals, namely the identity function $\lambda x.x$. In conclusion, there is no way for the two daughters of VP in (204) to combine semantically, and the semantic derivation stops dead.

The only way to interpret the structure in (204) is for the subject trace to denote a variable over plural entities. This is the case with traces left behind by a plural subject, as shown in (205).

\[
\text{(205)*Die Verkäufer sagen, dass die Jungen jeweils einen Ballon gekauft haben.}
\]

\`
the store clerks say that the boys each a balloon bought have

‘The store clerks said that the boys have bought a balloon each.’
\`

In (205), the subject of the embedded clause is invariably the DistKey for jeweils. This is so for the simple reason that it must be interpreted as such under the constellation in (204). There is no way for the semantic derivation to by-pass the subject trace, or to assign it another semantic role, because the denotation of $V'$ has exactly one semantic argument position free after $\lambda$-abstraction, that of the DistKey.

The reason for the ungrammaticality of (200c), and for the impossible reading for (205), then, does not lie in the fact that the DistKey expression is syntactically too far away from jeweils. It lies solely in the fact that the subject of the embedded clause must be interpreted as DistKey due to the way the interpretive procedure is set up. If the embedded subject is of the right kind, i.e. if it is a plural expression as in (205), it must be interpreted as DistKey. If the subject is not of the right kind, i.e. if it is a singular expression as in (200c), it cannot be interpreted at all. The semantic derivation cannot proceed, and the sentence is ungrammatical because it is uninterpretable.

---

78 This argumentation implies that the trace of an argument inherits the plural or singular status from its raised antecedent. Alternatively, one could assume that traces are always optionally of type $<\epsilon,t>$, and that the type mismatch in (204) arises in a position higher in the tree, where $I'$ combines with the raised subject.

79 This is not fully true. There is an additional syntactic reason for why (200c) is out. The sentence could be interpreted if QR raised the jeweils-DP out of the embedded clause, leaving behind a trace of type $<\epsilon,t>$. However, there is reason to belief that QR is clause-bound (cf. e.g. Reinhart 1997), making extraction of the jeweils-DP impossible.
Concluding, the three characteristic properties of adnominal jeweils, namely indefiniteness requirement, plurality requirement, and clausemate condition, can be shown to follow from the semantics of the construction. Furthermore, on the plausible assumption that the semantics involved are universal, we can also explain why these properties hold for d-distributive constructions cross-linguistically.

6 A Cross-Linguistic Difference: DDs in Small Clauses

The discussion of German jeweils has shown that its semantics are very flexible and do not seem to impose restrictions on the syntactic distribution of these elements. In the previous section, it was suggested that the meaning of d-distributive elements and the semantic operations involved in interpreting d-distributive constructions are the same cross-linguistically. It follows that the interpretation of d-distributive constructions in other languages should happen along the same lines as in German. Therefore, d-distributive elements in other languages should be interpretable in the same way as German jeweils in those positions in which they are licensed syntactically (see chapter III.5.4). This section shows in exemplary fashion that this prediction seems to be correct for English and for the other languages under discussion. In light of this, the impossibility of d-distributive each in subject position of small clauses (SCs), which was left as an open problem in chapter III.5.5, comes unexpected. The greater part of this section is therefore devoted to an integrated syntactic and semantic account of d-distributive elements in SCs.

Focussing on English, we see that the d-distributive element each occurs in direct object position of individual level verbs (206a), in direct object position of stage-level verbs (206b), in indirect object position (206c), and inside PP-adverbs (206d). In each position, each is syntactically licensed by a c-commanding DistKey-DP.

(206) a. The boy each have [two tattoos each].
   b. The boys bought [two sausages each].
   c. The boys gave [two girls each] roses.
   d. The boys bought books [in three bookstores each].

On the null hypothesis, the semantic derivations for the sentences in (206) are the same as those introduced for the corresponding German structures in sections 4.2 and 4.3.

(207) shows examples of d-distributive elements inside PP-adjuncts from a number of languages. The occurrence of d-distributive elements in this position is expected, since the syntactic requirement of a c-commanding DP as DistKey is met, and since the interpretive procedure is capable of interpreting such structures (cf. section 4.3.2).

(207) a. Strákarnir keyptu bókur í þremur bókabúðum hver / hver. [Icelandic] boys-DUAL bought books in three bookstores each / each (Hrafn, p.c.)
   b. I ragazzi hanno comprato libri in ciascuno dei tre negozi [Italian] the boys have bought the books in each of the 3 stores (d’Allessandro, p.c.)
   c. Guttene kjøpte bøker i hver sine tre butikker. [Norwegian II] boys-DUAL bought books in each their-REFL three store (Vangsnes, p.c.)
   ‘The boys bought books in three stores each.’
In light of these cross-linguistic correspondences, the following contrast between English and German is surprising. It concerns the (non-) availability of a d-distributive element in the subject position of a (resultative) small clause.

(208) a. Die Jungen, haben jeweils, zwei Häuser rot gestrichen.
the boys have each two houses red painted
b. *‘The boys have painted two houses each red.’

This contrast was pointed out as problematic in chapter III.5.5, but there we lacked the necessary semantic tools for solving the problem. The problem is that the d-distributive element in the English (208b) is ungrammatical although is c-commanded by a DistKey DP. According to the discussion in chapter III.5.4, the D-features of the boys should be able to copy onto the proform complement of each and check against the D-features of the latter if this process is licensed under c-command. Hence, it cannot be the syntax (in isolation), which is responsible for the ungrammaticality of (208b). On the other hand, we have just argued that the semantics of d-distributive constructions are the same universally. Given this, it cannot be the semantics (in isolation), which are responsible for the ungrammaticality.

In response to this problem, I would like to argue that semantic and syntactic factors conspire to rule out (208b), and to rule in (208a). More to the point, I argue that the semantics are the same in both sentences, but that they only tolerate a certain syntactic structure. This structural requirement is matched by German (208a), but not by English (208b). The relevant difference lies in the fact that German is underlyingly SOV, whereas English is SVO (cf. chapter I.2.3). This way, the difference between (208a) and (208b) is reduced to an underlying syntactic difference between the two languages. Even so, the ungrammaticality of (208b) ultimately arises from semantic factors: The English structure in (208b) cannot be properly interpreted. If correct, this explanation provides a powerful argument for an integrated syntactic and semantic analysis. Only by looking at syntax and semantics in parallel can we determine the reason for the difference in grammaticality between (208a) and (208b).

How does the difference between (208a) and (208b) follow from a difference in underlying word order? In order to see this, we must look at the syntactic structures of the two sentences and ask how they can be interpreted. The surface structures of the VPs are given in (209ab).

(209) a. \[VP \text{ subj} [VP \text{ rot}] \]
    each two houses red painted
b. \[VP \text{ subj} [VP \text{ each}] \]

The striking difference between (209a) and (209b) is the position of the main verb. In German it occurs in sentence-final position, adjacent to the SC-predicate rot ‘red’. In English, it precedes the SC, and does not stand adjacent to its predicate.

Deriving the meaning of (209b), we begin with the meaning of the each-DP in (210).

(210) \[\text{DP} \text{ each} \] = \begin{align*}
&\forall z \in \mathbb{Z}, \exists x [\text{2houses’}(x) \land R(x)(z)]
\end{align*}

80 I assume a very simple non-endocentric SC-structure. Nothing hinges on the exact structure of the SC (cf. e.g. Stowell 1981, Bowers 1993). The argument will go through no matter what SC-structure we assume.
(210) is a saturated expression, a proposition, with the two free variables \( Z \) and \( R \). But this expression cannot combine with the denotation of its sister, the property-denoting predicate \( \text{red} \). The predicate does not denote a relation, hence it cannot be substituted for \( R \). On the other hand, the predicate does denote a set of entities and could be – in principle – inserted for \( Z \) (making \textit{each} distribute over the set of red things). In a next step, the verb denotation could be inserted for \( R \). The resulting expression is a proposition with no free variables, which means that there is no way to incorporate the denotation of the subject (trace). It follows that the entire clause (208b) cannot be interpreted and is consequently ruled out for semantic reasons. The problem is reminiscent of the problems encountered in connection with the clausalmate condition in the previous section.

Why is the German counterpart in (208a) ruled in? I would like to argue that the difference is effected by the adjacency of SC-predicate and main verb. In my view, the two elements optionally undergo reanalysis, thus forming a complex relation-denoting predicate \( \text{rotgestrichen} ‘\text{painted red}’ \). I leave it open if this reanalysis is accomplished through re-categorisation, or if it happens through incorporation (to the right) of the SC-predicate into the verb. What is clear is that it cannot simply be a phonological process at PF, for its result is visible to the semantic component. 81 After reanalysis, the denotation of the complex verb \( \text{rotgestrichen} \) is as in (211).

(211) \[
[V \text{rotgestrichen}] = \lambda y \lambda x \lambda e. \text{painted_red}'(x,y,e)
\]

This expression is inserted for \( R \) in (210) by the by now well-known double application of \( \lambda \)-abstraction over \( R \) and functional application to \([V] \). The result is (212), which combines with the subject denotation in the usual manner.

(212) \[
[[\text{DP jeweils}_i] \text{zwei Häuser rot gestrichen}]] = \forall z [z \in Z_i \rightarrow \exists x, e [\text{\#2houses}'(x) \wedge \text{painted_red}'(z,x,e)]]
\]

The explanation for the grammaticality is therefore ultimately rooted in the adjacency of SC-predicate and main verb in German, which in turn is due to the underlying SOV-order of German. Reanalysis provides the \textit{jeweils}-DP with a semantic argument of the right kind. In English, this fails because reanalysis cannot apply.

The above argument is supported by the fact that d-distributive \textit{each} becomes possible (or significantly better) inside English SC-subjects if the SC-predicate occurs adjacent to

81 The assumption of reanalysis raises a number of possibly non-trivial questions. To begin with, it must also be assumed to apply to SC-predicate and the trace of a verb, since (i) is grammatical.

(i) \[
\text{Die Jungen streichen gerade jeweils zwei Häuser rot tiv.} \quad \text{‘The boys are each painting two houses red.’}
\]

Sentence (i) seems to argue in favour of a derivational approach on which the SC-predicate first moves to V, and then V moves on to I and C, leaving the predicate behind. Such processes are well attested in German with particle verbs, e.g. with \textit{an-rufen} ‘to call’ in (ii):

(ii) \[
\text{Die Jungen rufen gerade jeweils zwei Freunde an.} \quad \text{‘The boys are calling two friend each.’}
\]

Against the movement analysis argues the fact that the process only applies under adjacency, for it obviously does not apply in English although the structural configurations are identical and movement in English would be to the left. I will leave this issue open, assuming that some sort of reanalysis that is conditioned by adjacency must take place in German.
the main verb. This is the case in (213), where the ‘heavy’ SC-subject has been right-dislocated across the SC-predicate by ‘Heavy NP-shift’.

(213) The boys painted red two ugly houses in the neighbourhood each.

On the assumption that main verb and SC-predicate can reanalyse under adjacency in order to form a complex relation-denoting expression, the interpretability and hence grammaticality of (213) is ensured. (213) shows, again, that structural and semantic factors interact in the derivation of sentences with d-distributive each and jeweils. Only some structures are interpretable structures.

Let us conclude this section by briefly touching upon another possibility to ‘rescue’ d-distributive each inside SCs. Stowell (1999) observes that SCs with d-distributive each improve if the each follows the SC-predicate, as in (214).

(214) ?The boys painted [two houses red] each.

It is possible that the constituents two houses and red in (214) combine to form a complex predicate that denotes the property of being a group of two red houses. This complex property can serve as the first semantic argument for d-distributive each. On this view, the semantic derivation of (214) would be parallel to that of (215) with a postnominal PP-modifier inside the DistShare expression.

(215) The boys painted [two houses in the neighbourhood] each.

I will leave it open whether each in (214) combines with the SC as a whole, or with a complex NP as in (215).

In conclusion, this section has given an answer to the first of the unsolved problems from chapter III.5.5. We have accounted for a difference between English and German that was unexpected on the assumption that the semantic mechanisms involved in interpreting jeweils-DPs are universal. The difference concerns the impossibility of each in subject position of SCs. It was reduced to the difference in underlying word order in German and English, i.e. to a syntactic difference. Only the German structure can be properly interpreted. This explanation allows for maintaining the assumption that the semantics of d-distributive elements are the same universally. The discussion has also shown that the complex facts that show up in connection with the distribution of d-distributive elements cannot be accounted for in purely syntactic terms. Sometimes, semantic factors need to be considered as well.

7. Applying the Semantics to Inverse Linking Constructions

In chapter III.4, it was argued that jeweils-DPs and ILCs on the “inverse” reading have the same underlying structure. In this section, I show that ILCs can be interpreted in the same way as jeweils-DPs. This supports the claim that both constructions are identical underlyingly.

The structure of ILCs on the “inverse” reading is repeated for (216a) in (216b):
In III.3, it was argued that the structure in (216b) is the result of re-interpreting the postnominal PP as a generalised quantifier, as shown in (217). \(^{83}\)

\[
(217) \quad [\text{in every basket}] = \lambda P \cdot \forall z \ [\text{basket}'(z) \rightarrow \exists X \ [P(X) \land \text{in}'(X,z)]]
\]

This expression takes a property, denoted by the numeral NP, as its semantic argument. The resulting denotation of the upper NP-node is given in (218). If D^0 is semantically empty (as was argued to be the case with jeweils-DPs), (218) is also the denotation of the entire DP.

\[
(218) \quad [\text{one apple in every basket}] = \forall z [\text{basket}'(z) \rightarrow \exists X [\text{one_apple}'(X) \land \text{in}'(X,z)]]
\]

Next, (218) is expected to combine with the denotation of the predicate is rotten, which denotes the set of rotten things. But how can the proposition in (218), which does not seem to contain any more free variables, combine with the property of being rotten? I propose a strategy that resembles the one employed in connection with the interpretation of jeweils-DPs inside PP-adjuncts (see section 4.3.2). The same strategy was employed in the interpretation of object jeweils-DPs that occur in the scope of event modifiers (see section 4.2.4), and - more generally – some version of it seems to be required in all cases of multiple event modification (see section 1.3). For all cases mentioned, I argued that the existentially bound event variable is restricted by a free variable over pluralities (sets) of events. This free set variable could be targeted by \(\lambda\)-abstraction. This way, the derivation moved from the level of atomic events to the level of plural events. Technically, an analogous operation is conceivable for ILCs. Assume that the existentially bound variable X in (219) is restricted by an additional variable over sets of sets. \(^{84}\)

\[
(219) \quad [\text{one apple in every basket}] = \forall z [\text{basket}'(z) \rightarrow \exists X [\text{one_apple}'(X) \land \text{in}'(X,z)]]
\]

In analogy to the case of repeated event quantification from section 1.3, the index on the set variable \(X_i\) can be targeted by \(\lambda\)-abstraction (cf.220a). The resulting expression, a function from sets into truth-values, takes the denotation of the plural predicate is rotten

\(^{83}\) I neglect the presence of events for the time being.

\(^{84}\) von Fintel (1994) argues that quantifiers in general have an additional ‘domain resource variable’, which adds to their restriction. The difference between von Fintel’s domain resource variables, and the additional restricting variables proposed here is that the former must be contextually bound, whereas the latter can be bound by an existential or a \(\lambda\)-operator in the course of the derivation.
as its argument and delivers the proposition in (220b). (220b) correctly specifies the truth conditions for (216a).

\[(220)\]
\[
a. \quad \text{[one apple in every basket]} \\
\quad = \lambda \forall z \exists X \left( \text{basket}'(z) \rightarrow \text{∃X} \left( \text{*-in}'(X, z) \land \text{*-one_apple}'(X) \land \text{*-X}'(X) \right) \right)
\]
\[
b. \quad \text{[one apple in every basket is rotten]} \\
\quad = \forall z \exists X \left( \text{basket}'(z) \rightarrow \text{∃X} \left( \text{*-rotten}'(X) \land \text{*-one_apple}'(X) \land \text{*-in}'(X, z) \right) \right)
\]

(220b) is true iff for each basket z, there is a singleton set X such that X consists of an apple and X is rotten and X is in z. This is true if there is one rotten apple in every basket.

Summing up, ILCs can be interpreted along the same lines as jeweils-DPs. Since the two constructions are argued to derive from the same underlying structure, this is a welcome result. The crucial move in interpreting ILCs lies in positing an implicit variable over sets of sets, and let \(\lambda\)-abstraction apply to the index of that variable. The assumption of such an implicit variable parallels our treatment of repeated event modification over different event layers discussed in 1.3. The interpretation of ILCs therefore poses no problem for the semantic system proposed here.

8. Conclusion

Chapter IV has presented the semantic analysis of the German distributive marker jeweils, in particular on its distance-distributive use. The results are summarised in the following.

\[(221)\]
\[
i. \quad \text{Adverbial and adnominal jeweils have the same underlying meaning. Both denote a generalised quantifier that contains a free relation variable R (expressed by genitive case).}
\]
\[
ii. \quad \text{The ambiguity of adverbial and adnominal jeweils is structural in nature.}
\]
\[
iii. \quad \text{Adverbial jeweils is an event quantifier. Its restriction -weils- picks up an implicit set of events. The relation variable R stays free, thus establishing coherence with the preceding discourse.}
\]
\[
iv. \quad \text{Adnominal (= distance-distributive) jeweils distributes over individuals or events, depending on its syntactic position. Its restriction -weils- co-refers with the DistKey, which is (usually) expressed by means of a clausemate plural expression. The relation variable R is bound by an overt relation-denoting expression (normally, a transitive verb or a preposition) that indicates the kind of distributive relationship that is established.}
\]
\[
v. \quad \text{The analysis allows for the correct interpretation of distance-distributive jeweils in a variety of syntactic configurations.}
\]
\[
vi. \quad \text{The analysis is applicable to the interpretation of distance-distributive constructions in other languages, and to the interpretation of inverse linking constructions.}
\]

The final chapter of the thesis deal with instances of adnominal jeweils in sentence-initial position, where the clear-cut distinction between adnominal and adverbial jeweils is systematically blurred by syntactic and semantic factors.
Chapter V  
Adverbial readings with Adnominal Elements

In the course of this thesis, it was shown that there are two instances of *jeweils*, which give rise to different readings. Adverbial *jeweils* is adjoined to VP and distributes the elements of the VP-denotation (i.e. individual events) over an (implicit) set of events. Adnominal *jeweils* is located inside a complex DP and distributes sets of individuals over a plural-denoting expression in its clause. In this chapter, we turn to what looks like a borderline case between the two instances of *jeweils*, at least at first sight. It turns out that instances of adnominal *jeweils* sometimes give rise to – what looks like an - adverbial reading. This mostly happens when adnominal *jeweils* is in subject position, a case that has not been considered in detail so far (but see the data from German, Czech, Bulgarian in chapter II.4.4). The phenomenon is exemplified in (1).

(1)  Jeweils zwei Jungen standen Wache.
    each      two boys      stood     watch
    ‘Each time, two boys kept watch.’

At first sight, *jeweils* in (1) is interpreted adverbially. It seems to distribute individual events of two boys keeping watch over an implicit set of events. The adverbial interpretation is somewhat surprising, since *jeweils* in (1) seems to form part of the subject DP.

This chapter has two chief goals, then: First, the semantic analysis of adnominal *jeweils* from chapter IV is extended to instances of adnominal *jeweils* in subject position. In the process, it is shown that the analysis accounts for the existence of – what looks like – adverbial readings with adnominal *jeweils*, as in (1).

