Structural change in the post-socialist transformation of Central European agriculture: Studies from the Czech and Slovak Republics

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Chapter 10

Risk and De-Collectivisation

10.1 Introduction

The contribution of this chapter to the explanation of dual production structures in Central and Eastern European agriculture is to suggest a more pervasive reason for the limited emergence of individual farming. It is based on the differences between individual and traditional farms with regard to the ownership-management-implementation division of labour, the relation between profit and income, the range of economic activities, and the interaction between household and farm business. The impact of these features on farm expansion in the presence of uncertainty is analysed theoretically and assessed with use of the survey data.

10.2 The Argument

The idea underlying this account rests on four observations. First, the limited importance of individual farming is not so much due to the number of farms as to their size. In the case of the Czech Republic, in 1998 there were, according to the 'Register of Economic Subjects', 92,845 agricultural businesses with the legal form of 'physical person' (podniky fyzickych osob), i.e. individual farmers, in the terminology used in this book. But the number of individual farmers also registered (this time in the 'Agricultural Register') as producing food (i.e. for the market) was only 32,365 (MACR, 1999: TA2.1/03; TA2.1/04). These farms are probably roughly overlapping with the type presented in the sample as 'professional individual farmers'. Of these 32,365 farmers there is area information for 22,971: over half (12,208) worked less than ten hectares and only 6 % (1,425) used over a hundred hectares. Between them they worked 24 % of agricultural land, with an average area of 26 hectares (MACR, 1999: TA 2.1/05).

The bulk of the remaining land was occupied by 3,464 traditional farms (2,208 farm companies and 1,256 co-operative farms). Of the 2,251 traditional farms for which area information is given, all worked over a hundred hectares, except for a minority of 232 farms, or about 10 %. The average area was 677 hectares for farm companies and 1,411 hectares for co-operative farms (MACR, 1999:TA2.1/03; TA2.1/04).
The same pattern can be observed in most other Central and Eastern European countries (see Sarris et al., 1999:309 for figures). Individual farms have been established in abundance, but most remain of marginal size relative to traditional farms. Explaining why individual farms stay small and traditional farms stay large is explaining present agricultural sector structures in Central and Eastern Europe.

A second observation is that Central and Eastern European agricultural markets have been characterised by risk in the sense of variability of farm gate output prices\(^1\). An illustration is presented in table 10.1, where price developments during the transformation in the Czech Republic and the European Union are compared. Especially in the years up to 1995, price fluctuations were large.

**Table 10.1: Food Price Indices in the European Union-12 and the Czech(o-Slovak) Republic**

<table>
<thead>
<tr>
<th>year</th>
<th>EU-12 crops</th>
<th>EU-12 livestock</th>
<th>Czech Republic crops</th>
<th>Czech Republic livestock</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1991</td>
<td>107</td>
<td>99</td>
<td>58</td>
<td>48</td>
</tr>
<tr>
<td>1992</td>
<td>98</td>
<td>102</td>
<td>109</td>
<td>104</td>
</tr>
<tr>
<td>1993</td>
<td>99</td>
<td>102</td>
<td>112</td>
<td>97</td>
</tr>
<tr>
<td>1994</td>
<td>100</td>
<td>100</td>
<td>119</td>
<td>126</td>
</tr>
<tr>
<td>1995</td>
<td>109</td>
<td>98</td>
<td>142</td>
<td>162</td>
</tr>
<tr>
<td>1996</td>
<td>109</td>
<td>99</td>
<td>159</td>
<td>168</td>
</tr>
<tr>
<td>1997</td>
<td>106</td>
<td>102</td>
<td>154</td>
<td>167</td>
</tr>
<tr>
<td>1998</td>
<td>110</td>
<td>98</td>
<td>160</td>
<td>177</td>
</tr>
</tbody>
</table>

Note: Indices are based on real aggregate farm gate prices.

Third, as was noted in chapter 2, the defining difference between the alternative farm modes considered is governance structure. In addition, there are type-related differences in several other farm features such as revenue composition and consumption behaviour. In connection to that, the fourth observation underlying the present account is that economic theory suggests a link between, on the one hand, such farm features and, on the other, risk perception of farm agents. Moreover, theory also poses a relation between (perceived) risk levels and the level of output – or farm size.

Combining these observations, the explanation for persistent dual farming structures proposed in this chapter is that, given price risk, farm features affect the risk perception of decision makers directly and output levels of their farms indirectly. This may cause traditional governance structures to dominate individual-farm structures in terms of use of factors of production and in terms of output.
Before proceeding to a detailed exposition of such an explanation, it is useful to note that its basic assumption is a link between price fluctuations and utility of the farm operator. This may not always be a valid assumption. Price variability need not affect utility if wealth is sufficiently high to provide a buffer, if futures markets are used to hedge price risk, or if forward contracting is possible (e.g. Newbery and Stiglitz, 1981:99). However, farms in Central and Eastern European agriculture generally operate under none of these conditions. In the case of the Czech Republic, both official figures and the survey information show that losses have typically depleted what financial resources farms possessed at the beginning of the transition period. Also, apart from a few instances, hedging or forward contracting as risk-management tools have not yet started to develop in agribusiness (see e.g. MACR, 1999; Csaki et al., 1999:39). Assuming sensitivity of farm operators to the risk implied in price fluctuations does indeed appear to be valid in the conditions of Central European agriculture.