To this end, I first show that *jeweils* in (1) is really an instance of adnominal *jeweils*, not an adverbial adjoined to CP, or located in some other functional projection in the left periphery of the clause. This is done in section 1. In section 2, I demonstrate that and how adnominal *jeweils* can give rise to an adverbial reading when it occurs in sentence initial position. In the process, the semantic operation of ‘crosswise λ-abstraction’ is introduced. Notice that although the reading of (1) will be shown to derive from an adnominal instance of *jeweils*, I will go on to call it ‘adverbal’ because of its truth-conditional equivalence to genuine adverbial readings. In section 3, I show that the analysis accounts for the (im)possibility of d-distributive elements in embedded subject position (thus accounting for the last remaining problem from chapter III.5.5). It will become clear that the impossibility of d-distributive elements in embedded subject position is partly due to semantic, and partly due to syntactic reasons. The chapter concludes with a few (speculative) remarks concerning the applicability of crosswise λ-abstraction to other syntactic configurations. It is suggested that crosswise λ-abstraction may play a role in connection with variable binding from within ILCs, with variable binding out of possessive DPs, and with PP-pluractional quantifiers. The potential application of crosswise λ-abstraction in a wider range of constructions, if feasible, lends independent motivation to the process as a whole.
1 Adverbial Readings with Adnominal Jeweils

This section introduces the relevant facts concerning the adverbial interpretation of adnominal elements. Starting with jeweils, I present the arguments for its adnominal status in (1) in section 1.1. In 1.2, I show that analogous semantic effects arise with other jeweils-DPs that have moved overtly to sentence-initial position, e.g. by passivisation or topicalisation. The possibility of an adverbial interpretation is independent of the grammatical function of the raised jeweils-DP. In 1.3, I show that similar semantic effects occur with other adnominal elements, such as the s-expression wenigstens ‘at least’, the adjective gelegentlich ‘occasional’, or with numerals. The observed facts are summarised in 1.4 in form of a generalisation about the availability of adverbial readings with adnominal elements.

1.1 Jeweils in Subject Position

In chapter II.4.4, the possibility of backwards distribution with with adnominal jeweils in underlying subject position was introduced in passing. An example is given in (2).

(2)  jeweils zwei Offiziere begleiteten die Ballerinen nach Haus.

Each two officers accompanied the ballerinas to home.

On the backwards distributive reading in (3a), each ballerina was walked home by two officers. However, (2) has a second, more prominent reading according to which two officers walked home a group of ballerinas each time (cf.3b).

(3)  a. \( \forall z [\text{ballerina}'(z) \rightarrow \exists X [\text{officers}'(X) \land \exists e [*\text{accompany}'(X, z, e)]]] \)
b. \( \forall z [z \in E \rightarrow \exists X [\text{officers}'(X) \land \exists e [*\text{accompany}'(X, [[\text{the ball.s}]],z) \land R(e,z)]]] \)

How to account for this additional adverbial reading? As a first guess, one could analyse the two readings in (3) as the result of structural ambiguity, similar to what was argued for ambiguities with jeweils in the middle field (see the discussion in chapter II.2 and IV.4.3.3). According to this view, reading (3b) would be derived from a structure as in (4):

(4)  \([XP] \text{jeweils} [CP \text{zwei Offiziere}, [C \text{begleiteten t die Ballerinen nach Haus}]] \)

The label XP leaves open the exact positioning of jeweils in the left periphery. Jeweils could be adjoined to CP, or it could occupy the specifier of one of the functional projections that have been argued to make up the left periphery by Rizzi (1997). Note that the structure in (4) violates the V2-requirement which seems otherwise inviolable in German.\(^2\)

However, even if the V2-requirement should prove violable in German, there are three arguments against (4) as the correct syntactic structure for (2). First, jeweils in (2) can be replaced by the short form je, which – as shown in chapter II.1.9 – is restricted to

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1 The ‘adverbial’ reading can be suppressed by adding the imperfectivity marker gerade ‘just’.

2 But see the reference to Büring & Hartmann (2001) in chapter III.2.1.1, fn.9, who argue that the V2-requirement is violable by occurrences of the focus particle nur ‘only’ in the initial position of root clauses.
adnominal position. (5) shows that the adnominal form je can be interpreted adverbially in sentence-initial position.3

(5)  
\[\text{Je zwei Offiziere begleiteten die Ballerinen nach Haus.}\]  
each two officers accompanied the ballerinas to home  
a. ‘Each of the ballerinas was accompanied home by two officers.’  
b. ‘Each time, two officers accompanied the ballerinas home.’

Second, jeweils in (2) has the selection properties of adnominal jeweils. It must occur with a predicate denoting DP as in (2). With proper names or specific DPs in SpecCP, jeweils cannot occur in sentence-initial position (cf.6ab).

(6)  
a. *Jeweils Leutnant Tarski begleitete die Ballerinen nach Haus.  
  each Lieutenant T. accompanied the ballerinas to home  
b. *Jeweils der Hauptmann begleitete die Ballerinen nach Haus.  
  each the captain accompanied the ballerinas to home

Third, other adverbial quantifiers cannot be substituted for jeweils in (2). Their insertion leads to ungrammaticality, as shown in (7).

(7)  
*Oft/ manchmal/ selten zwei Offiziere begleiteten die Ballerinen nach Haus.  
  often sometimes seldom two officers accompanied the ballerinas to home

Given that the syntactic distribution of adverbial jeweils parallels that of other adverbial quantifiers in all other syntactic contexts (see chapter III.1), (7) suggests that jeweils in (2) is not an instance of adverbial jeweils.

Summing up, this section has shown that jeweils gives rise to ‘adverbial’ readings when it occurs in subject position together with an indefinite expression serving as the DistShare. The selection properties of jeweils, the impossibility of other adverbial quantifiers in this position, and the fact that jeweils can be replaced by the short form je combine to show that we deal with an instance of adnominal jeweils in (2). I therefore assume that the structure of (2) is as in (8), with adnominal jeweils forming part of the subject DP.

(8)  
\[\text{[CPDP jeweils}_1 [\text{zwei Männer}_1] ]_2 [C begleiteten}_1 [\text{die Ballerinen nach Haus}].}\]  
each two men accompanied the ballerinas to home

I conclude that instances of adnominal jeweils are sometimes interpreted adverbially.

1.2 Adverbial Readings with Fronted Jeweils-DPs

The ability of jeweils to be interpreted adverbially does not depend on the subject status of its embedding DP, but on its being in sentence-initial position. An adverbial reading is possible for jeweils-DPs of all grammatical functions as long as they have moved to an ‘initial position’ at surface structure. The term initial position must here be understood as a position outside the VP, usually a position in sentence- or middle field-initial position.

---

3 See also example (i) from Link (1987):

(i)  
\[\text{Je drei Äpfel waren faul.}\]  
each two apples were rotten ‘Each time / in each basket, two apples were rotten.’
(9a) illustrates the adverbial reading for an object jeweils-DP after passivisation, and (9b) for an indirect object jeweils-DP after topicalisation.

(9)  

    each two beauty queens were chosen 
    ‘Each time, two beauty queens were chosen.’

b. Jeweils drei Kandidaten haben wir einen Preis überreicht.  
    each three candidates have we a price handed over 
    ‘Each time, we handed over a price to three candidates.’

The adverbial reading is the only reading for the sentences in (9), for they contain no plural DistKey expression that jeweils could quantify over.

So far, we have seen that adverbial readings are possible with jeweils-DPs in SpecCP. The examples in (10) show that the possibility of adverbial readings is not dependent on the CP-position (or any other projection in the left periphery). In the embedded clause in (10a), the subject jeweils-DP occupies the initial position in the middle field. In the embedded clause in (10b), the object jeweils-DP has scrambled across the subject to middle field initial position.

(10)  

a. ..., weil [je(weils) zwei Jungen] t1 Wache standen.  
    because each two boys watched 
    ‘...because two boys kept watch each time.’

b. ..., weil [je(weils) zwei Gästen] ein Preis t1 überreicht wurde.  
    because each two guests a price handed over was 
    ‘...because each time two guests were handed over a price.’

Notice immediately that jeweils in (10ab) must be an instance of adnominal jeweils since the adverbial reading is also possible with the short form je in the same position (as indicated by the brackets). Again, distributive je is a short form of adnominal jeweils only.

(10ab) show, then, that an adverbial reading is possible with a jeweils-DP if the jeweils-DP is located outside the VP. This is the case for subject DPs on the normal word order, or for DPs of other grammatical functions that have undergone passivisation, topicalisation, or scrambling out of the VP. Based on (9) and (10), I conclude that jeweils-DPs can be interpreted adverbially if they are in a VP-external position.

Summing up, it was shown that the possibility of an adverbial interpretation is not restricted to instances of adnominal jeweils inside subject DPs. Instances of jeweils in other DPs can also be interpreted adverbially, given that the DP has overtly moved to a VP-external position. In the following subsection, it is shown that adverbial readings are possible with other adnominal expressions besides jeweils.

1.3 Adverbial Readings with other Adnominal Elements

In this section, I show that German jeweils is not the only adnominal element allowing for an adverbial reading. Indeed, the phenomenon seems to be quite pervasive. It occurs with a number of other expressions, among them s-expressions such as wenigstens ‘at least’, adjectival constructions such as d- gelegentliche ‘the occasional’, and numeral expressions.

As shown in chapter II.3, the focus particle wenigstens can occur both adverbially and adnominally. The adnominal case is illustrated in (11a), the adverbial case in (11b). The two instances of wenigstens are distinguished by their relative position to the exhaustivity
marker *alle* ‘all’ and the adverbial quantifier *immer* ‘always’. Being a (speaker-oriented) sentence adverbial, adverbial *wenigstens* must precede the adverbial quantifier. This makes it a little easier to tell apart instances of adnominal and adverbial *wenigstens*.

(11) a. Die Jungen haben immer alle *wenigstens* zwei Bücher gelesen.
   the boys have always all at least two books read
   ‘The boys have always all read at least two books.’

b. Die Jungen haben *wenigstens* immer alle zwei Bücher gelesen.
   the boys have at least always all two books read
   ‘At least, the boys have always read two books.’

In (11a), presence of *wenigstens* indicates that the set denoted by the object NP *zwei Bücher* ‘two books’ contains two books or more. In other words, *wenigstens* indicates the lower margin of the set denoted by the NP. In (11b), *wenigstens* functions as a speaker-oriented adverb. It compares the proposition expressed by the clause with a set of alternative propositions which might also have been the case. It indicates that the state of affairs expressed by the proposition was the least what one could have expected, or what would have been appropriate according to the speaker’s evaluation.

Interestingly, an adverbial reading is available for adnominal *wenigstens*, once the object DP in (11a) has raised out of the VP, e.g. by topicalisation (cf.12a). Similarly, the adverbial reading is possible for adnominal *wenigstens* inside subject DPs (12b).

(12) a. [Wenigstens zwei Bücher] haben die Jungen immer alle *t₁* gelesen.
   at least two books have the boys always all read
   i. ‘The boys have always all read at least two books.’
   ii. ‘At least, the boys have always all read two books.’

b. [Wenigstens zwei Studenten] haben *t₁* zugeschaut.
   at least two students have watched
   i. ‘At least two students have watched.’
   ii. ‘At least, two students have watched.’

Informally, the reason for the ambiguity of (12ab) is clear. *Wenigstens* is a focus particle which takes its focus to the right at surface structure. For this reason, the entire proposition can be in the focus of *wenigstens* and be positioned on the speaker’s scale of evaluation, while the same is impossible for (11a).

Adverbial readings can also be found with adnominal elements without a formally identical adverbial counterpart. A well documented case (cf. Bolinger 1967, Stump 1985, Larson 1999, Zimmermann 2000) are the adverbial readings observed with the adjective *occasional*. (13a) has a reading synonymous to the adverbial (13b).

---

4 For a precise formal account of the semantics of *wenigstens*, see Krifka (1999).
5 The two readings come along with two different intonations. I assume that the differences in intonation are due to the different focus structures imposed, depending on whether the whole proposition (adverbial reading) or only the fronted numeral NP (adnominal reading) is the focus of the expression.
6 As pointed out in chapter III.4.4, this condition can be overruled in particular (discourse) contexts. In (i), *wenigstens* occurs to the left of the contrastive topic *mir* ‘meDAT’:
   (i) Mir *wenigstens* ist das zuviel.
      me at least is that too much ‘For me at least, this is too much.’
(13) a. \[\text{DP}\ An/\text{the occasional} \text{ sailor}\] \text{walked by.}

b. \text{Occasionally, a sailor walked by.}

The same holds for German, as shown in (14ab):

(14) a. \[\text{DP}\ Der gelegentliche \text{ Seemann}\] \text{spazierte vorüber.}

the occasional \text{ sailor} \text{ walked by}

i. ‘Occasionally, a sailor walked by.’ (adverbial reading)

ii. ‘Somebody who sails occasionally walked by.’ (adnominal reading)

b. \text{Gelegentlich spazierte ein Seemann vorüber.}

occasionally \text{ walked a sailor by}

‘Occasionally, a sailor walked by.’

In (13a) and (14a), the adjective is clearly inside the DP at surface structure. Despite this, an adverbial reading is available.

In German, the adverbial reading is impossible for the adjective \textit{gelegentlich} ‘occasional’, if it occurs inside an object DP, unless this DP has been fronted to a position outside the VP.

7 This is illustrated in (15ab).

(15) a. Wir haben auch [den gelegentlichen \text{ Einbrecher}] verhaftet.

we have also \text{the ACC occasional burglar} arrested

‘We have also arrested the hobby burglar.’

** ‘Occasionally, we have also arrested a burglar.’

b. [Den gelegentlichen \text{ Einbrecher}] haben wir auch t\text{ACC} verhaftet.

the ACC occasional burglar have we also arrested

‘Occasionally, we have also arrested a burglar.’

Again, we see that the possibility of an adverbial reading for an adnominal element depends on the syntactic position of the embedding DP. It must be outside the VP, fronted to a sentence- or middle field initial position. Presumably, the DP must occur in VP-external position for semantic reasons. On the adverbial reading of (13a), the sequence \textit{the occasional} seems to form a complex quantifier over pairs of individuals and events (see section 2.3.2 and Zimmermann (2000) for more discussion). As a quantifier over events, it is expected to occur in a position above the event argument of the verb, i.e. outside the VP (see chapters IV.1 and IV.2).

A further case of an adnominal element giving rise to an adverbial reading is discussed in Krifka (1990) and Doetjes & Honcoop (1997). It is instantiated by adnominal numeral expressions, which can be used to quantify existentially over events. In this case, they take on the reading of the adverbial event quantifier \textit{n times}, as shown in (16).

(16) 4000 ships passed through the lock.

i. ‘4000 times, there was a ship passing through the lock.’

ii. ‘4000 different ships passed through the lock.’

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7 In English, the adverbial reading is possible for \textit{occasional} inside an object DP, as witnessed by (i):

(i) We met the occasional sailor. = ‘Occasionally, we met a sailor.’

Zimmermann (2000) puts this difference down to an independent syntactic factor: The availability of LF-movement for semantic reasons in English. LF-movement can raise the object DP in (i) to a position outside the VP, where it can be interpreted adverbially.'
On the adverbial reading, there need not be 4000 different ships. 1000 ships would suffice given that each ship passed through the lock 4 times. In contrast, on the adnominal reading there have to be 4000 different individual ships.

Again, it turns out that this adverbial reading is not so readily available with the numeral DP in VP-internal object position. This is shown for English in (17), and for German in (18a). The adverbial reading is easily available again if the object DP has been raised outside the VP to an initial-position (cf.18b).

(17) The coast guard examined 4000 ships.
    ?‘4000 times, the coast guard examined a ship.’

(18) a. Die Küstenwache untersuchte 4000 Schiffe.
    the coastguard examined 4000 ships
    ?‘4000 times, the coastguard examined a ship.’

b. 4000 Schiffe wurden untersucht.
   4000 ships were examined
   i. ‘4000 times, a ship was examined.’ (adverbial reading)
   ii. ‘4000 different ships were examined.’ (adnominal reading)

As in the case of the occasional, the VP-external position of the numeral DP in (18b) seems to follow from semantic requirements. Doetjes & Honcoop (1997) argue that numerals can (optionally) denote quantifiers over pairs of individuals and events. As an event quantifier, the numeral – or the DP containing it – must be in a position above the VP in order to take scope over the verb’s event argument.

Summing up, this section has shown that the possibility of adverbial readings with adnominal elements is not restricted to the case of jeweils. Parallel facts are observed with s-expressions, determiner-adjectival constructions, and numeral expressions. It was shown that the possibility of an adverbial reading depends on structural factors. The embedding DP must be in a VP-external position in all cases. Tentatively, it was suggested that the VP-external position follows from a semantic requirement, namely the need for the adnominal element to take either the entire proposition (in the case of s-expressions), or at least the event argument of the verb in its scope. In the next section, we will look at the structural conditions for adverbial readings with adnominal elements in more detail, arriving at some preliminary generalisations.

1.4 Structural Conditions on Adverbial Readings with Adnominal Elements

In this section, I present a few preliminary generalisations concerning the possibility of adverbial readings with adnominal elements. Since the matter is rather complex, I will not attempt to give a full-fledged explanation of all observable phenomena, rather limiting myself to a few remarks that may hint at a possible solution, and which may serve as the basis for future work. The general point will be that the possibility of an adverbial reading

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8 The adverbial reading is contingent on the numeral being relatively high and thus excluding the possibility of individual identification of the various ships. In contrast, (i) does not readily allow for the adverbial reading.

(i) Three ships passed through the lock.

9 I am not sure if the adverbial reading is entirely impossible for (17) and (18a). In any event, it is more easily available if the numeral DP occurs in initial position, as in (18b). A possible explanation for the availability of an adverbial reading for (17) and (18a) could be the application of vacuous scrambling in German and LF-movement in English, which would move the numeral object out of the VP. Outside VP, it would be in a position from where it could quantify over the event argument of the verb.
depends both on structural and on morphosyntactic factors, namely on the syntactic position of the adnominal element and on its feature content.

In the preceding section, adverbial readings in German (and to a certain extent in English) were shown to be possible with the following adnominal elements:

(19)  

i. *s-expressions: wenigstens ‘at least’
ii. numerals: 4000
iii. sequences of determiner and adjective: d-gelegentliche ‘the occasional’

It was also pointed out that the possibility of an adverbial reading is subject to a structural condition, as formulated in (20).

(20)  

1st Structural Constraint on Adverbial Readings with Adnominal Elements:  
The embedding DP must occur in a position (at least) above VP.

(20) is satisfied by underlying subjects in SpecIP or SpecCP, as well as by objects which have overtly moved outside the VP through scrambling, topicalisation, or passivisation. Above, it was argued that (20) is motivated semantically. The DP containing the adnominal element must be in the right scopal position. In the case of wenigstens ‘at least’, it must take scope over the entire proposition expressed (including potential adverbial quantifiers). With those elements (including jeweils) which give rise to adverbial quantification over events, it must be in a position where it can take scope over the external event argument of the verb. From this, it follows that the embedding DP must be at least adjoined to VP.  

Apart from (20), there is a second structural constraint that refers to the position of the adnominal element inside its embedding DP. (21a-d) show that the adnominal element must occur at the left edge of the DP in order to give rise to an adverbial reading. If the adnominal element is preceded by other DP-internai material, an adverbial interpretation is impossible. For jeweils, this case is illustrated by means of a jeweils-DPs that is embedded inside another DP.

(21)  
f. Die wenigstens 500 Demonstranten marschierten zum Rathaus. (cf.12b)  
   the at least 500 protesters marched to the townhall
   i. ‘The at least 500 protesters marched to the townhall.’
   ii. * ‘At least, 500 protesters marched to the townhall.’

b. Der gutgekleidete gelegentliche Seemann spazierte vorüber. (cf.13a/14a)  
The well-dressed occasional sailor walked by
   *Occasionally, a well-dressed sailor walked by.’

c. Die 4000 Schiffe fuhren durch die Schleuse. (cf.16/18b)  
The 4000 boats passed through the lock.
   *4000 times, the boats passed through the lock.’

10 In section 2.3.1, it will be shown for adnominal jeweils that the semantic derivation cannot proceed if the embedding DP has not left the VP.
d. Mütter von jeweils zwei Soldaten wurden ausgezeichnet.
   mothers of each two soldiers were decorated
   *‘Each time, mothers of two soldiers were decorated.’

The data in (23a-d) suggest the second generalisation in (22):

(22) 2nd Structural Constraint on Adverbial Readings with Adnominal Elements:
The adnominal element must occur at the left edge of DP.

The generalisations in (20) and (22) account for all the data discussed so far. However, (20) and (22) are at best necessary, but not sufficient conditions for the availability of adverbial readings with adnominal elements. Consider (23).

(23) Jeder Student hat ein Buch gelesen.
    each student has a book read
    i. ‘Each student has read a book.’
    ii. *‘A/the student has always read a book.’

The universal D-quantifier jeder ‘each’ in (23) does not allow for a universal adverbial reading, although the two structural conditions in (20) and (22) are met. The DP is in a position above VP, and jeder is at the left edge of this DP. Hence, there must be a third licensing condition that would correctly exclude an adverbial reading for (23).

I would like to argue that the third licensing condition concerns the feature content of the adnominal element in question. The intuitive idea is that the specific feature content of some adnominal elements blocks them from being interpreted adverbially. This qualification is reminiscent of the discussion of the possibility or impossibility for d-distributive elements to select a non-DP as DistKey. In chapters II.4 and III.5, it was shown that there is a correlation between this property and the morphological shape of the d-distributive element. D-distributive elements which are formally identical to the respective D-quantifiers cannot distribute over the denotations of non-DPs. D-distributive elements which differ in form usually can do so. Representative examples from German and English are repeated as (24ab).

(24) a. Peter kritisierte und lobte Maria aus jeweils zwei Gründen.
   Peter criticised and praised Maria for each two reasons
   ‘Peter criticised and praised Maria for two reasons respectively.’
   b. *Peter kritisierte und lobte Maria für jeden zwei Gründen.

In chapter III.5.4.1, it was argued that the D-features of each block it from distributing over the set of events denoted by the verb conjunction in (24b). By the same token, the D-quantifier jeder in (23) cannot have an adverbial reading on which it would quantify over events. Recall that jeder overtly encodes typical D-features such as gender, number, and person. The third condition on adverbial readings with adnominal elements is given in (25).

(25) Morphosyntactic Condition on Adverbial Readings with Adnominal Elements:
The adnominal element must not contain (overtly expressed) D-features.
In contrast to *jeder* in (23), the expressions in (19) do not encode D-features overtly. From this, I conclude that they do not contain D-features in their lexical entry. In III.4.4, it was argued that adnominal *s*-expressions – among them adnominal *jeweils* - are postnominal PPs underlyingly and raise to SpecDP overtly. Numerals were argued to be adjectival underlingly, and as such they are base-generated adjoined to NP. Possibly, the adverbial reading is the result of head movement of the adjectival numeral to an empty D-head. In a similar vein, Zimmermann (2000) argues that the sequence *a/the occasional* forms a complex quantifier after (A-to-D) head movement of the adjective *occasional*. Note that the choice of overt determiner (definite or indefinite) makes no difference in (13a). This suggests that – after A-to-D incorporation - the presence of D-features is not discernible any longer. It follows that quantification over events becomes possible.11

To conclude these somewhat speculative remarks, I have proposed that an adnominal element must meet the following three licensing conditions in order to be interpreted adverbially.

(26) **Licensing Conditions on Adverbial Readings with Adnominal Elements**

i. The embedding DP must occur in a position (at least) above the VP.

ii. The adnominal element must occur at the left edge of the DP.

iii. The adnominal element must not have (semantically visible) D-features in its feature content.

(26i) and (26iii) where shown to follow from semantic factors. The adnominal element’s DP must be in the right scopal position, and the adnominal element must be capable to quantify over, or modify the denotations of non-DP-constituents. The following section shows how adverbial readings are derived with adnominal *jeweils* in subject position. In section 2.3, it will be shown that the licensing conditions in (26) fall out automatically for *jeweils* from the semantic analysis proposed.

1.5 **Summary**

In this section, it was shown that adnominal *jeweils* can be interpreted adverbially under certain conditions. Adverbial readings are also possible with other adnominal elements. Finally, it was shown that the possibility of an adverbial reading with an adnominal element depends on certain, partly structural licensing conditions. In particular, the DP containing the adnominal element has to be located outside the VP.

2 **The Semantics of Adnominal *Jeweils* in Subject Position**

This section presents the semantic analysis of sentences with adnominal *jeweils* in subject position. 2.1 establishes the syntactic surface structure of such sentences, which serves as the input for semantic interpretation. 2.2 shows how the adverbial reading is derived. To this end, it is necessary to introduce a semantic mechanism, which I refer to as ‘crosswise λ-abstraction’. Section 2.3 shows how the licensing conditions for adverbial readings with adnominal elements follow from semantic factors. Finally, section 2.4 shows that the mechanism of crosswise λ-abstraction allows for a correct interpretation of all instances of

11 An alternative way to account for adverbial readings with complex quantifiers such as *the/an occasional* would be to deny the indefinite and definite article a quantifier status altogether, in line with Kamp (1981) and Heim (1982).
Adnominal *jeweils* that were left unaccounted for in chapter IV (see the examples in (168a-d) in chapter IV.4.3). These include backwards distribution with a *jeweils*-DP in subject position over a DistKey in object position, and the distribution with *jeweils*-DPs in direct object position over a DistKey in indirect object position. In all constructions, the *jeweils*-DP is analysed as having moved overtly, leaving behind an indexed trace. The existence of this trace is important for the semantic derivation to proceed. The present discussion completes the semantic analysis of adnominal *jeweils*. At the end of this section, all syntactic occurrences of adnominal *jeweils* that were presented in IV.4.3 will have received a formal semantic account.

2.1 The Syntactic Structure

Since the interpretive component takes syntactic (surface) structures as its input, we have to be clear about the syntactic structure of sentences such as (1), which has been slightly altered to an embedded structure in (27).

(27) ..., weil jeweils zwei Jungen Wache gestanden haben.

because each two boys watch stood have

‘...because, each time, two boys have kept watch.’

(27) is taken to be derived by standard assumptions. The *jeweils*-DP is base-generated in VP-internal subject position and raises to SpecIP, where it receives case. The surface structure is given in (28), irrelevant details aside.

(28) \([CP \text{ weil } [DP P^0 jeweils} zwei Jungen]_1 \text{ Wache gestanden haben}]]\).

The question is how the structure in (28) can give rise to an adverbial reading.

2.2 Crosswise λ-Abstraction

Attempting to derive the meaning of (28) in compositional fashion, one encounters the following problem. The derivation proceeds smoothly up to the point where the denotations of DP and I’combine. The interpretation of the *jeweils*-DP should be standard by now. Recall that the constituent \([DP P^0 jeweils}\) carries two indices, one shared with the DistKey, the other with a relation-denoting expression.

(29) \([[\text{DP } P^0 jeweils} zwei Jungen]] = \forall z [z \in Z_1 \to \exists X [2\text{boys'}(X) \land \ast R_j(X)(z)]]\)

The I’-denotation is derived by functionally applying the verb denotation to a variable co-indexed with the moved subject, followed by existential closure over the event variable (I ignore the contribution of I^0, if any).

(30) \([[I' t_1 \text{ standen Wache}]] = \exists e' [\ast \text{kept\_watch'}(x_1,e')]\)

The problem is that (29) and (30) are both saturated expressions of semantic type <t>, i.e. none of the denotations can functionally apply to the other. Nor can they be combined by predicate modification. Being of type <t>, they could combine by boolean conjunction.

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12 The embedded structure in (27) was chosen in order to keep the syntactic structure as minimal as possible, thus avoiding unnecessary intermediate steps in the semantic derivation. The semantic derivation works the same way for *jeweils*-DPs in SpecCP.
However, the result of boolean conjunction in (31) shows that this operation does not apply in the case at hand either.

\[(31) \ \exists e \left[ \text{kept\_watch}(x_1, e) \right] \land \forall z [z \in Z_i \Rightarrow \exists X \left[ 2\text{boys}(X) \land \text{R}_j(X)(z) \right]]\]

After boolean conjunction, the variable ‘\(x_1\)’ in the first conjunct is not in the scope of the existential quantifier ‘\(\exists x\)’ in the second conjunct. According to (31), it is not necessary that the agent of the watch keeping (i.e. the value of ‘\(x_1\)’) be a set of two boys, contrary to fact.

I propose to mend the problem regarding the composition of (29) and (30) in the following way. First, I assume that the verb denotation contains an optional modifier which expresses a relation of the event predicated by the verb to an event in the preceding discourse. In IV.1.3, it was shown that such optional, event-relating modifiers are required independently in order to ensure discourse coherence. With this assumption, the \(I'\)-denotation is as follows.

\[(32) \ \left[ [I \_t \text{ standen Wache}] = \exists e' \left[ \text{kept\_watch}(x_1, e') \land \text{R}(e', e) \right] \right]\]

(32) contains two free variables, ‘\(e_i\)’ and ‘\(x_1\)’ which could be \(\lambda\)-abstracted over in principle. The question is what could be the trigger for such \(\lambda\)-abstraction. In my view, \(\lambda\)-abstraction is triggered by the presence of the indices ‘\(i\)’ and ‘\(1\)’ on the syntactic sister of \(I\)’, which is the \(jeweils\)-DP. Index ‘\(1\)’ is added to the subject DP as a result of movement from its VP-internal base position. In 2.3.1, I discuss how the index ‘\(i\)’ on \(jeweils\) can be visible to \(I\)’. For now, let us assume that the \(jeweils\)-DP as a whole carries the two indices ‘\(i\)’ and ‘\(1\)’. If so, \(\lambda\)-abstraction is licensed by the index-triggered \(\lambda\)-abstraction rule from chapter IV.4.2.1, which is repeated as (33).

\[(33) \ \text{Index-Triggered } \lambda\text{-Abstraction:} \]

If the semantic types of a proposition-denoting expression \(\alpha\) and its syntactic sister \(\beta\) do not match, and if \([\alpha]\) contains a free variable \(u\) which shares an index ‘\(i\)’ with \(\beta\), \(\lambda\)-abstraction in \([\alpha]\) over index ‘\(i\)’ is licensed, and \(\lambda u.[\alpha]\) is a value for \(\alpha\).

After \(\lambda\)-abstraction over index ‘\(i\)’ and then over index ‘\(1\)’ in this order, we get (34), which expresses a relation of type \(<e,et>\).

\[(34) \ \lambda x \lambda e. \exists e' \left[ \text{kept\_watch}(x, e') \land \text{R}(e', e) \right]\]

At this point, we are left with the relation in (34), the denotation of \(I'\) after \(\lambda\)-abstraction, and an expression that contains a free relation variable, the denotation of the \(jeweils\)-DP. Given the discussion of the conditions on \(\lambda\)-abstraction from chapter IV.4.2.1, a possibility to resolve this type-mismatch lies at hand. The rule of type-triggered \(\lambda\)-abstraction rule, repeated as (35), allows for type-triggered \(\lambda\)-abstraction over a free variable if the result is of a suitable type to combine with the denotation of the sister node.
(35) **Type-Triggered \( \lambda \)-Abstraction:**
If the semantic types of a proposition-denoting expression \( \alpha \) and its syntactic sister \( \beta \) do not match, and if \( [\alpha] \) contains a free variable \( u_i \) which shares an index ‘i’ with \( \beta \), \( \lambda \)-abstraction in \( [\alpha] \) over index ‘i’ is licensed, and \( \lambda u_i[[\alpha]] \) is a value for \( \alpha \).

Applying (35) to the denotation of the jeweils-DP in (29), \( \lambda \)-abstraction over ‘\( R \)’ yields (36).

\[
[[ \text{DP},_j \text{jeweils}_i \text{zwei Jungen} ]] = \lambda R. \forall z[z \in Z_i \to \exists X [2\text{boys}'(X) \land \ast R(X)(z)]]
\]

Functional application of (36) to (34) yields (37a), with truth conditions as specified in (37b).

\[
\begin{align*}
(37) \quad a. \quad [[ \text{DP},_j \text{jeweils}_i \text{zwei Jungen Wache gestanden haben} ]] & = [\lambda R. \forall z[z \in Z_i \to \exists X [2\text{boys}'(X) \land \ast R(X)(z)]]] \\
& \equiv \forall z[z \in Z_i \to \exists X [2\text{boys}'(X) \land \exists e' [\ast \text{kept watch}'(X, e') \land R(e', z)]]] \quad \text{iff} \\
& \forall z [z \in Z_i \to \exists X [2\text{boys}'(X) \land \exists e' [\ast \text{kept watch}'(X, e') \land R(e', z)]]] = 1 \\
b. \quad \text{for all elements } z \text{ of a contextually salient set (of events) } Z_\alpha \text{, there is a set of two boys } X, \text{ and an event } e', \text{ such that the elements of } X \text{ kept watch in } e', \text{ and event } e' \text{ is related to event } z \text{ by a temporal, causal, subpart, or other contextual relation.}
\end{align*}
\]

The reader may convince herself that the truth conditions in (37b) are the same as those found with adverbial jeweils. Hence, the semantic derivation proposed here gives the correct results. Observe that the universal quantifier binds an event variable \( z \) both in its restriction and in its nuclear scope in (37a). In chapter IV.1.3, this was argued to be a characteristic property of adverbial quantification over events. This shows, then, that the label ‘adverbial reading’ for the interpretation of (27) is justified.

The derivation of the adverbial interpretation of jeweils-DPs in subject position differs from that of jeweils-DPs in other syntactic positions in two respects. The first difference pertains to the role of the index ‘i’ on jeweils, which it shares with the DistKey. In all cases studied in chapter IV, the index on jeweils only indicated the presence of a free set variable which could be \( \lambda \)-abstracted over triggered by an identical index on the DistKey. In the case of jeweils-DPs in subject position, the index on jeweils triggers \( \lambda \)-abstraction over a co-indexed variable inside the denotation of the sister of the jeweils-DP. This suggests that identical indices always have the same semantic capacity, no matter where they appear syntactically.

The second difference pertains to the mechanism of \( \lambda \)-abstraction. In all the cases discussed so far, \( \lambda \)-abstraction was employed in order to resolve type-matches. At each syntactic node, \( \lambda \)-abstraction applied to the denotation of only one daughter. In the course of the discussion, we have encountered \( \lambda \)-abstraction over a relation variable, \( \lambda \)-abstraction over a plural individual variable, and \( \lambda \)-abstraction over an event variable in the following syntactic configurations.
(38) a.  
\[
\text{VP} \\
\text{jeweils-DP} \\
<\langle t\rangle, \langle e, e\rangle\rangle \\
\]
\[\uparrow\]
\[\lambda\text{-abstraction applies here, yielding an expression of type } \langle \langle e, e\rangle, t\rangle\]

b.  
\[
\text{V'_{individual-level}} \\
\text{DistKey}_{i} \\
<\langle e\rangle, \langle e\rangle\rangle \\
\]
\[\uparrow\]
\[\lambda\text{-abstraction applies here, yielding an expression of type } \langle e, e\rangle\]

(39) a.  
\[
\text{VP} \\
\text{PP}_{adv} \\
<\langle \langle t\rangle, \langle t\rangle\rangle, \langle t\rangle\rangle \\
\]
\[\uparrow\]
\[\lambda\text{-abstraction applies here, yielding an expression of type } \langle \langle t\rangle\rangle\]

b.  
\[
\text{VP} \\
\text{PP}_{adv} \\
<\langle \langle t\rangle, \langle t\rangle\rangle, \langle t\rangle\rangle \\
\]
\[\uparrow\]
\[\lambda\text{-abstraction applies here, yielding an expression of type } \langle \langle t\rangle\rangle\]

(38a) models the semantic composition of a jeweils-DP in object position with an individual-level verb. (38b) models the ‘factoring in’ of the DistKey denotation. Both \(\lambda\)-abstractions are triggered by an index on the sister constituent according to the \(\lambda\)-abstraction rule in (33). (39a) models the semantic composition of an (event modifying) adverbial PP and a VP. (39b) models the composition of a VP and an (event-modifying) adverbial that contains a jeweils-DP. In chapter IV.4.3.2, the latter compositions were argued to be mirror images of the same semantic process.

The composition of jeweils-DPs in subject position with the remainder of the clause is different in nature. The crucial difference lies in the fact that \(\lambda\)-abstraction must apply to both daughters of the IP-node. This is illustrated schematically in (40).

(40)
\[
\text{IP} \\
\text{jeweils-DP}_{i, 1} \\
<\langle t\rangle, \langle t\rangle\rangle \\
\]
\[\uparrow\]
\[\lambda\text{-abstraction applies here, yielding } \langle \langle e, e\rangle, t\rangle\]
\[\uparrow\]
\[\lambda\text{-abstraction applies here (twice), yielding } \langle e, e\rangle\]

For the composition to proceed, it is important that \(\lambda\)-abstraction applies first to the denotation of the right-hand daughter, which is triggered by the two indices on the subject DP. Without this process, \(\lambda\)-abstraction over the left hand daughter’s denotation for type reasons could not apply. This shows, once again, the prominent role played by index-triggered \(\lambda\)-abstraction in the semantic system sketched here. In what follows, I will refer to the double operation of \(\lambda\)-abstraction first to the right-hand daughter, and then to the left-hand daughter of a syntactic node as ‘crosswise \(\lambda\)-abstraction’. In section 4, I suggests
that this process possibly plays a role in the semantic interpretation of other syntactic configurations besides d-distributive constructions.

One may wonder what fixes the order of $\lambda$-abstraction on the right-hand daughter in (40). In other words, how do we know that $\lambda$-abstraction is first applied to index ‘i’ (the index on jeweils) and then over index ‘1’ (the index of the moved DP)? In my view, the two rules are intrinsically ordered. An argument for this is the fact that application of the rules in the reverse order yields a reading which is not attested. Consider what happens if we apply $\lambda$-abstraction in the reverse order. Instead of (34), we get (41).

\[(41) \quad \lambda e \lambda x. \exists e' \left[ \text{kept}_i \left( x, e' \right) \land R(e', e) \right] \]

And applying (36) to (41), we get (42):

\[(42) \forall z \left[ z \in Z \rightarrow \exists X \left[ \text{2boys}_i(X) \land (\lambda e \lambda x. \exists e' \left[ \text{kept}_i \left( x, e' \right) \land R(e', e) \right] (X)(z)) \right] \right] \]

\[(42) \quad \forall z \left[ z \in Z \rightarrow \exists X \left[ \text{2boys}_i(X) \land \exists e' \left[ \text{kept}_i (z, e') \land R(e', X) \right] \right] \]

(42) states that each element $z$ of a contextually given set of individuals kept watch, and in addition for each $z$ there is a set of two boys which stands in some relation to the watching event. This is not a possible reading for (27), where the two boys must be the agent of the watch keeping. Based on this empirical evidence, I conclude that there is only one order in which $\lambda$-abstraction can apply to the configuration in (40).

In conclusion, it was shown that application of the two $\lambda$-abstraction rules from chapter IV.4.2.1 allows for a correct derivation of the adverbial reading of adnominal jeweils. The only additional assumption was that $\lambda$-abstraction can apply crosswise to both daughters of a syntactic node.

2.3 Deriving the Licensing Conditions on Adverbial Readings

In this section, I show how the empirical generalisations at the end of 1.4 follow from a semantic analysis of adnominal jeweils in subject position. The three licensing conditions for adverbial readings with adnominal jeweils were the following: (i.) jeweils must be able to quantify over non-DP denotations, i.e. it must not contain D-features; (ii.) the embedding DP must be outside the VP; and (iii.) jeweils must be located at the left edge of DP. Section 2.3.1 shows how the last two licensing conditions follow from the mechanism of crosswise $\lambda$-abstraction. Having done this, I show that the licensing conditions for adverbial readings with other adnominal elements – though on the face of it identical – may be conditioned by other factors, I will do this in exemplary fashion for the plurational quantifier the/an occasional in section 2.3.2.

2.3.1 Deriving the Conditions for Adnominal Jeweils

The first licensing condition for adverbial readings with adnominal jeweils was discussed at length in chapter III.5.4. Since jeweils does not have D-features, it can freely quantify over non-DP denotations, for instance binding an event variable introduced by the verb.

The reason for the second generalisation becomes clearer by looking at how the adverbial reading is derived when adnominal jeweils is inside a fronted object DP. Consider (43).
(43) [Jeweils zwei Schönheitsköniginnen] haben wir t gewählt.
   each two beauty queens have we chosen
   i. ‘Each of us has chosen two beauty queens.’
   ii. ‘Each time, we have chosen two beauty queens.’

(43) is ambiguous between the ‘regular’ adnominal reading (43i), and the preferred adverbial reading (43ii). I assume that the regular reading arises when the fronted DP is reconstructed to its base position at LF (in line with Burzio 1986). After reconstruction, the standard semantic procedure for object jeweils-DPs with transitive stage-level verbs from chapter IV.4.2.4 applies.

In contrast, the adverbial reading is derived from the surface structure of (43) in (44) by application of crosswise λ-abstraction.

(44) [CP [DP jeweils zwei Schönheitsköniginnen] haben wir [VP t gewählt]].
   each two beauty queens have we chosen

Crosswise λ-abstraction applies at the CP-node, where the denotations of jeweils-DP and C’ combine. The denotations of the jeweils-DP and C’ are given in (45ab).

(45) a. ([DP,2 jeweils zwei Schönheitsköniginnen]) = ∀z [z ∈ Z₁ → ∃X [2beautyqueens’(X) ∧ *R(X)(z)]]
   b. ([C: haben wir₁ t₁ t₂ gewählt]) = ∃e’[*choose’(we’,y₂, e’) ∧ R(e’, e)]

Crosswise λ-abstraction over ‘i’ and ‘2’ in C’ and over ‘j’ in the denotation of the jeweils-DP, followed by functional application yields (46a), which has the truth conditions in (46b).

(46) a. ([jeweils zwei Schönheitsköniginnen, haben wir₁ t₂ gewählt]) = [λR. ∀z[z ∈ Z₁ → ∃X[2beautyqueens’(X) ∧ *R(X)(z)]]
   (λyλe.∃e’[*choose’(we’,y,e’) ∧ R(e’, e)])
   ⇔ ∀z[z ∈ Z₁ → ∃X[2beautyqueens’(X) ∧
   (λyλe.∃e’[*choose’(we’,y,e’) ∧ R(e’, e)]) (X)(z)]
   ⇔ ∀z[z ∈ Z₁ → ∃X[2beautyqueens’(X) ∧
   ∃e’[*choose’(we’,e,X,e’) ∧ R(e’, e)]][X](z)] = 1
   b. iff for each event z of a contextually salient set of events Z₁, there is a set X of two beauty queens, and an event e’, such that we have chosen X in e’, and e’ stands in some temporal, causal, subpart, or other relation to z.

The derivation shows that – as was the case with jeweils in subject DPs – the semantic derivation is contingent on the index (here ‘2’) introduced by movement. Without this index on the fronted DP (and without the co-indexed variable left behind), the denotation of C’ could not be turned into a relation by λ-abstraction, and the denotations of fronted jeweils-DP and C’ could not be composed. In other words, the derivation of adverbial readings with adnominal jeweils is contingent on movement of the jeweils-DP out of its VP-internal base position. This way, we have arrived at a formal explanation for the fact that adverbially interpreted instances of adnominal jeweils must be embedded inside DPs that are located outside the VP.
We turn now to the third condition, which states that *jeweils* must be located at the left edge of its embedding DP for an adverbial reading to be possible. In my view, this requirement follows from the fact that the index ‘i’ on *jeweils* must be visible to the syntactic sister of the fronted DP. If the index is invisible, λ-abstraction cannot apply, thus blocking crosswise λ-abstraction. This gives rise to a slight problem that was glossed over in connection with the interpretation of (27) in 2.2. There, I have simply assumed that the *jeweils*-DP as a whole carries the index ‘i’. Looking at (44) in more detail, in particular at the structure of the fronted *jeweils*-DP, we see that visibility of ‘i’ is not automatically guaranteed by the syntactic structure.

(47)  
```
          CP
          /   
   DP₂  /     
     /      
   jeweils₃,₂ D’ haben wir t₂ gewählt
       /       
  zwei Schönheitsköniginnen t₃
  two beauty queens
```

The rule of index-triggered λ-abstraction in (33) states that λ-abstraction over an indexed free variable is possible in the denotation of C’ iff *the syntactic sister* of C’ carries an identical index. However, (47) shows that the index ‘i’ is not on the sister of C’, but on the specifier of this sister. There are at least two possible ways to approach this problem. The first would be to stick to the rule of λ-abstraction in (33) in its strong form and make sure that the index ‘i’ on the specifier of DP somehow gets copied onto the DP. It seems to be a plausible assumption that the index is copied onto the D-head of the DP under Spec-Head-agreement. From the D-head, it could percolate to the maximal projection, DP. This percolation process is illustrated schematically in (48).

(48)  
```
          DP₁
          /   
SpecDP₁ /     
       /      
D’ percolation
       /       
  D₀ percolation

NP
```

In contrast, there is no way for the index on *jeweils* to percolate to the upper DP in (49a), given the DP-structure in (49b).

(49)  a. [DP Listen mit [DP jeweils drei Namen]] [C’ wurden herumgereicht]. 
     lists with each three names were passed around
     *‘Each time, listst with three names were passed around.’
     ‘Lists, each with three names on it, were passed around.’
As a result, an adverbial reading is impossible for (49a). Hence, the obligation for adnominal *jeweils* to occur at the left edge of DP seems to follows from the need for the index ‘i’ to percolate up to DP. This is possible from the specifier position of DP.

An alternative approach to the index problem would be to weaken the definition of index-triggered λ-abstraction so that it could also apply to the structure in (47). For instance, the definition could be changed in such a way that λ-abstraction over an indexed free variable is possible in α iff an identical index is carried by the sister of α, or by the specifier of α’s sister. With the changed definition, the index ‘i’ on *jeweils* is visible to C” in (47), but invisible in (49).

A third strategy would be to adopt Kayne’s (1994) analysis of specifiers as adjuncts and redefine the definition of index-triggered λ-abstraction negatively. According to this negative definition, an index on a sister constituent is visible to α if it is carried by an element not included within its sister constituent. According to Chomsky & Lasnik (1991), elements adjoined to a maximal projection are not included within this maximal projection because they are not dominated by all its segments. This means that an index is visible to α if it is carried by α’ sister, or by an element adjoined to α’s sister. If adnominal *jeweils* is analysed as adjoined to the DP, as in (50), it follows that its index is visible to the sister of DP.

(50)

\[
\begin{align*}
\text{XP} & \quad \text{DP} \\
\text{α} & \quad \text{DP} \\
\text{jeweils} & \quad \text{DP} \\
\uparrow & \quad \uparrow \\
\text{not contained} & \quad \text{contained} \\
\text{within DP} & \quad \text{within DP} \\
\text{visible to α} & \quad \text{invisible to α}
\end{align*}
\]

13 The weakened version is reminiscent of the definition of ‘government’ in the GB-framework where a lexical element governs its syntactic sister and the specifier of this sister (Chomsky 1986b:162).

14 This formulation is reminiscent of Kayne’s (1994) notion of adjoined elements c-commanding out of the maximal projection they are adjoined to. The notion of ‘c-commanding out’ was necessitated by structures as (i) in which a DP-external pronoun is bound by a possessor QP in the specifier position of a DP.

(i) [Everybody’s dog] follows him obediently.

In section V.4, it will be shown that there may be a deeper connection between the interpretation of *jeweils*-DPs and the interpretation of binding from within possessive DPs in (i).
(50) also shows that an adverbial reading for (49a) is excluded, in line with the facts. All three approaches to the index problem have shown that adnominal jeweils must be in a left-peripheral position (either in SpecDP or adjoined to DP) in order for its index to be visible to the sister constituent of the DP, and in order for crosswise λ-abstraction to apply. The left-peripheral position of adnominal jeweils inside the DP thus seems to be determined by semantic factors. It provides a suitable configuration for crosswise λ-abstraction to apply. The discussion has also shown that the semantic mechanism of crosswise λ-abstraction is compatible – in principle – with a syntactic analysis of adnominal jeweils as specifier of DP, or as adjoined to DP. The semantics are of no help to us, then, in deciding whether jeweils should be analysed as being in the specifier position of DP, or as being adjoined to DP. I will stick to the specifier analysis of jeweils (assuming percolation of the index to DP) because it is the only analysis compatible with the strong definition of index-triggered λ-abstraction, according to which the triggering index must be located on the sister constituent.

In conclusion, it was shown that the assumption of crosswise λ-abstraction accounts for two empirical generalisations concerning the availability of adverbial readings with adnominal jeweils. The embedding DP must have moved outside the VP because the index introduced by movement is vital for the semantic derivation to proceed. At the same time, jeweils must be located in the specifier of DP in order for its index to be visible to the sister constituent, and in order for the semantic derivation to proceed.

2.3.2 Deriving the Conditions for the/a+occasional

The unified empirical generalisation about the possibility of adverbial readings with adnominal elements at the end of section 1.4 incorrectly suggests that the observed restrictions are due to the same factors in all cases. That this is not the case is illustrated in exemplary fashion for the so-called occasional-construction in (13), repeated as (51):

(51) DP An/ the occasional sailor] walked by.
     Occasionally, a sailor walked by.

Here, I will base myself on the analysis of occasional-constructions in Zimmermann (2000). There, the sequence of determiner and adjective in (51) is analysed as a complex existential quantifier over pairs of individuals and events. The complex quantifier the/an+occasional is formed by syntactic incorporation of the adjective into the determiner. It is a pluractional quantifier, with ‘pluractionality’ defined as in Lasersohn (1995). Presence of the/an+occasional not only asserts the taking place of a number of events of a given kind with given individuals. It also distributes these events in a special way so that the events in question are distributed over a given stretch of time. Their times of occurrence must not overlap. E.g., (51) would not be a felicitous description of a complex event in which three sailors walked by at the same time, or immediately after one another, even though the condition that there are some sailor-event-pairs such that the sailors are walking by is satisfied. The meaning of the complex quantifier is given in (53).

(52) [[o/an/the occasional ]] =
     λQ,λS,λ<e,x>: ∃<e,x>: [ e∈E & Q(x)]: (S(x,e) & ∀<e',x'>,<e'',x''>:[S(e',x') & S(e'',x'') & Q(x') & Q(x'')]: ((e'=e'') ∨ (e'≠e'' & ¬(τ(e') o τ(e''))))
     (with τ = time of occurrence, o = overlap-relation)
The truth-conditions of (52) read as ‘There are some pairs <e,x>, with e an element of a contextually given set E & x having a particular property Q, such that e is an event S involving x, AND all pairs <e’,x’>, <e’’,x’’> of events S involving an x having Q are such that the events do not overlap in time.

The complex quantifier the/an+occasional in (51) takes two arguments and maps them onto a truth value. The first argument is a set of individuals (here the set of sailors) denoted by the NP-complement of the quantifier. The second argument is a relation between individuals and events (here a set of events of walking by). It is provided by the VP-denotation after \( \lambda \)-abstraction over the index of the subject trace has applied. Functional application of (52) to the two arguments yields (53a), with the truth conditions in (53b).

\[(53) \quad \exists <e,x>[e \in E \land \text{sailor}'(x)] \land \forall <e',x'>, <e'',x''> [\text{walk}_by'(e',x') \land \text{walk}_by'(e'',x'') \land \text{sailor}'(x') \land \text{sailor}'(x'')]: ((e'=e'') \lor (e' \neq e'' \land \neg (\tau(e') \circ \tau(e'')))) = 1 \text{ iff} \]

b. There are some pairs of individuals x and events e, with e element of a contextually given set E and x a sailor, such that x walks by in e and no two walking by events by a sailor overlap in time.

The semantic representation in (52) gives us the clue for the VP-external occurrence of DPs containing the complex quantifier the/an+occasional. Since the second argument of the complex quantifier in (52) must be of type <e,\( \langle v,t \rangle \rangle \), and since transitive (stage-level) verbs are of type <e,\( \langle v,t \rangle \rangle \), it follows that the/an+occasional in object DPs cannot directly combine with the verb denotation because of type mismatch. It follows that the/an+occasional in object DPs can only be interpreted adverbially if the embedding DP has left the VP either overtly (in German) or covertly (in English). In this case, then, the VP-external position of the embedding DP is necessary in order to avoid type mismatch. It is not conditioned by the need to introduce an index (through movement), as was the case with jeweils. Of course, subject DPs containing the pluractional quantifier the/an+occasional give rise to adverbial readings because they are located outside the VP anyway.

What about the left-peripheral occurrence of the adjective occasional in (51)? In (21b), it was shown that occasional must occur adjacent to the determiner for an adverbial reading to be possible. The adverbial reading is impossible in (54), where another adjective intervenes.

\[(54) \quad \text{The well-dressed occasional sailor walked by.} \]

\[\ast \langle \text{Occasionally, a well-dressed occasional sailor walked by.} \rangle \]

Its semantics in (52) require the complex quantifier the/an+occasional to be in a position from where it can take first an NP- and then a VP-argument, i.e. in the left-peripheral D-position. (54) does not allow for the formation of such a complex quantifier over pairs of events and individuals in D. The intervening adjective blocks head-movement of occasional to the determiner, thus also blocking complex quantifier formation. The left-peripheral position of the adnominal element occasional therefore follows from a syntactic restriction on movement, and not from a visibility condition on indices, as was the case with adnominal jeweils.

The aim of this comparison of the adnominal elements jeweils and occasional was to show that the observed correlation between syntactic position (DP-peripheral, VP-
external) and semantic interpretation (adverbial quantification over events), is motivated by different factors in each case. In the case of jeweils, the syntactic restrictions follow from factors governing the presence or visibility of indices that are crucial for the semantic interpretation. In the case of the/an+occasional, the syntactic restrictions follow in part from semantic requirements (type mismatch), and in part from syntactic requirements (no movement of an adjective over an intervening adjective).

The point of this section was to show that a parallel syntactic and semantic behaviour of related elements may still be due to different syntactic and semantic factors, depending on the exact nature of these elements. Clearly, more research regarding the licensing conditions on adverbial readings with adnominal elements is necessary.

2.4 Further Applications of Crosswise $\lambda$-Abstraction with jeweils

The semantic mechanism of crosswise $\lambda$-abstraction accounts for the interpretation of two other constructions with adnominal jeweils that have not yet been analysed. In (55a), jeweils in direct object position distributes over the denotation of an indirect object. In (55b), jeweils in subject position distributes backwards over the denotation of a direct object.

(55) a. Peter hat den Mädchen jeweils eine Rose gegeben.
   Peter has the girls each one rose given
   ‘Peter gave the girls one rose each.’

b. Jeweils zwei Offiziere begleiteten die Ballerinen nach Haus.
   each two officers accompanied the ballerinas to home
   ‘Each ballerina was accompanied home by two officers.’

The semantic analysis of (55ab) was postponed in chapter IV.4.3 because back then we did not have the mechanism of crosswise $\lambda$-abstraction at our disposal. In this section, I first discuss the semantics of (55a) in 2.4.1. In 2.4.2, I present the analysis of backwards distribution with jeweils in subject position in (55b). (55b) will turn out to be the only instance of jeweils-DPs that involves LF-movement. The vital role that crosswise $\lambda$-abstraction plays in the interpretation of these constructions shows that it is not restricted to deriving adverbial readings with adnominal jeweils. The section concludes the discussion of the semantics of adnominal jeweils. At its end, all relevant cases will have been accounted for.

2.4.1 Distribution over Indirect Objects

The semantic interpretation of (55a) is straightforward, given crosswise $\lambda$-abstraction and one additional assumption. The assumption concerns the surface position of the jeweils-DP in (55a). I assume that the jeweils-DP has vacuously moved and that the surface structure of (55a) is the one in (56).

(56) Peter$_2$ hat $t_2$ [den Mädchen, [[jeweils, eine Rose]$_{1,i}$, [vp$_{t_2}$ t$_1$, gegeben]]].

There are two semantic reasons for vacuous movement of the jeweils-DP in (56). First, the jeweils-DP cannot be interpreted in its base position. This is because the ditransitive verb geben ‘to give’ is a 4-nary predicate $\lambda y \lambda z \lambda x \lambda e. \text{give}(x,z,y,e)$. In chapter IV.4.2.4, it was shown that jeweils-DPs can combine with ternary predicates (denoted by stage-level transitive verbs) once the ‘superfluous’ event variable has been bound by existential
closure. The same strategy is not applicable to the combination of jeweils and stage-level ditransitive verbs because here the ‘superfluous’ subject variable must later be bound by an overt argument, the subject Peter. The problem disappears if the jeweils-DP has moved vacuously from its base position to a position above or adjoined to VP.

The second motivation for movement of the jeweils-DP is that it creates an index on the moved constituent. The presence of this index (here: ‘1’) triggers λ-abstraction in the VP-denotation, and is a precondition for crosswise λ-abstraction.\(^\text{15}\)

Taking the syntactic structure in (56) as input, the semantic derivation proceeds as follows. The VP-denotation after existential closure over the event argument is shown in (57a). The denotation of the scrambled jeweils-DP is shown in (57b). Both denotations are propositions.

\[ (57) \quad \text{a. } [\text{VP}_{t_2}, t_1 \text{gegeben}] = \exists e [\text{give}'(x_2, z_1, y_1, e)] \]
\[ \text{b. } [\text{DP}_{t_1, t_2} \text{jeweils}, \text{eine Rose}] = \forall z [\forall \in Z_i \exists y [\text{one}_\text{rose}'(y) \wedge R_j(y)(z)]] \]

In a next step, the denotations in (57ab) must be combined. The situation is reminiscent of that encountered with adnominal jeweils in subject position in section 2.2. There, we were also confronted with two proposition-denoting syntactic sisters. The remedy for the type mismatch there was crosswise λ-abstraction, first over the two indices of the jeweils-DP, and then over the index of the relation variable ‘R’. The same remedy will be used in the case at hand. Recall from the discussion in section 2.3.1 that the jeweils-DP carries two indices, namely ‘1’ (introduced by movement) and ‘i’ (by inheritance from its specifier jeweils). These indices trigger λ-abstraction in the VP-denotation, first over index ‘i’, and then over index ‘1’. The result is shown in (58a).

\[ (58) \quad \text{a. } [\text{VP}_{t_2}, t_1 \text{gegeben}] = \lambda y_1\lambda z_1 \exists e [\text{give}'(x_2, z_1, y_1, e)] \]
\[ \text{b. } [\text{DP}_{t_1, t_2} \text{jeweils}, \text{eine Rose}] = \lambda R_1 \lambda z_1 \forall z [\forall \in Z_i \exists y [\text{one}_\text{rose}'(y) \wedge R_j(y)(z)]] \]
\[ \text{c. } [\text{DP}_{t_1, t_2} \text{jeweils}, \text{eine Rose}] = \lambda y_1\lambda z_1 \exists e [\text{give}'(x_2, z_1, y_1, e)] \]
\[ \equiv \forall z [\forall \in Z_i \exists y [\text{one}_\text{rose}'(y) \wedge \exists e [\text{give}'(x_2, z, y, e)]]] \]

λ-abstraction over the indices ‘i’ and ‘2’ followed by functional application to the denotations of indirect object ([[the girls]]) and subject (pet e’) respectively, yields the expression in (59a), which specifies the correct truth conditions for (55a) (cf.59b).

\[ (59) \quad \text{a. } [\text{Peter}_{t_2} \text{hat den Mädchen}, \text{jeweils}, \text{eine Rose}] = \forall z [\text{girl}'(z) \rightarrow \exists y [\text{one}_\text{rose}'(y) \wedge \exists e [\text{give}'(\text{pet e'}, z, y, e)]]] = 1 \text{ iff} \]
\[ \text{b. } \text{For each girl } z \text{ there is one rose } y \text{ and an event } e \text{ such that Peter gave } y \text{ to } z \text{ in } e. \]

(59b) shows that crosswise λ-abstraction allows for a correct interpretation of (55a).\(^\text{16}\)

\[^{15}\text{It seems difficult to verify the assumption of vacuous movement in (56) syntactically. Standard tests like the impossibility of extraction from moved constituents (in adjoined position), or the position relative to left edge markers of VP (adverbial quantifiers, ja…doch-particles) seem to fail. I leave this problem open.}\]
2.4.2 Backwards Distribution from Subject Position

Backwards distribution with adnominal *jeweils* in subject position is the final case that still needs accounting for. Again, crosswise λ-abstraction is the solution to the problem, but again, we need one additional syntactic assumption in order to get correct results.

The problem becomes clear if we look at the surface structure of (55b) in (60):

(60) [CP [jeweils, zwei Offiziere], [i,VP [t, dieBallerinen, nach Haus]]].

Simply speaking, the problem lies in the fact that the denotation of the *jeweils* DP in (61) requires a relation-denoting expression as argument after λ-abstraction over index ‘j’ has taken place.

(61) [ [DP, jeweils, zwei Offiziere] = ∀z [z ∈ Zi → ∃X [2officers’ (X) ∧ Rj(x)(z)]]]

The denotation of *C’*, on the other hand, contains only one free variable with index ‘1’. Therefore, λ-abstraction over *C’*s denotation will at best result in a property-denoting expression, which is of the wrong semantic type. In addition, it is not clear how the variable *Z* can be bound by the denotation of the object *die Ballerinen* ‘the ballerinas’ in (60).

In view of these problems, we are forced to assume LF-movement of the object DP *die Ballerinen* to sentence-initial position. Note that it is not the *jeweils*-DP, nor *jeweils* in isolation, which move, but the specific DistKey expression. The resulting LF-structure that is the input to semantic interpretation is given in (62).

---

16 A similar derivation derives the meaning of (i), where adnominal *jeweils* in object position distributes over the plural event modifier *in zwei Läden* ‘in two shops’. Again, the *jeweils*-DP must have raised and adjoined to VP at surface structure (cf. (62)).

(i) a. Peter hat [in zwei Läden], jeweils eine Rose gekauft.
   Peter has in two shops each a rose bought
   ‘In two shops, Peter has bought one rose each.’

b. Peter hat [in zwei Läden], jeweils eine Rose gekauft]
   ‘In two shops, Peter has bought one rose each.’

The DistKey expression is a plural event modifier with a meaning as given in (iia). The derivation proceeds parallel to that in (58) and (59), except that the denotations of VP and the adjoined DistKey combine by predicate modification, and not by functional application:

(ii) a. [[in zwei Läden], jeweils eine Rose gekauft]] = λE. 3e₂,ζ₂[E={e₁, e₂} ∧ ∃x₁,ζ₁ [shop’(x₁) ∧ shop’(x₂) ∧ in’(x₁, e₁) ∧ in’(x₂, e₂)]]
   b. [[in zwei Läden, jeweils eine Rose gekauft]] = λE. 3e₂,ζ₂ [e₁, e₂] by index-triggered λ-abstraction over ‘1’
   c. [[in zwei Läden, jeweils eine Rose gekauft]] = λE. 3e₂,ζ₂ [e₁, e₂] by type-triggered λ-abstraction
   d. [[jeweils eine Rose gekauft]] = ∃z [z ∈ Zi → ∃y [rose'(y) ∧ bought'(x₂, y, z)]]
   e. [[jeweils eine Rose gekauft]] = ∃z [z ∈ Zi → ∃y [rose'(y) ∧ bought'(x₂, y, z)]]
   f. [[jeweils eine Rose gekauft]] = ∃z [z ∈ Zi → ∃y [rose'(y) ∧ bought'(x₂, y, z)]]
   by FA of (iic) to (ilib)
   g. [[jeweils eine Rose gekauft]] = ∃z [z ∈ Zi → ∃y [rose'(y) ∧ bought'(x₂, y, z)]]
   by index-triggered λ-abstraction over ‘i’
   h. 1 iff there is a set of events E, which has two elements e₁ and e₂ and e₁ and e₂, and e₁ takes place in shop x₁, and e₂ takes place in x₂, and for all subsequents z of E (i.e. for e₁ and e₂) there is a rose y such that Peter bought y in z.'
The LF-moved object leaves behind a variable \( t_1 \) which is co-indexed with the jeweils-DP. With this, the derivation is fairly standard. The denotation of \( C' \) is shown in (63a). \( \lambda \) abstraction over indices ‘i’ and ‘1’ in this order yields (63b). \( \lambda \) abstraction in (61) over index ‘j’ gives (63c). (65c) functionally applies to (65b), yielding (65d).18

\[
(63) \quad \begin{align*}
\text{a. } & [[c \text{-begleiteten } t_1 t_1]] = \exists e [^*\text{accompany'(x}_1,y_i,e)] \\
\text{b. } & [[c \text{-begleiteten } t_1 t_1]] = \lambda x_1 \lambda y_i e [^*\text{accompany'(x}_1,y_i,e)] \\
\text{c. } & [[\text{die Ballerinen, zwei Offiziere}]] = \lambda R. \forall z [z \in Z_i \rightarrow \exists X [2\text{officers'(X) } \land R(X)(z)]] \\
\text{d. } & [[c \text{-die Ballerinen, zwei Offiziere begeleiteten } t_1 t_1]] = \lambda R. [\forall z [z \in Z_i \rightarrow \exists X [2\text{officers'(X) } \land R(X)(z)]] ] \\
& \quad (\lambda x_1 \lambda y_i e [^*\text{accompany'(x}_1,y_i,e)]) \\
& \quad \Leftrightarrow \forall z [z \in Z_i \rightarrow \exists X [2\text{officers'(X) } \land \exists e [^*\text{accompany'(X,z,e) } ]] ] \\
& \quad (\lambda x_1 \lambda y_i e [^*\text{accompany'(x}_1,y_i,e)]) \\
& \quad \Leftrightarrow \forall z [z \in Z_i \rightarrow \exists X [2\text{officers'(X) } \land \exists e [^*\text{accompany'(X,z,e) } ]] ]
\end{align*}
\]

(63d) contains a free variable \( Z_i \), which is co-indexed with the DistKey ‘die Ballerinen’ the ballerinas’. The denotation of the DistKey is factored in by \( \lambda \) abstraction over index ‘i’in (63d), followed by functional application of the result to the DistKey denotation. The final result is given in (64a). The truth-conditions in (64b) match those of (55b).

\[
(64) \quad \begin{align*}
\text{a. } & [[ \text{die Ballerinen, jeweils, Offiziere, begleiteten } t_1 t_1]] \\
& = \forall z [\text{ballerina}'(z) \rightarrow \exists X [2\text{officers'(X) } \land \exists e [^*\text{accompany'(X,z,e) } ]] ] = 1 \text{ iff} \\
\text{b. } & \text{for each ballerina } z \text{ of a given set, there is a group of two officers } X \text{ and an event } e \text{ such that } X \text{ accompanies } z \text{ in } e.
\end{align*}
\]

Hence, the proposed semantic system accounts for instances of backwards distribution from subject position.

It is a nice property of the instrument of crosswise \( \lambda \)-abstraction that it is entirely index-and type-driven. The grammatical funtions of DistKey, DistShare, and relation-denoting expression play no role as long as the indices are distibuted correctly. This makes crosswise \( \lambda \)-abstraction a very flexible instrument which can apply to a range of constructions. It allows adnominal jeweils to establish distributive relations between events (DistShare) and events (DistKey), as in the case of adverbal readings with fronted jeweils-DP; between direct objects (DistShare) and indirect objects (DistKey); and even between subjects (DistShare) and objects (DistKey). The semantics used in all three cases are the same. Differences in interpretation are due to differences in indexation and differences in syntactic structure (which seem to follow in part from semantic requirements). The picture of the interpretation of adnominal jeweils that emerges is therefore a very homogenous one, even in cases that appear problematic at first sight. LF-movement of the jeweils-DP, or of jeweils, for interpretive reasons has proven unnecessary, making the semantic analysis very surfacy in nature. As pointed out in chapter I, the development of such a surface analysis was one of the objectives of this thesis.

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18 I leave out the contribution of nach Haus ‘home’ and the intermediate subject trace in SpecIP for reasons of transparency.
2.4.3 The Costliness of LF-Movement
In the previous section, I have that argued that LF-movement of the DistKey object across the jeweils-DP is a precondition for the backwards distributive reading. It was shown that LF-movement must apply for semantic reasons. Without LF-movement, no indexed variable (the trace of the moved constituent) would be introduced. Without this variable, crosswise $\lambda$-abstraction could not apply. And without crosswise $\lambda$-abstraction, sentence (55b) would not have a backwards distributive reading, but only the adverbial reading (over an implicit set of events). I conclude that LF-movement applies in order to give rise to a new interpretation that would be impossible without application of LF-movement. This state of affairs fits in nicely with Fox’s (2000) semantic licensing condition on LF-movement, which demands that LF-movement can apply if and only if it gives rise to a new interpretation. This makes syntax appear to be sensitive to semantic factors at least in the LF-component, the basic idea being that LF-movement is costly and should be dispreferred unless it “pays off” by allowing for a new interpretation. The costliness of the LF-movement operation in (62) is adequately reflected by the fact that the backwards distributive reading of (60) is harder to get than the adverbial reading.\footnote{The same can be observed for Korean. In Korean, the d-distributive element –ssik- in subject position is also preferably interpreted adverbially as quantifying over an implicit set of events. The backwards distributive reading of subject denotation over object denotation is possible, but dispreferred (cf. Choe 1987:50, fn.9)}

In light of the costliness of LF-movement, it is a welcome result that all other readings with adnominal jeweils can be derived from surface structure and do not involve LF-movement. Observe finally, that LF-movement in the case of backwards distributive readings is triggered by the need to create an indexed variable and not by scope considerations. The fronted specific DP always takes wide scope with respect to other quantificational elements in the clause. Therefore, LF-movement of the DP does not give rise to a new scopal reading. This fact allows for maintaining the restriction that German does not allow for scope-driven LF-movement, a claim which was relevant for the revised analysis of ILCs in chapter III.3, and more or less tacitly assumed in the rest of the thesis.\footnote{I will leave it open why some semantic requirements (presence of a trace for the backwards distributive reading) can trigger LF-movement in German, while others (relative scope) do not.}

2.5 Summary
This section discussed the interpretation of adnominal jeweils in subject position. The possibility of adverbial readings with adnominal jeweils was attributed to application of crosswise $\lambda$-abstraction. Then, it was shown that the assumption of crosswise $\lambda$-abstraction allows for deriving the structural licensing conditions on adverbial readings with adnominal jeweils from section 1.4. Finally, it was shown that the assumption of crosswise $\lambda$-abstraction accounts for distribution with direct object jeweils over indirect objects, and backwards distribution with subject jeweils over direct objects. The variability in the application of crosswise $\lambda$-abstraction follows from the fact that this semantic process is only sensitive to the presence of indices and type requirements. In section 4, it is argued that the semantic operation of crosswise $\lambda$-abstraction may have an even wider range of applications, independent of the presence of adnominal jeweils. This suggests that we deal with a more general semantic process here.
3 Cross-Linguistic Considerations

The discussion of the semantics of subject jeweils puts us in the position to widen the scope of the analysis once again, and to look at the wider cross-linguistic picture. In this section, we investigate the question of whether distance-distributive elements (DDs) in other languages can also be interpreted by crosswise $\lambda$-abstraction when occurring in underlying subject position. We will look at three phenomena in particular. Section 3.1 shows that subject DDs can be interpreted adverbially in those languages that allow for DDs in this syntactic position. On the null hypothesis, the adverbial interpretation is derived by the same semantic mechanism as in German, namely by crosswise $\lambda$-abstraction. Section 3.2 discusses the origin of backwards distributive readings with subject DDs in other languages. Finally, section 3.3 discusses the general impossibility of DDs in subject position of embedded clauses, as in (65).

(65) *The storeclerks said that one boy each had laughed.

(65) is of particular interest because it underlines the need for an integrated syntactic and semantic analysis of distance-distributivity. First, (65) is not ruled out for purely syntactic reasons, since there is a potential DistKey antecedent (the storeclerks) which c-commands each in (65) (see III.5.5 for discussion). Second, structures like (65) are as ungrammatical (on the intended reading) in German as they are in English. The latter fact suggests that the ungrammaticality of (65) is semantic in nature, since German jeweils need not be syntactically licensed anyway. I take this as an argument in favour of an integrated syntactic and semantic account.

3.1 Adverbial readings with DDs in Subject Position

The discussion in chapter III.5 has shown that d-distributive elements which are formally identical to the D-quantifier in their language must take a c-commanding DP as their DistKey expression. This correctly excludes the possibility of adverbial readings for the d-distributive element in these languages. On its adverbial reading, the DD distributes over an implicit set of events which is not expressed as an overt DP in c-commanding position. It follows that no D-features can be copied onto the NP-proform which provides the restriction for the DD, and the DD finds no matching D-features to check its own against. As a result, the sentences in (66) are ungrammatical with or without an adverbial reading.

(66) a. *One boy each came in.
   b. *Elk een jonge kwam binnen. [Dutch]
   c. *Un garçon chac-un(e) est entré. [French]
   d. *E’ entrato un ragazzo ciascuno. [Italian]

In contrast, DDs which do not require licensing by a c-commanding element allow for adverbial readings, when in subject position. Apart from German jeweils, this is the case for Korean –ssik-, Czech and Bulgarian po, and Japanese zutu. The relevant examples are repeated in (67).

(67) a. [hyengsa-twu-myeng-ssik]-i [yonguicha-tul]-ul ccoch-ko-iss-ta. [Korean]
   ‘The detectives are chasing a group of suspects in pairs of two.’
   (Choe 1987:50, ex.15)
b. Po edna yabulka beshe izgnila.  
   (Each time / in each basket), one apple was rotten.  
   (Petrova, p.c.)

c. Po třech ženách vstupovalo do místnosti.  
   (Each time / each ten minutes), three women entered the room.  
   (Filip, p.c.)

d. Taroo-wa i-ssatu-zutu hon-o ka-tta.  
   ‘Taroo bought one book on each occasion.’  
   (Sakaguchi 1998:115, fn.1)

The availability of adverbial readings with d-distributive elements in other languages suggests that the semantic process of crosswise  λ-abstraction is universally available. On the null assumption, the sentences in (67) are derived in parallel fashion to the case of jeweils discussed in section 2.2. The availability of an adverbial reading seems to depend solely on the insensitivity of an d-distributive element to the presence of a DP as DistKey (at least in the languages under discussion) plus the two additional structural conditions from (26) in section 1.4.

### 3.2 Backwards Distribution from Subject Position

In this section, we look at the possibility of backwards distributive readings with subject DDs in other languages. Of course, such readings are only attested in languages that allow for DDs in subject position independently (for syntactic reasons).

In section 2.4.2, it was argued that backwards distributive readings are the result of covert LF-movement of the object DistKey across the DD in subject position. Since such movement results in a weak crossover configuration, we expect languages that allow for backwards distributive readings to be insensitive to WCO-effects on the null assumption that backwards distributive readings are derived by the same semantic mechanism cross-linguistically.

Apart from German, backwards distribution with a subject DD over an object DistKey is possible with Korean –ssik–, Japanese zutu, and Bulgarian po. The sentences in (68) allow for a backwards distributive reading.

(68) a. [hyengsa-twu-myeng-ssik-i[yonguicha-tul]-ul ccoch-ko-iss-ta.  
   ‘Each suspect is chased by two policemen.’  
   (Choe 1987:50, ex.15)

b. Shinbunkisyga-futari-zutu sorera-no seizika-o sirabeta.  
   ‘Those politicians were investigated by two newspaper journalists each.’  
   [Jap.]

c. Po edin student pomogna na vseki profesor.  
   ‘The professors were helped by one student each.’  
   (Petrova 2000, ex.6b)
The DDs in (68) contain no D-features. Hence, they can occur in underlying subject position, a precondition for a backwards distributive reading. (69) shows that Korean allows for weak crossover configurations as the result of overt scrambling (Kim, p.c.).

   which child-ACC self-GEN mother- NOM abandon- PAST-Q
   ‘Which child was abandoned by his, mother?’

Based on (69), I conclude that the object DistKey in (68a) can rise across the distributing subject at LF.\textsuperscript{21} The resulting structure is then interpreted by application of crosswise $\lambda$-abstraction.

The Bulgarian facts do not present us with a clear picture. At first sight, Bulgarian does not seem to allow for weak crossover configurations (70a). However, in certain configurations weak crossover effects seem to be absent. There is no weak crossover with a clitic double of the possessive in (70b) (Petrova, p.c.).

(70) a. *Kogo\textsubscript{i} obicha negovata\textsubscript{i} maika? [Bulgarian]
   who\textsubscript{i} loves his\textsubscript{i} mother
   ‘Who does his mother love?’

b. Kogo\textsubscript{i} go\textsubscript{i} obicha maika mu\textsubscript{i}? [Bulgarian]
   who\textsubscript{i} him\textsubscript{i} loves mother his\textsubscript{i}
   ‘Who does his mother love?’

In light of the contradictory evidence, it seems difficult to account for the backwards-distributive reading in (68c). I see two options. Either, (68c) is a configuration in which LF-movement does not result in ungrammaticality, similar to what we find with (70b). Or, LF-movement in (68c) would result in ungrammaticality were it not for the fact that the NP-proform that was argued to be cross-linguistically present in d-distributive constructions in chapter III.5.1 is covert. In both cases, LF-movement could apply, and the resulting structure could be interpreted by crosswise $\lambda$-abstraction. In the absence of further evidence, I will leave it at these sketchy remarks.

In conclusion, the evidence for the assumption that LF-movement of the object DistKey across the co-indexed DD is possible in the languages in (68) is far from overwhelming. Korean seems to allow for such movement (but see fn.21). Bulgarian provides contradictory evidence in the overt component. Furthermore, I was unable to retrieve any relevant data concerning Japanese. Therefore, the claim that all backwards distributive readings are derived by application of crosswise $\lambda$-abstraction after LF-movement of the DistKey remains a mere hypothesis, pending further decisive evidence in its favour or against it.

\textsuperscript{21} This assumption appears problematic when confronted with the ill-formedness of (i), which seems to show that Korean is sensitive to weak crossover at the level of LF. Apparently, LF-movement of the wh-constituent \textit{enu ai-lul ‘which child’ over the subject is impossible.

(i) ??caki-uy emeni-ka enu ai-lul naydapeli-ess-upnika?
   self-GEN mother- NOM which child-ACC abandon-PAST-Q
   ‘‘Which child, did his, mother abandon?’’

In order to maintain the analysis in the main text, the reason for the ungrammaticality of (i) must lie elsewhere, e.g. in the need for the pronoun caki ‘self’ to be licensed at surface structure. In the absence of further evidence, I will leave the matter unresolved.
3.3 On DDs in Embedded Subject Position

We now take up the discussion of ADs in embedded subject position that was postponed in chapter III.5.5. There, it was mentioned that the ungrammaticality of (65), repeated as (71), does not follow from a violation of the c-command requirement.

(71) *The storeclerks, said that one boy each, had laughed.

Interestingly, the German counterpart of (71) is equally ungrammatical on the intended reading.

(72) *Die Verkäufer, sagten, dass jeweils ein Junge gelacht hatte.

The fact that jeweils does not need to be licensed under c-command suggests that c-command, or lack thereof is not the decisive factor for the ungrammaticality of (71) and (72). The parallel behaviour of English and German rather suggests that the sentences are out (on the intended reading) for semantic reasons. In what follows, the structures in (71) and (72) are argued to be semantically ill-formed. They cannot be interpreted in a meaningful way. This conclusion underlines the importance of semantic considerations for an adequate analysis of d-distributive constructions.

Observe that (71) and (72) cannot be saved by raising the embedded subject (or the DD in isolation) into the matrix clause. Extraction of or subextraction from subjects is generally bad in English and German, as shown in (73ab).

(73) a. *Who did Peter say that ti had laughed.


I conclude that no raising of (part of) the subject DP has taken place in (71) and (72).

This being so, we have to determine why the DDs in (71) and (72) cannot be interpreted in situ. In my view, the non-interpretable of (71) and (72) follows directly from applying the semantic analysis for jeweils in subject position. In other words, the semantic analysis of DDs in subject position rules out the sentences in (71) and (72) as ungrammatical.

Consider the semantics at the point in the derivation where the denotations of the embedded subject DP and I’ combine. The relevant subtree is given in (74). The embedded subject has moved overtly to SpecIP, leaving behind a trace inside the VP. The denotations of subject DP and I’ are given in (75ab).

(74) IP

    DP1,1

    jeweils, each ein Junge t1 gelacht hatte

    I’

(75) a. *Who did Peter say that ti had laughed.


I conclude that no raising of (part of) the subject DP has taken place in (71) and (72).

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(74) IP

    DP1,1

    jeweils, each ein Junge t1 gelacht hatte

    I’

22 (72) has an adverbial reading on which jeweils distributes over an implicit set of events: The store clerks said that one boy laughed each time.
(75)  a. \[\left[ \text{de jeweils},_i _j \text{ ein Junge} \right] = \forall z \left[ z \in \mathbb{Z}_i \rightarrow \exists X \left[ \text{one}_\text{boy}'(X) \land *R_j(X)(z) \right] \right] \]

b. \[\left[ \text{t}_i \text{ gelacht hatte} \right] = \exists e \left[ \text{laughed}'(x_i , e) \right] \]

(75b) contains only one free variable, but we can add a second by introducing an optional relational modifier. This optional modifier establishes discourse coherence by relating a discourse-old event with the event introduced by the existential quantifier (see chapters IV.1.3, and V.2.2 for discussion of this point). The denotation of \( \Gamma' \) will then be as in (76a). Since both indices ‘1’ and ‘i’ are visible to \( \Gamma' \) (see 2.3.1), crosswise \( \lambda \)-abstraction can apply. First, \( \lambda \)-abstraction applies to the free variables \( e_i \) and \( x_1 \) in (76a), yielding (76b). Then, \( \lambda \)-abstraction applies to \( R_j \) in (75a), yielding (76c). Finally, (76c) and (76b) combine by functional application, giving (76d).

(76)  a. \[\left[ \text{t}_i \text{ gelacht hatte} \right] = \exists e \left[ \text{laughed}'(x_i , e) \land R(e, e_i) \right] \]

b. \[\left[ \text{t}_i \text{ gelacht hatte} \right] = \lambda x_i \lambda e_i \exists e \left[ \text{laughed}'(x_i , e) \land R(e, e_i) \right] \]

c. \[\left[ \text{de jeweils},_i _j \text{ ein Junge} \right] = \lambda R_j \lambda z \left[ z \in \mathbb{Z}_i \rightarrow \exists X \left[ \text{one}_\text{boy}'(X) \land *R_j(X)(z) \right] \right] \]

d. \[\left[ \text{de jeweils},_i _j \text{ ein Junge t}_i \text{ gelacht hatte} \right] = \forall z \left[ z \in \mathbb{Z}_i \rightarrow \exists X \left[ \text{one}_\text{boy}'(X) \land \exists e \left[ \text{laughed}'(X,e) \land R(e, z) \right] \right] \right] \]

So far, the derivation is well-formed. The matrix verb \( \text{sagten} \) ‘said’ selects the proposition in (76d) as one of its arguments, together with the trace of the subject \( \text{die Verkäufer} \) ‘the storeclerks’. The moved subject in SpecIP can semantically bind both its trace and the index of the variable \( Z_i \) on \( \text{jeweils} \) in (76d). This is shown schematically in (77).

(77)           IP
              \text{die Verkäufer}_i
            \text{the store clerks}  VP
                t_i                     V'
                   V          CP
                      \text{sagten}                  ... jeweils...
            \forall z [z \in \mathbb{Z}_i \rightarrow \exists X [(\text{one}_\text{boy}'(X) \land \exists e [\text{*laughed}'(X,e) \land R(e, z)]))]]

However, this binding would lead to disastrous results. For consider what happens if we \( \lambda \)-abstract over index ‘i’ in the denotation of the matrix VP (cf.78a), and functionally apply the result to the denotation of \( \text{die Verkäufer} \) (cf.78b):

(78)  a. \[\lambda Z_i \exists e'' [\text{said}'(Z,e''), \forall z [ z \in \mathbb{Z}_i \rightarrow \exists X \left[ \text{one}_\text{boy}'(X) \land \exists e \left[ \text{*laughed}'(X,e) \land R(e, z) \right] \right] \left[ \text{one}_\text{boy}'(X) \land \exists e \left[ \text{*laughed}'(X,e) \land R(e, z) \right] \right]] \]

b. \[\exists e'' [\text{said}'([\text{the storeclerks}], e''), \forall z [ z \in [\text{the storeclerks}] \rightarrow \exists X \left[ \text{one}_\text{boy}'(X) \land \exists e \left[ \text{*laughed}'(X,e) \land R(e, z) \right] \right] \left[ \text{one}_\text{boy}'(X) \land \exists e \left[ \text{*laughed}'(X,e) \land R(e, z) \right] \right]] \]

(78b) is semantically ill-formed. It would be true if there were an event of the storeclerks saying that for each of the storeclerks \( z \) there are a boy \( x \) and an event \( e \) such that \( x \) laughs in \( e \) and such that \( e \) is related to \( z \). The last condition in italics is in contradiction to the sortal restriction on \( R \) in (78b). \( R \) was introduced as a sorted relation between two atomic events, one of them discourse-old, the other introduced by the existential quantifier. This
being so, R cannot establish a relation between an event and an individual, as demanded by (78b).

This point becomes clearer still if we assume that existential closure over the embedded VP (optionally) does not apply. Without existential closure, the embedded I’ would denote the expression in (79)

\[(\text{gelacht hatte})] = \lambda e_i \text{[laughed'}(x_i,e_i)]\] (79)

Applying all the steps in (76b-d) and in (78a), we get the following expression for the meaning of the entire clause:

\[\exists e'' \text{[said'}([\text{the_storeclerks}]), e'', \forall z [z \in [\text{the_storeclerks}] \rightarrow \exists X [\text{one_boy'}(X) \land \text{*laughed'}(X,z)]]]}\] (80)

(80) could only receive an interpretation if the intransitive verb lachen ‘to laugh’ was able to establish a relation between two individuals. However, lachen is sortally restricted to take one event argument e and one individual argument x that laughs in e. For this reason, (80) cannot be a well-formed expression from a semantic point of view. The last condition \text{*laughed'}(X,z) cannot be interpreted in a meaningful way, as long as z stands for a storeclerk.

In German, jeweils can alternatively select for an implicit set of events as DistKey. On this reading the sentence is grammatical (see fn.22). For English each, this alternative strategy is not available because it requires a DistKey in form of a DP. As seen, the denotation of the only potential DistKey DP is of the wrong sort to lead to a meaningful interpretation.

The above considerations show that a combination of syntactic and semantic factors excludes d-distributive each from the subject position of the embedded clause in (71). Semantically, each requires a set of events as DistKey and cannot distribute over the DP-subject the storeclerks. Syntactically, each requires a c-commanding DP as DistKey in order to check its D-features (after feature copying onto the covert proform). The ensuing conflict results in ungrammaticality.

Finally observe that the present analysis predicts that the conflict between semantic and syntactic requirements in English can be circumvented if the DP-antecedent in the matrix clause does not denote a set of individuals, but a set of events. In this case, there is a DP antecedent that can check the D-features of each, and that satisfies the semantic requirement of denoting a set of events. Indeed, it seems that each is not altogether impossible in embedded subject position in (81a) (Since a set of events cannot be the subject of a propositional verb (such as say), I have inserted a verb of causation instead). The German counterpart of (81a) is also grammatical.

(81)  

a. The protest rallies, had the effect that one politician each, stepped down.

b. Die Proteste, bewirkten, dass jeweils, ein Politiker zurücktrat.

If correct, the grammaticality of (81) follows directly on the analysis presented here.\(^{23}\) In (81), each in embedded subject position can be interpreted by means of crosswise λ-

\(^{23}\) The grammaticality of (81b) also shows that there is no clausemate condition in the strict sense, at least in German. The apparent clausemate effect comes about through the choice of an unsuitable, individual-denoting
abstraction because the matrix DP provides a plurality of the appropriate sort. This shows that crosswise λ-abstraction is operative in English, and presumably cross-linguistically. It also shows that semantic factors are important in the analysis of d-distributive elements.

3.4 Summary
In this section, I have argued that the semantic process of crosswise λ-abstraction is operative cross-linguistically. It was argued that crosswise λ-abstraction applies in the derivation of adverbial and backwards distributive readings in those languages that syntactically license a DD in subject position. Furthermore, it was argued that the assumption of crosswise λ-abstraction accounts for the general ungrammaticality of DDs in embedded subject position. This provides indirect evidence for the operativeness of crosswise λ-abstraction even in English, which otherwise does not show much overt evidence for it, at least with d-distributive constructions. The indirect evidence seems confirmed by the relative acceptability of (81a).

In the next section, I argue that crosswise λ-abstraction is not only relevant for the semantic analysis of DDs in subject position (cross-linguistically). It also seems to play a role in the semantic analysis of other syntactic constructions.

4 Crosswise λ-Abstraction in other Syntactic Constructions
In this final section of the thesis, I show that the mechanism of crosswise λ-abstraction possibly applies to a range of phenomena which are – at first sight - unrelated to d-distributive constructions. In 4.1, I show how crosswise λ-abstraction may account for variable binding out of ILCs (cf.82a). In 4.2, I show how crosswise λ-abstraction may account for variable binding out of possessive DPs (cf.82b). In 4.3, I show how crosswise λ-abstraction may account for the working of pluractionally quantifying PPs, as in (82c), which are discussed by Stockall (2001).

(82) a. Some man from every city loves it,
    b. Every lady’s dog adores her,
    c. Girl after girl arrived.

The semantic mechanism in all three cases is argued to be identical. In each construction, one or two indices on the subject DP trigger λ-abstraction in the denotation of the subject’s sister. This λ-abstraction is followed by λ-abstraction over a free relation variable in the subject denotation. The use of crosswise λ-abstraction in all three cases points out a semantic (and a syntactic) parallel between at first sight unrelated constructions, thus achieving a high degree of generality. Although the discussion is admittedly sketchy and in need of further elaboration, it serves to highlight the potential use of the mechanism of crosswise λ-abstraction in the semantic analysis of natural language expressions. This last section of the dissertation can therefore be considered the starting point for further research into the nature of crosswise λ-abstraction and its application in natural language semantics.

DP as potential DistKey in the matrix clause. If an event-denoting DP is chosen as DistKey, the clausemate effect disappears.
4.1 Binding from within ILCs

The discussion of ILCs in chapter III.3 and in IV.7 has not answered the question of how bound variable readings with ILCs come about. (82a) from May (1985) is a classical instance of such readings. As pointed out in chapter III.3.1, fn.33, bound variable readings with ILCs are not accepted by all speakers of English, but there needs to be an explanation for the subgroup of speakers that finds them acceptable.

To begin with, recall that the bound variable reading only shows up together with the “inverse” reading. This indicates that the structure of (82a) should be as in (83) (cf. III.3.4.2).

\[
(83) \quad \left[ I^P \left[ D^P \left[ N^P \text{Some man} \right] \left[ Q^{PP} \text{from every city} \right] \right] \right], \left[ I^t \text{loves it} \right].
\]

Also recall that the right-adjunction structure in (83) is the result of re-interpreting the PP from every city as a generalised quantifier. Its meaning is given in (84a), the meaning of the entire ILC in (84b):

\[
(84) \quad \text{a. } \left[ Q^{PP} \text{from every city} \right] = \lambda P. \forall z \left[ \text{city'(z)} \rightarrow \exists x \left[ P(x) \land \text{from'(x,z)} \right] \right] \\
\text{b. } \left[ N^P \text{some man from every city} \right] = \forall z \left[ \text{city'(z)} \rightarrow \exists x \left[ \text{man'(x)} \land \text{from'(x,z)} \right] \right]
\]

(84b) is a closed proposition with no free variables. For this reason, it should not be an appropriate target for \( \lambda \)-abstraction. The denotation of \( I^t \) is an open proposition with the two free variables \( x, y \), the value of the VP-internal subject trace, and the value of the object pronoun \( it \). Therefore, \( \lambda \)-abstraction could in principle apply over both indices, resulting in a relation-denoting expression of type \( \langle e, e^t \rangle \). This in itself is to no avail because the ILC-denotation in (84b) is of the wrong type (type \( \langle e, e^t \rangle \)) to serve as an argument for the relation.

In my view, the problem can be mended by means of one additional stipulation. Say, that it is possible to introduce an additional optional relation variable into the nuclear scope of (84a), along the lines in (85).

\[
(85) \quad \left[ Q^{PP} \text{from every city} \right] = \lambda P. \forall z \left[ \text{city'(z)} \rightarrow \exists x \left[ P(x) \land \text{from'(z,x)} \land R^j(z)(x) \right] \right]
\]

The relation variable establishes an additional relation between the two variables bound by universal and existential quantifier respectively. It seems that such a step is semantically harmless because it does not introduce truth-conditions that are too strong. This is because we can always fill in the non-identity relation in cases where an additional relation variable is unnecessary, i.e. in all cases with no variable binding from within the ILC. In other words, it will always be possible to find a relation that makes (85) true, given that the other conditions are satisfied.

Granted that the optional addition of a relational modifier is permitted in general (compare also the optional addition of relational event-modifiers in the verbal domain), applying crosswise \( \lambda \)-abstraction will derive the bound variable reading for (83). The relevant point in the derivation is shown in (86).\(^{24}\)

\(^{24}\) For the derivation to proceed, it is necessary that the index ‘i’ of the QP be visible on the subject DP. I will return to this point shortly.
The denotation of the right-hand daughter $I'$ before $\lambda$-abstraction is given in (87a). The indices ‘i’ and ‘1’ trigger $\lambda$-abstraction in (87a), in this order. The result is the relation-denoting expression in (87b). In a second step, $\lambda$-abstraction over index ‘j’ applies to the left-hand daughter, the ILC-denotation. The result in (87c) functionally applies to (87b), yielding the correct (87d) as the meaning for (83).

(87)  

a. $[[t_1 \text{ loves } it_1]] = \exists e \ [\text{love'}(x_1, y_1)]$

b. $[[t_1 \text{ loves } it_1]] = \lambda y \lambda x_1. \exists e \ [\text{love'}(x_1, y_1)]$

c. $[[\text{DP}_{i,1} \text{ some man from every city}]]$

$= \lambda R. \forall z [\text{city'}(z) \to \exists x [\text{man'}(x) \land \text{from'}(z)(x) \land R(z)(x)]]$

d. $[[\text{some man from every city } t_1 \text{ loves } it_1]]$

$= \forall z [\text{city'}(z) \to \exists x [\text{man'}(x) \land \text{from'}(z)(x) \land \exists e [\text{love'}(x, z)]]] = 1 \text{ iff}$

e. for every city $z$, there is a man $x$ from $z$ and there is an event $e$ such that $x$ loves $z$.

The derivation in (87) is structurally analogous to the semantic analysis of adnominal jeweils-DPs in subject position. This is a welcome result, since ILCs and jeweils-DPs were argued to be structurally parallel in chapter III. Given their structural parallelism, a similar semantic derivation is to be expected. The price to pay in order to achieve this parallelism is the introduction of an extra relational modifier. As argued above, I do not conceive of such an introduction as dangerous. It does not lead to truth-conditions that are too strong, for it can always be trivially satisfied by the non-identity relation. In addition, it is in line with compositionality, since its introduction seems to be necessitated by the parts of the whole expression (the clause) and the way they are combined. Finally, the fact that an extra relational modifier must be introduced may account for the marginality of the construction, and to its rebuttal by many speakers.

A more serious problem was raised in footnote 24. It regards the position of the index ‘i’. In section 2.3.1, I have argued that the index-bearing expression must be at the left periphery of the DP in order for its index to be visible to DP’s sister, thus triggering $\lambda$-abstraction. Visibility could be attributed to percolation of the index to DP, or to the fact that expressions in SpecDP (or adjoined to DP) are visible to the sister of DP. However, the index-bearing expression in (86), the QPP, is not at the left-periphery of the DP, but right-adjointed to NP. So how can the index be visible to I’, triggering $\lambda$-abstraction? I can see at least two possible answers to this problem. First, one could assume that the postnominal QPP is right-adjointed to DP, instead of NP. Being not included inside the DP, the index ‘i’ of QPP should be visible to I’, triggering $\lambda$-abstraction. The second solution is that the postnominal QPP can undergo LF-movement to SpecDP after all, contrary to what was argued in chapter III.3. In this case, the LF-structure of the ILC in (83) would be identical to the surface structure of jeweils-DPs, and the index could get to DP from SpecDP. Since movement would be necessitated by the need to get the index to the DP-level, such LF-movement would be licensed by Fox’s (2000) requirement that LF-
movement can apply only if it gives rise to a new reading. In this case, the new reading is the bound variable reading. On this view, there would be two syntactic structures for the “inverse” readings of ILCs. On the regular “inverse” reading, the postnominal QPP can be interpreted in situ, in its postnominal base position. On the bound variable “inverse” reading, the postnominal QPP must be interpreted in SpecDP after LF-movement has taken place.

The second solution has the advantage that it also gives an account for the marginality of bound variable readings with ILCs. Additional LF-movement for semantic reasons is costly, and generally dispreferred by speakers. On the other hand, the assumption of two different LF-structures for the two “inverse” readings of ILCs makes the analysis testable in principle. We would expect to find empirical differences in connection with the two “inverse” readings if their LF-structures differ. At present, I am not aware of such differences. Also, a mixed syntactic account of the two inverse readings takes away a lot of the appeal of the surface analysis of ILCs proposed in chapter III.3. I leave the matter open for further research, simply assuming that the index ‘i’ is visible to I’ one way or another.

4.2 Binding from within Possessive DPs
Crosswise λ-abstraction may also be of use in the analysis of variable binding from within possessive DPs (Reinhart 1976). In (88), the universal QP every lady in SpecDP can bind a pronoun inside the VP.

(88) Every lady_i’s dog adores her_i.

Since Abney (1987), prenominal genitive DPs are standardly analysed as being located in the specifier of DP. I will adopt Abney’s analysis without further comment. The structure of (88) is given in (89).

(89) [IP [DP Every lady_i’s [NP dog]]_i [i: t_i adores her_i]].

The question is how the QP can bind the pronoun from SpecDP? Kayne (1994) gives a syntactic answer to the problem. On his analysis, all specifiers are adjuncts, and all adjuncts can c-command out of the structure they are adjoined to because they are not dominated by it. It follows that every lady_i’s c-commands her_i in (89). If syntactic c-command is a precondition for semantic binding, such binding should be licensed.

The syntactic solution does not solve the semantic problem with (88), though. The problem lies in the fact that DPs with a genitive QP in prenominal position are usually analysed as generalised quantifiers (type <et,t> ) (cf. Keenan & Stavi 1986). In the ordinary case, this GQ would take a property-denoting expression as its semantic argument. However, the sister of DP in (89) appears to be relation-denoting. It contains two free variables which must be bound by the DP or material therein. The type mismatch is illustrated in (90).

(90) [Every lady_i’s dog]_i (λx,λy_i.x_i adores y_i) <et,t> <e<et>>

In other words, the DP-denotation should be able to take a relation as argument if it were to bind the two variables in one go. A potential solution to this problem is to raise the QP (or the Q-head in isolation) out of the DP, and adjoin it to IP, as in (91).
In (91), binding proceeds in two steps. In a first step, the moved DP binds its trace $t_1$. In a second step, the raised QP binds both its trace inside the DP and the pronoun inside the VP. The syntactic structure in (91) therefore receives a correct interpretation. The obvious disadvantage of this approach is that it involves extraction out of a specific DP. Such extraction is not attested otherwise in English. In addition, the structure in (91) does not account for why (92) is ungrammatical. Given the structure in (91), the QP *every lady* should bind the reflexive pronoun inside its minimal governing category.

(92) *Every lady’s dog adores herself.*

In answer to this problem, I would like to propose an account that does not involve LF-extraction. Instead, the alternative analysis makes use of the mechanism of crosswise $\lambda$-abstraction. The starting point is den Dikken’s (1998) claim that prenominal genitive expressions start out as underlying PPs in postnominal position. On this analysis, the DP in (88) has the underlying structure in (93a). The surface structure in (93b) is derived through movement of the preposition into the functional head $F^0$, followed by predicate inversion of the headless PP to the specifier of this functional projection. The complex head $[F^0+P]$ is spelt out as genitive $–s$.

(93) a. $[FPF^0[NP dog [PP (of) every lady]]$

b. $[FP [tP every lady] [P+F^0] [NP dog t_1]]$

Even though the analyses differ in details, the structural similarity between (93a) and the underlying structure of ILCs should be obvious. Here as there, a PP which is generated in postnominal base position moves overtly to a DP-initial position. The structural similarity of the two constructions plus the fact that variable binding is possible from within ILCs as well suggests an analysis for (88) along the lines discussed for ILCs in the previous subsection.

Turning to the semantics of prenominal genitive constructions, Partee (1983/97) and Partee & Borshev (1998) argue that these contain a free relation variable in their denotation. An example is given in (94).

(94) $[[Sarah’s team]] = \text{x}[\text{team’(x) \land R(x, sarah’)}]$

The relation variable $R$ in (94) is free and receives its value from the context. This explains why prenominal genitive constructions can vary in interpretation. The genitive construction in (94) could refer to the team Sarah owns, the team she plays in, the team she supports etc. depending on the context. What is interesting is that a prenominal genitive construction can express different relations simultaneously. *Sarah’s team* can also refer to the team which Sarah owns and in which she plays. One way to implement this formally, would be to introduce a second relation variable in the denotation of the genitive construction.

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25 In response to this problem, Reinhart (1983:81) suggests a strengthening of the licensing conditions on syntactic anaphors according to which anaphors and their antecedents must be dominated by the same minimal governing category, i.e. the same minimal IP or DP. This condition is violated in (92).
(95) \[\text{[[Sarah’s team]]} = \text{\(\{\text{team}(x) \land R_i(x, \text{sarah}) \land R_j(x, \text{sarah})\}\)}\]

With (95), we are in a position to account for the bound variable reading with (88). I take the genitive construction in (88) to be proposition denoting, just like ILCs or jeweils-DPs. The semantic content of the genitive expression can be paraphrased as ‘every lady stands in some relation to a unique dog’. Its semantic representation is given in (96).

(96) \[\text{[[every lady’s dog]]} = \forall z \left[\text{lady}(z) \to \exists x \left[\text{dog}(x) \land R_k(x, z) \land R_j(x, z)\right]\right]\]

With (96) in place, the derivation is straightforward. The indices ‘1’ and ‘i’ on the DP are visible to its syntactic sister, I’. This triggers \(\lambda\)-abstraction over the co-indexed variables in the denotation of I’. The result is the relation-denoting expression in (97).

(97) \[\text{[[I’ t1 adores her]]} = \lambda y_1 \lambda x_i. \text{adore}'(x_i, y_1)\]

Now the road is paved for \(\lambda\)-abstraction over the index of one of the relation variables in (96), the denotation of the left-hand sister, yielding (98).

(98) \[\text{[[every lady’i’s dog]]} = \lambda R_j. \forall z \left[\text{lady}(z) \to \exists x \left[\text{dog}(x) \land R_k(x, z) \land \text{adore}'(x, z)\right]\right]\]

In a last step, (98) functionally applies to (97), yielding (99a).

(99) a. \[\text{[[every lady’i’s dog] t1 adores her]]\]
    = \forall z \left[\text{lady}(z) \to \exists x \left[\text{dog}(x) \land R_k(x, z) \land \text{adore}'(x, z)\right]\right] = 1 \text{ iff }

b. for every lady z, there is a dog x such that x stands in a relation of possession, ownership etc. to z and x adores z.

The foregoing remarks are admittedly sketchy and need to be worked out in further detail. In particular, the interpretation of the universally quantified genitive construction in (96) deserves further comment. Nonetheless, the present analysis points out an interesting parallelism in the behaviour of possessive DPs and ILCs (and jeweils-DPs). This parallelism may have its origin in a shared underlying structure syntactically, and in the shared application of crosswise \(\lambda\)-abstraction semantically.

### 4.3 Pluractional Quantifiers

The final case that I would like to discuss is the case of - on the face of it - PP-modifiers that show the semantic behaviour of pluractional quantifiers (see Lasersohn 1995, Matthewson 2000, Zimmermann 2000). Two examples are given in (100ab)

(100) a. Girl after girl arrived.
    b. John washed dog after dog.

The analysis of (101ab) as involving pluractional quantification is due to Stockall (2001), where an insightful account of the phenomenon is given. I will quickly summarise her
analysis, and then go on to show why (100ab) may have a bearing on the present discussion.

Stockall analyses the bracketed constituents in (100) as PPs with the structure in (101).

(101)      PP
    RED   P' after girl

The NP girl is the complement of the PP headed by after. The preposition after does not have its basic lexical meaning. In addition to two individuals x,y, after takes a relation f (the value of which will be that of the intransitive verb arrive, type <e,vt>) and a complex event as arguments. It specifies that the complex event consists of two events of x arriving in e', and of y arriving in e'', such that e' occurs after e''. The last clause of this condition contains the original meaning of after. SpecPP is occupied by an operator RED, which phonemically reduplicates the NP girl. Semantically, RED quantifies over the set of girls. RED is defined in such a way that it takes a set g, with a large subset Cov (here: a large set of girls), a relation, and an event as argument (i.e. it is of type <et,<eet,vt>>), specifying that any two elements x, y of Cov and the event e stand in a particular relation to each other (in the course of the derivation this relation will turn out to be the relation of x arriving after y in e).

Stockall assumes that RED must LF-raise and adjoin to IP because it is quantificational, and because it does not stand in sister position to the expression denoting its first semantic argument, the NP girl. This movement is followed by LF-movement of the NP girl to a position adjoined to RED, so that the LF-structure is as given in (102).

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27 The analysis of reduplication as a process of copying phonemic material from a base form to an operator-element is reminiscent of Marantz’ (1982:437) definition of movement. The suggested process of reduplication differs from the ones discussed in Marantz in that it seems to apply in the syntactic component, and therefore cannot be a pure morphological process.

28 The formal denotations for the elements in (101) are given in (ia-c):

   (i)  a. [[girl]] = λx.x is a girl
       b. [[after]] = λxλyλf.x∈y.∃e,e' e'' e'e'≤e, e''≤e[f(x)(e')=1 ∧ f(y)(e'')=1 ∧ e' occurs after e'']
       c. [[RED]] = λgλf.x∈y.∀g∈Cov= a large subset of g ∧ [∀x,y: (x∈Cov ∧ y∈Cov) → f(x)(y)(e) ∨ f(y)(x)(e)=1]

The denotation of the verb arrive is found in (ii):

   (ii) [[arrive]] = λx.x arrives in e

29 The movement is Heim & Kratzer (1998)-style in that it leads to insertion of indexical nodes in the syntactic structure.
With the denotations from fn.28, (102) can be correctly interpreted. Stockall’s analysis is a major step forward towards an analysis of the hitherto quite mysterious constructions in (100). In particular, the analysis in terms of pluractionality is insightful and deserves merit. Nonetheless, the analysis raises a number of syntactic problems. The first problem concerns the movement of the bare noun girl to its adjunction site in (102). As Stockall observes, this movement looks rather like head movement. But if this is the case, the N-head girl must be assumed to skip the prepositional head after in violation of Travis’ (1984) ‘Head Movement Constraint’. The second problem concerns the fact that the preposition after selects a bare singular count NP. In chapter III.4.1.1, it was pointed out that prepositions typically do not select bare count nouns, as witnessed by (103).

(103)  *John went after girl.

The question arises why the selectional restrictions on P should be different in (100). The final problem seems to be the most serious. The maximal projection headed by the preposition after occurs in subject position. As an argument position, this position is reserved for DPs.

(104)  *With the men arrived.

In response to these problems, I would like to suggest an alternative analysis which retains the pluractionally quantifying nature of the construction, but which faces fewer syntactic problems. Not surprisingly, perhaps, I propose to analyse the bracketed constituents in (100) as DPs with an empty D-head that selects for the bare NP. A PP consisting of the preposition after and the operator element RED is right-adjointed to NP.

(105)
In other words, the underlying structure of the pluractional constructions in (100) is identical to that of jeweils-DPs, of ILCs (on their “inverse” reading), and possibly of possessive DPs as well. The structure in (105) maintains the DP-status of the subject constituent, the preposition selects a full QP (as it should), and the entire structure can be interpreted without LF-movement, given an appropriate semantic value for RED.

Semantically, RED takes two arguments, a relation expressed by the preposition, and a property expressed by the bare NP, mapping these into a truth-value. In addition, I assume that RED contains a free relation variable that will be assigned the semantic value of the verb in the course of the derivation. As a result, the semantic analysis of (105) is very close to that of jeweils-DPs. The interpretation of (105) is illustrated in (106).

(106) a. 
\[ ([\text{RED}_i]) = \lambda W \chi_\text{RED}_i \lambda P \chi_{\text{RED}_i}. \exists Q \subseteq P, \exists E = \text{a set of events} \] 
\[ (\forall x,y, \forall e', e''[(x, y \in Q \land e', e'' \in E \land R_j(x, e') \land R_j(y, e'')) \rightarrow (W(e', e'') \lor W(e'', e'))]) \]

b. 
\[ ([\text{after}]) = \lambda x \lambda y. \text{after}'(x, y) \]

c. 
\[ ([\text{girl}]) = \lambda x. \text{girl}''(x) \]

\[ \Downarrow \]

FA of (106c) to (106b)

d. 
\[ ([\text{DP after RED}_i]) = \lambda P \chi_{\text{RED}_i}. \exists Q \subseteq P, \exists E = \text{a set of events} \]
\[ (\forall x, y, \forall e', e''' [(x, y \in Q \land e', e'' \in E \land R_j(x, e') \land R_j(y, e'')) \rightarrow (\text{after}'(e', e'') \lor \text{after}'(e'', e'))]) \]

\[ \Downarrow \]

FA of (106d) to (106c)

e. 
\[ ([\text{DP girl after RED}_i \text{ after RED}_i \text{ after RED}_i]) = \exists Q \subseteq ([\text{girl}]), \exists E = \text{a set of events} \]
\[ (\forall x, y, \forall e', e''' [(x, y \in Q \land e', e'' \in E \land \text{after}'(x, e') \land \text{after}'(y, e'')) \rightarrow (\text{after}'(e', e'') \lor \text{after}'(e'', e'))]) \]

(106c) gives the semantic value for the entire DP. Hence, the subject DP in (100a) denotes a proposition like jeweils-DPs. Syntactically, the subject DP has moved out of its base position to SpecIP, leaving behind a co-indexed trace.

(107) [IP [Girl after girl], [VP t1 arrived]].

The index ‘1’ on the moved subject now triggers crosswise \(\lambda\)-abstraction. In a first step, index-triggered \(\lambda\)-abstraction applies to index ‘1’ in the VP-denotation, yielding (108a). In a second step, type-triggered \(\lambda\)-abstraction applies to index ‘j’ in the denotation of the subject DP, yielding (108b). (108b) then functionally applies to (108a), yielding (108c).

(108) a. 
\[ ([t_1 \text{ arrived}]) = \lambda y. \lambda e. \text{arrive}'(y, e) \]

b. 
\[ ([\text{DP girl after RED}_i \text{ after RED}_i \text{ after RED}_i]) = \lambda R_j. \exists Q \subseteq ([\text{girl}]), \exists E = \text{a set of events} \]
\[ (\forall x, y, \forall e', e''' [(x, y \in Q \land e', e'' \in E \land \text{arrive}'(x, e') \land \text{arrive}'(y, e'')) \rightarrow (\text{after}'(e', e'') \lor \text{after}'(e'', e'))]) \]

c. 
\[ ([\text{DP girl after RED}_i \text{ after RED}_i \text{ after RED}_i \text{ after RED}_i \text{ after RED}_i]) = \exists Q \subseteq ([\text{girl}]), \exists E = \text{a set of events} \]
\[ (\forall x, y, \forall e', e''' [(x, y \in Q \land e', e'' \in E \land \text{arrive}'(x, e') \land \text{arrive}'(y, e'')) \rightarrow (\text{after}'(e', e'') \lor \text{after}'(e'', e'))]) \]

\[ \text{iff} \]

d. 
there is a large group of girls Q and a complex event E, such that for any two girls \(x, y\) in P and for any two events \(e', e''\) in E such that \(x\) arrives in \(e'\) and \(y\) arrives in \(e''\), either \(e'\) occurs after \(e''\) or \(e''\) occurs after \(e'\).

(108d) adequately captures the truth-conditions of (100a). The correct semantic interpretation is arrived at by applying crosswise \(\lambda\)-abstraction at the cost of postulating a free relation variable R in the denotation of RED. In this connection, observe that Stockall...
must also posit a relation variable (bound by a λ-operator) in the lexical entry of the preposition *after*. So, the two analyses fare equally good or bad in this respect. In contrast, the merits of the present analysis are fourfold: (i.) the denotation of *after* is the normal one; (ii.) no LF-movement is required; (iii.) the syntactic problems concerning the selectional properties of Ps and the obligatory DP-status of subjects do not arise; and (iv.) the syntactic and semantic analysis of (100ab) is analogous to that proposed for several other constructions. The applicability of crosswise λ-abstraction to the range of syntactic constructions discussed in this and the preceding sections is a strong argument in its favour.

### 4.4 A Perspective for Reduplicating Languages

The previous sections have shown that a unified semantic analysis of a number of (at first sight) unrelated constructions is feasible. The role played by crosswise λ-abstraction in the semantic derivation of binding from ILCs, binding from possessive DPs, and in the interpretation of pluractional DPs assigns it a prominent role in the semantic analysis of natural language expressions. It provides a flexible tool for the analysis of a variety of constructions in a variety of languages. From a universalist perspective, this is a welcome result.

In addition, the discussion of pluractional *N*-after-*N* constructions in section 4.3 opens an unexpected window to the analysis of languages that express adnominal d-distributivity by reduplication of the numeral. Examples from Hungarian and Georgian from chapter II.4.1 are repeated as (109ab).

(109) a. A gyerekek hoztak egy-egy könyvet.          [Hungarian]
            the children bought a-a book
    ‘The children bought a book each.’ (Farkas 1997:260, ex.36)

b. Orma k’acma sam-sami čanta c’aiyo. [Georgian]
        twoERG manERG three-threeNOM suitcaseNOM carried
    ‘Two men carried three suitcases each.’ (Gil 1982:18, ex.1c)

The discussion of *N*-after-*N* constructions in section 4.3 was based on the assumption that the reduplicated expression is an operator element that receives its phonological feature value through feature copying from an overt lexical element at PF. On the plausible assumption that a similar process applies with reduplicated numerals, the object DP in (109a) could be analysed as in (110).

(110)  

(110) resembles the surface structure of German *jeweils*-DPs to a certain extent. Furthermore, Hungarian exhibits overt DP-internal fronting, as witnessed by (111b) which is derived from (111a) (Szabolcsi 1994:180f.):

(111) a. (a) Mari kalap-ja-i  
      the Mari(NOM) hat-POSS-PL

b. Mari-nak a tı kalap-ja-i
      Mari-DAT the hat-POSS-PL
    ‘Mari’s hats’
This means that the underlying structure of (110) could – in principle – be as in (112).

(112) \([DP \ [NP \ [NP \ {\text{egy könyvet}] \ RED]}\])\]

This structure closely resembles the cross-linguistic structure of adnominal d-distributive constructions from chapter III.5.1. It is relatively simple to write a lexical entry for RED in (112) that is parallel to that of adnominal jeweils, and that would allow for a correct interpretation of (109a).30

(113) \([\text{RED}] = \lambda P \cdot \text{P}(\cdot) \quad \forall z \ [z \in Z \rightarrow \exists x \ [P(x) \land R_j(x)(z)]\])\]

I do not want to go further into the details of Hungarian here. Farkas (1997) shows that reduplication is a more general process in Hungarian which also applies with verbs, resulting in an iterative reading. So quite possibly, we need an eventivised version of (112) as well. The point of the foregoing remarks is merely that a unified analysis of languages that mark adnominal d-distributivity by means of a proper DD, and languages that mark d-distributivity by means of reduplication may not be as hopeless an enterprise as previously thought.

These concluding remarks are therefore intended to pave the way for further research into the universal nature of adnominal d-distributivity. Ideally, the result of such a research program would be (i.) that languages do not differ widely concerning the way they express adnominal d-distributivity, and (ii.) that the observable differences can be reduced to general syntactic differences between languages.

5 Conclusion

In this chapter, I have argued for the following:

(114) i. A subset of adnominal elements can be interpreted adverbially if two structural conditions are satisfied: (i.) The adnominal element must be at the left edge of its embedding DP; (ii.) The embedding DP must be located outside VP.

ii. The semantic operation of crosswise \(\lambda\)-abstraction lies at the heart of adverbial readings with adnominal jeweils in sentence-initial position. Crosswise \(\lambda\)-abstraction involves \(\lambda\)-abstraction on both daughters of a syntactic node so that the first application of \(\lambda\)-abstraction creates the precondition for the second application of \(\lambda\)-abstraction.

iii. Crosswise \(\lambda\)-abstraction may play a role in a number of at first sight unrelated constructions, involving binding from within inverse linking constructions, binding from within possessive DPs, and pluractional quantification with NP-P-NP-constructions.

30 See Farkas (1997) for an alternative semantic account of (109a) in terms of dependent variables.
In this thesis, I have investigated the syntax and semantics of adnominal distance-distributive elements focusing on the German distributive element *jeweils* in (1a), the German translation of English (1b):

(1) a. Die Jungen haben jeweils zwei Currywürste gegessen.  
    the boys have each two curry sausages eaten  
    b. The boys bought two curry sausages each.

German *jeweils* is much less restricted in its syntactic distribution than its English counterpart binominal *each* in (1b). First, *jeweils* also occurs adverbially, as in (2).

(2) Peter ist jeweils als erster gegangen.  
    ‘Each time, Peter was the first to leave.’

Second, *jeweils* has a much wider distribution even on its adnominal use as a distance-distributive element. For instance, it can occur in underlying subject position (3a), and it can distribute over pluralities that are not denoted by a DP, but e.g. by two conjoined verbs (3b):

(3) a. Jeweils zwei Offiziere haben die Ballerinnen nach Hause begleitet.  
    each two officers have the ballerinas to home accompanied  
    i. ‘Each time, two officers accompanied the ballerinas home.’  
    ii. ‘Each of the ballerinas was accompanied home by two officers.’  
    b. Peter hat Maria aus jeweils zwei Gründen gelobt und kritisiert.  
    Peter has Maria for each two reasons praised and criticised  
    ‘Peter has praised and criticised Maria for two reasons respectively.’

The objectives of the thesis were threefold:

(O1) To account for four puzzles posed by the syntactic and semantic behaviour of *jeweils* by providing a surface compositional analysis of *jeweils* on both its uses, but in particular on its adnominal use, where *jeweils* behaves as a distance-distributive element (DD).

(O2) To provide a unified cross-linguistic analysis of distance-distributivity for a sample of languages including West Germanic, Scandinavian, Romance, Slavic and East Asian languages.

(O3) To show that an integrated syntactic and semantic account of DDs fares better than a purely syntactic account.

The structure of the discussion was as follows: An initial step saw the introduction of the relevant data both from German and from other languages (including English, French, 

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**Chapter VI**

**Conclusion**

In this thesis, I have investigated the syntax and semantics of adnominal distance-distributive elements focusing on the German distributive element *jeweils* in (1a), the German translation of English (1b):

(1) a. Die Jungen haben jeweils zwei Currywürste gegessen.  
    the boys have each two curry sausages eaten  
    b. The boys bought two curry sausages each.

German *jeweils* is much less restricted in its syntactic distribution than its English counterpart binominal *each* in (1b). First, *jeweils* also occurs adverbially, as in (2).

(2) Peter ist jeweils als erster gegangen.  
    ‘Each time, Peter was the first to leave.’

Second, *jeweils* has a much wider distribution even on its adnominal use as a distance-distributive element. For instance, it can occur in underlying subject position (3a), and it can distribute over pluralities that are not denoted by a DP, but e.g. by two conjoined verbs (3b):

(3) a. Jeweils zwei Offiziere haben die Ballerinnen nach Hause begleitet.  
    each two officers have the ballerinas to home accompanied  
    i. ‘Each time, two officers accompanied the ballerinas home.’  
    ii. ‘Each of the ballerinas was accompanied home by two officers.’  
    b. Peter hat Maria aus jeweils zwei Gründen gelobt und kritisiert.  
    Peter has Maria for each two reasons praised and criticised  
    ‘Peter has praised and criticised Maria for two reasons respectively.’

The objectives of the thesis were threefold:

(O1) To account for four puzzles posed by the syntactic and semantic behaviour of *jeweils* by providing a surface compositional analysis of *jeweils* on both its uses, but in particular on its adnominal use, where *jeweils* behaves as a distance-distributive element (DD).

(O2) To provide a unified cross-linguistic analysis of distance-distributivity for a sample of languages including West Germanic, Scandinavian, Romance, Slavic and East Asian languages.

(O3) To show that an integrated syntactic and semantic account of DDs fares better than a purely syntactic account.

The structure of the discussion was as follows: An initial step saw the introduction of the relevant data both from German and from other languages (including English, French, 

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Italian, Norwegian, Icelandic, Russian, Czech, Bulgarian, Korean, and Japanese). Based on these data, the first hypotheses were formulated. Then, I presented the syntactic analysis of distance-distributive constructions, first for adnominal *jeweils*, then for DDs in other languages. In a next step, I showed that distance-distributive constructions are interpretable compositionally from surface structure. Finally, the syntactic and semantic analysis was put to use in solving the empirical problem of an unexpected adverbial reading with adnominal *jeweils*.

The main results of the discussion can be summarised as follows:

(R1) There is no distance-distributivity as an independent grammatical phenomenon:
Careful analysis reveals the syntactic and semantic systematcity behind an – at first sight – irregular property of natural languages.

It was shown that the distance-distributive effect observed with adnominal *jeweils* is the result of (i.) the internal structure of *jeweils*, namely the presence of an NP-proform *-weil-*, which is the syntactic complement of the universal quantifier *je*, and which restricts the latter semantically; and (ii.) the syntactic status of *jeweils* as part of a complex DP in an inverse linking structure. With these assumptions, a surface compositional analysis of (adnominal) *jeweils* is possible, thus obviating the need for LF-movement for interpretive reasons. Both adverbial and adnominal *jeweils* are analysable as generalised quantifiers. The difference in interpretation is due to their different structural position, making the ambiguity of *jeweils* a case of structural ambiguity.

(R2) Languages exhibit systematic patterns regarding the syntactic and semantic behaviour of distance-distributive elements:
Languages are predictable (at least what concerns distance-distributivity)

It was shown that languages fall into four classes regarding the behaviour of DDs, depending on two independent properties. The possibility or impossibility of overt DP-internal movement in a language determines the occurrence of the DD in pre- or postnominal position. The ability or inability of a DD to distribute over the denotations of non-DPs, and to occur with underlying subjects depends on its syntactic feature content, namely on whether the DD contains D-features or not. With the exception of Japanese, the following correlation between the feature content of a DD and its morphological shape was observed: If the DD in a language is identical to the determiner-quantifier of that language, it contains D-features and is restricted to syntactic configurations in which these D-features can be checked. If the DD differs from the determiner-quantifier, it has no D-features and its syntactic distribution is not restricted by the need to check D-features. With these generalisations, a large part of the syntactic distribution and possible interpretation of a DD in a given language is predictable on the base of its morphological shape. This result may therefore serve as a suitable starting point for future investigations of distance-distributivity in languages other than the ones considered in this thesis.

(R3) Structural factors are important for the interpretation of distance-distributive elements (in particular for the adverbial interpretation of adnominal *jeweils*), but the semantic requirement of interpretability also has an influence on their syntactic distribution.
It was shown that structural factors are responsible for the ambiguity of adnominal and adverbiale jeweils. In addition, they are also responsible for whether or not an adverbiale interpretation is possible for an adnominal element. On the other hand, the requirement of semantic interpretability also has an (indirect) effect on the syntactic distribution of DDs. DDs are excluded from certain syntactic positions simply because they are not interpretable in this position. In addition, the semantic component was shown to have a more direct influence on the syntactic component in the case of backwards distribution with DDs in subject position. It was shown that in this case, LF-movement is necessary in order to allow for an interpretation that would not be available otherwise.

Given the above considerations, the overall result of the discussion turns out to be that it is a fruitful, and often indispensible strategy to consider both structural and interpretive factors in the quest for an adequate account of a particular natural language phenomenon.


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Samenvatting

Het proefschrift gaat over de relatie tussen de structuur (syntaxis) en de betekenis (semantiek) van zinnen in natuurlijke talen. In het bijzonder probeert het proefschrift een antwoord te geven op een van de centrale vragen van de hedendaagse taalwetenschap: Hoe bepaalt de syntactische structuur van een zin zijn interpretatie? Of, anders gezegd, wat zijn de eisen die de interpretatie aan de structuur van een zin stelt?

Het proefschrift behandelt een aantal vragen betreffende de zg. "interface" tussen de syntaxis en de semantiek: vragen naar strikte compositionaliteit, naar structurele ambiguïteit en naar de mogelijkheid van adverbiale interpretaties van adnominale elementen.

Daartoe wordt een gedetailleerde analyse gegeven van zg. adnominale, op-afstand-distribuerende elementen (kortweg: ‘ADs’) die in hoofdstuk III worden geïntroduceerd. In het bijzonder wordt het Duitse op-afstand-distribuerende element jeweils (‘elk’) vergeleken met op-afstand-distribuerende elementen in andere talen. Zin (1a) vormt een voorbeeld van op-afstand-distributie van jeweils; (1b) is de Nederlandse pendant:

(1)  a. Die Jungen haben jeweils zwei Currywürste gegessen.
     b. De jongens hebben elk twee curryworstjes gegeten.

De constructies in (1) lijken problematisch voor het principe van compositionaliteit omdat hun semantische structuur niet in overeenstemming is met hun syntactische structuur. Semantisch gezien werkt het distribuerende element als een universele kwantor die over een groep van jongens kwantificeert. Enerzijds is er semantisch gezien een heel hechte relatie tussen jeweils/elk en het onderwerp van de zin, hoewel de twee geen syntactische constituent lijken te vormen. Anderzijds kan worden aangetoond dat jeweils/elk een constituent vormt met het lijdend voorwerp. Zo kunnen de twee elementen samen via topicalisatie aan het begin van de zin worden geplaatst, zoals geïllustreerd in (2):

(2)  a. [Jeweils zwei Currywürste], haben die Jungen t1 gegessen.
     b. [Elk twee curryworstjes], hebben de jongens t1 gegeten.

Het probleem is dus dat de semantische structuur (3a) van zin (1) anders is dan de syntactische structuur (3b):

(3)  a. ∀z [boy’(z)]: ∃X [2curryworstje’(X) ∧ gegeten’(z, X)]

Met andere woorden, het lijkt erop dat de betekenis van zo’n zin niet op basis van de syntactische structuur bepaald kan worden – in tegenstelling tot wat we zouden verwachten op grond van het principe van compositionaliteit, dat stelt dat de betekenis van een complexe syntactische structuur bepaald kan worden op basis van de betekenis
van zijn samenstellende onderdelen en van de manier waarop die syntactisch gecombineerd zijn.

Behalve het probleem voor het principe van compositionaleiteit zijn er nog een aantal andere eigenschappen die op-afstands-distribuerende elementen tot een belangrijk onderwerp maken voor een studie over de relatie tussen syntaxis en semantiek. Ten eerste verschillen ADs in de diverse talen in hun syntactische distributie. In het Duits kan jeweils ook in subjectpositie van transitieve zinnen voorkomen (cf.4a), en het kan over een conjunctie van twee werkwoorden (cf. 4b) distribueren. Het Nederlandse elk en het Engelse each kunnen dat niet.

(4)  a. Jeweils zwei Offiziere haben die Ballerinenbegleitet.
    *Elke ballerina is door twee officieren begeleid.
    ‘Elke ballerina is door twee officieren begeleid.’
    b. Peter hat Maria aus jeweils zwei Gründen gelobt und kritisier.
    *Peter heeft Marie om elk twee redenen geprezen en bekritiseerd.
    ‘Peter heeft Maria om twee redenen bekritiseerd en om twee andere redenen geprezen.’

Een andere eigenschap die jeweils niet met het Engelse each en het Nederlands elk deelt is dat het als bijwoord (in de betekenis van ‘elke keer’) voor kan komen, zoals te zien in (5):

(5) Peter hat jeweils gewonnen.
    *Peter heeft elk gewonnen

Bovendien kan het adnominale jeweils ook een adverbiale interpretatie krijgen als het bij het onderwerp hoort, iets wat uitgesloten is in het Engels en Nederlands:

(6) Jeweils ein Apfel war faul.
    *Elk een appel was bedorven
    ‘Steeds/ elk keer was er een appel bedorven.’

Dit roept een aantal vragen op: Hoe kunnen ADs op een compositionele manier worden geïnterpreteerd? Wat is de reden voor het verschil in de syntactische distributie van ADs in verschillende talen? En hoe kan een element in adnominale positie een adverbiale interpretatie krijgen?

In hoofdstuk III presenteer ik de syntactische oplossing voor het probleem van compositionaleiteit. Deze is gebaseerd op de aannemer dat de syntactische structuur van nominale constituenten waarin jeweils (of elk, of each) verschijnt ingewikkelder is dan op het eerste gezicht lijkt. Ik laat zien dat de syntactische structuur van dit soort constituenten op die van zg. “inverse linking” constructies (cf. May 1985) moet lijken, omdat de twee constructies dezelfde eigenschappen hebben. Een voorbeeld voor zo’n “inverse linking” constructie (met structuur) is gegeven in (7):

(7) [D^0_{np [np Een appel] [pp in elk mandje]]} is bedorven.

In (7) bestaat het onderwerp uit een NP die door een postnominale PP wordt gemonomificeerd. De kwantor en zijn restrictie (waarover hij kwantificeert) staan in een
syntactische zuster-relatie en de structuur kan in overeenstemming met het principe van compositionaliteit worden geïnterpreteerd.

Naar analogie daarvan stel ik de volgende structuur voor een constituent met het AD *jeweils* voor in (8):

\[(8) \quad [D^0_{NP} \quad [NP \quad zwei \quad Currywürste] \quad [PP \quad P^0_{je-weil-s}] ]\]

Ook hier staan de kwantor *je* en zijn restrictie *-weil-* in een syntactische zuster-relatie, in overeenstemming met het principe van compositionaliteit. Er zijn twee grote verschillen tussen (7) en (8). Ten eerste is de restrictie in (7) een echte lexicale NP (*mandje*), maar een NP-proform (*-weil-*) in (8). Ten tweede is het voorzetsel in (7) zichtbaar, maar in (8) niet. Toch is er reden om aan te nemen dat er in (8) een covert (= niet zichtbaar) voorzetsel aanwezig is en dat is de opmerkelijke markering van *jeweils* met genitief-casus. In het Duits zijn er veel constructies die zowel met een genitief-casus als met een overt voorzetsel voor kunnen komen (in een beperkte mate geldt dit ook in het Nederlands):

\[(9) \quad \begin{align*} &a. \quad abend-s \quad \text{Avond-GEN} \\ &b. \quad am \quad Abend \quad \text{on-the \ evening} \end{align*}\]

Daarom wordt hier aangenomen dat de genitief op *jeweils* de aanwezigheid van een niet zichtbaar voorzetsel aantoont. De NP-proform *-weil-* is semantisch gezien een variabele (net zoals andere pronomina) en krijgt zijn semantische waarde door co-indexering in het meervoud in dezelfde zin. In (1a) is dat het onderwerp *die Jungen* ‘de jongens’. In hoofdstuk III wordt ook beargumenteerd dat *jeweils* om ‘discourse’ redenen vanuit zijn postnominale basispositie naar een prenominale positie aan het begin van de zin wordt verplaatst. De uiteindelijke syntactische structuur van (1a) is dan zoals in (10):

\[(10) \quad \text{Die Jungen, haben} \quad [DP \quad [je-weil-s]_{1} \quad D^0_{NP} \quad [NP \quad zwei \quad Würstchen]_{1} ] \quad \text{gegessen.}\]

Deze syntactische analyse van ADs laat zien dat ADs geen apart syntactisch verschijnsel vormen. Het zijn gewoon kwantoren die met hun restrictie in een syntactische zusterrelatie staan. Zo zijn er ook geen problemen voor het principe van compositionaliteit.

De verschillen in de syntactische distributie van ADs in de diverse talen worden teruggevoerd op morfо-syntactische factoren. Er wordt aangetoond dat er twee soorten ADs zijn, ADs die formeel identiek zijn aan de ‘gewone’ distributieve kwantoren en dan ook D-kenmerken bevatten, en ADs die geen D-kenmerken hebben en dan ook niet identiek aan een gewone kwantor zijn. Het Engelse *each* en het Nederlandse *elk* horen (net zoals de ADs in het Noors, IJslands, Frans, Italiaans, Russisch) bij de eerste groep. Het Duitse *jeweils* hoort met zijn Koreaanse, Czechische, en Bulgaarse tegenhangers bij de tweede groep.

De D-kenmerken van de ADs van de eerste groep moeten “gecheckt” worden met die van hun NP-proform. Omdat de NP-proform geen eigen D-kenmerken heeft moeten deze door co-indexering met een meervoudige DP in dezelfde zin worden verkregen. Als dat niet gebeurt, kunnen de D-features van het AD niet worden gecheckt en is de structuur niet grammaticaal. Daaruit volgt dat in groep I – talen het AD vanwege zijn D-kenmerken alleen maar met een meervoudige DP kan worden geco-indexeerd. In groep II- talen heeft het AD geen D-kenmerken die gecheckt moeten worden en dus is co-indexering mogelijk
tussen het AD en willekeurig welke meervoudige constituent. Dit verklaart de feiten in (4b), waar jeweils over een conjunctie van twee werkwoorden (die een pluraliteit van gebeurtenissen uitdrukt) distribueert.

De aannemer dat de transfer van D-kenmerken van een DP naar de NP-proform alleen maar onder c-command kan plaatsvinden verklaart ook de feiten in (4a). Er is geen c-commanderende DP in de Nederlandse zin en de D-kenmerken van elk kunnen dus niet worden gecheckt. Het Duitse jeweils heeft geen D-kenmerken, er is dus geen cheking door een c-commanderende DP nodig en (4a) is een grammaticale zin.

De semantische analyse van ADs in hoofdstuk IV ondersteunt de conclusie dat die geen apart, niet compositioneel te interpreteren verschijnsel vormen. Allereerst wordt aangetoond dat adverbiale gevallen van jeweils (cf.5) als adverbiale kwantoren over gebeurtenissen kunnen worden geïnterpreterd. Jeweils fungeert als een soort dubbel-kwantor die een universele en een existentiële kwantificatie introduceert. In een tweede stap wordt aangetoond dat adnominale gevallen van jeweils op dezelfde manier kunnen worden geïnterpreterd. Op die manier wordt het adverbiale en adnominale voorkomen van jeweils verklaard als een typisch geval van structurele ambiguïteit. De semantische waarde van jeweils is zoals in (11) aangegeven:

(11) $[\text{jeweils}] = \lambda P. \forall z [z \in Z_i \rightarrow \exists X [P(X) \land R_j(x)(z)]]$

Het grootste probleem in verband met de interpretatie van het AD in (10) is hoe de DP die het AD bevat, met zijn syntactische zuster (het werkwoord) en later met het onderwerp, kan worden gecombineerd. In hoofdstuk IV wordt beargumenteerd dat dit door een herhaalde toepassing van een regel van $\lambda$-abstractie gebeurt, gevolgd door ‘functional application’ (FA). $\lambda$-abstractie kan toegepast worden als een constituent die een vrije variabele met een index bevat met een syntactische zuster met dezelfde index wordt gecombineerd (cf. ook Heim & Kratzer 1998). In het geval van jeweils leidt co-indexering van de variabele $R_j$ met het werkwoord tot $\lambda$-abstractie over $R_j$. Later leidt co-indexering van de variabele $Z_i$ en het onderwerp tot $\lambda$-abstractie over $Z_i$. Na ‘functional application’ komt de semantische waarde van het werkwoord in plaats van $R_j$ te staan, en de semantische waarde van het onderwerp komt in plaats van $Z_i$ te staan. Als resultaat van deze semantische procedures krijgt (1a) de juiste semantische representatie (3a).

Behalve door indexering kan $\lambda$-abstractie ook nog op een tweede manier tot stand worden gebracht. $\lambda$-abstractie kan toegepast worden als het semantische type van een vrije variabele in een constituent en het type van diens syntactische zuster gelijk zijn. Met deze twee regels van $\lambda$-abstractie kunnen alle syntactische voorkomens van jeweils (en ADs in andere talen) op een juiste en compositionele manier worden geïnterpreteerd.

In het laatste gedeelte van het proefschrift wordt in hoofdstuk V beargumenteerd dat deze semantische analyse van ADs ook de mogelijkheid van adverbiale interpretaties met adnominale gevallen van jeweils (en met ADs in groep II- talen) kan verklaren. De enige extra aannemer is dat $\lambda$-abstractie soms in elk van twee syntactische ‘zusters’ moet plaats vinden, voordat de twee semantisch worden gecombineerd. Dit proces wordt aangeduid met de term ‘kruisgewijze $\lambda$-abstractie’. De toepassing van kruisgewijze $\lambda$-abstractie is daarbij onderworpen aan twee structurele voorwaarden, zonder welke er geen interpretatie tot stand kan komen. 1) Jeweils moet aan de linker peripherie van zijn DP terecht komen, en 2) de DP als geheel moet zich buiten de VP bevinden. Op die manier wordt een direkt
verband gelegd tussen eisen van de semantiek en eisen van de syntactische structuur. Adverbiale interpretaties zijn alleen in bepaalde syntactische configuraties mogelijk. Dit laatste vormt nog eens een bevestiging van de rol van compositionaliteit in de relatie tussen syntaxis en semantiek.