10.3 Analysis

The implications of individual and traditional farming under risk are best studied by a formalisation of the production and income characteristics of the alternative farm types. Given a utility function \( U(K,L) \) of the farm owner, a variable indirect utility function which is the dual of \( U \) can be defined as \( V(p,y) \), where \( p \) denotes a stochastic output price, \( y \) is income, \( K \) denotes the quantity of capital and \( L \) other factors of production used (an aggregate of land and labour). Abstracting from saving, utility depends on income and there is risk aversion so that \( V_y > 0, V_{yy} < 0^2 \). Consider the case of an individual farm owner-operator. Expected total income depends directly on profit and can be defined as

\[
E(y) = E(pF) - c(L,K) + B
\]

\[
F = F(L,K)
\]

\[
c = p^L K + p^L L
\]

where \( E \) is the expectation operator, \( B \) denotes non-stochastic, non-agricultural income, and \( c \) and \( F \) are the cost and production function, their values depending on prices and quantities of inputs\(^3\).

10.3.1. Investment under Uncertainty

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As Sandmo (1971) has shown, investment under price uncertainty is smaller than under price certainty. Importantly for the present argument, a central variable in the proof of that result is the sensitivity of the utility from income to price risk \( \text{COV}(V_y, p) \). In the proof, we compare a farm producing under uncertainty with an income function as in (1) to a farm producing under certainty with \( E(y) = y \). Sandmo’s thesis can be shown by equating the first-order conditions with regard to capital investment of both, assuming certain input prices and yields. Denoting the uncertainty case by a superscript asterisk, this gives:

\[
\begin{align*}
E(V_y y_K) &= V_y y_K = 0 \\
E(V_y y_K) &= E(V_y(pF_K - p^K)^*) + \text{COV}(V_y(pF_K - p^K)) = V_y(pF_K - p^K) = 0 \\
\text{COV}(V_y, p) < 0 &\iff (pF_K - p^K)^* > (pF_K - p^K) = 0 
\end{align*}
\]

In words, under uncertainty and risk aversion marginal revenues exceed marginal costs, which must imply that investment and output levels are lower than in the certainty alternative. Importantly, the difference is proportional to the marginal productivity of capital \( F_K \), to output prices \( p \), and inversely proportional to input prices \( p^K \). Assuming the other factors constant and terming the absolute value of \( \text{COV}(V_y, p) \) the ‘sensitivity of the utility of income to price risk’, a more convenient phrasing of the central point is that under-investment due to price uncertainty is proportional to the sensitivity of utility from investor income to price risk.

A conventional focus in the production-under-uncertainty literature is on risk aversion of the decision maker, which is most often assumed an innate personal characteristic. Here the stress is on the sensitivity of utility from income to price risk, which is controlled both by risk aversion and by the extent to which price fluctuations translate into income fluctuations. The main analytical aim of this chapter is to show how this extent, in turn, depends on farm governance structures. The important implication is that lower risk sensitivity of decision makers may originate in farm structures and result in less under-investment due to uncertainty, i.e. in larger farm size. The basic model above can be used and adapted to show that there is a set of mechanisms that causes risk to have a larger impact on individual farm strategy than is the case in traditional farms.

10.3.2. Management
The first of those mechanisms is driven by the fact that traditional farms are corporate farms, i.e. that that there is a functional separation between labour, management, and ownership. The theories of structural change that were used to build the farm reform programmes in the region, and which were outlined in chapter 3, have one fundamental assumption which are embodied in the above equations. It is that farm structure controls farm efficiency, which in turn affects
owners' utility (through income and consumption). Vice versa, farm strategy is supposed to be
controlled by owners' utility maximisation. Given that incentive structure, owners can be expected
to change farm structure so as to maximise income.

While both assumptions are applicable to individual farms, they have limited relevance in
the reality of corporate farming. Typically, owners of a part of the corporate farm have
dele gated most of the formulation of farm strategy to the farm management, who face a different
incentive structure from the individual farm owner.

Farm management income (denoted I) is not equal to farm profit \( y \), but usually for the
larger part is a fixed wage (w). However, it may be partly variable as a share of farm profit. The
simplest management income function that incorporates the above features is

\[
I = w + (1-t)y \quad (2)
\]

subject to:

\[
y = 1
\]

\[
0 < t, I, w < 1
\]

where \( (1-t) \) is the share of farm profit (which is normalised to 1) that constitutes the variable part
of manager income. Under uncertainty, the optimisation problem for the owner or manager is to
set input levels such that expected utility, \( EV(p,y) \), is maximised. Abstracting from saving, farm
profit maximisation is implied by manager or owner utility maximisation. The first-order necessary
condition for an optimum with respect to investment in \( K \) the farm owner and the farm manager
are \( E(V_y y_K) = 0 \) and \( E(V_1 I_K) = 0 \), respectively. Assuming that \( V_y = V_i \), i.e. that a wealth
difference between the traditional farm manager and individual farm operator owner does not
affect the utility of income, the above implies

Proposition 1: Employment of farm managers with a (partly) fixed wage results in lower
investment in risk exposed production than in the certainty alternative, but higher than would be
the case on owner-operated farms.

Proof:

\[
E(V, y_K) = E(V_1 I_K) = 0
\]

\[
E(V, (p_F K - p^K)) = E(V_1 I (1-t)(p_F K - p^K)) = E(V_1 I p_F K - p^K) - t E(V_1 I p_F K - p^K)
\]

\[
F_K E((V, p - p)) = F_K E((V_1 p - p)) + t E(V_1 I p_F K - p^K)
\]

\[
COV(V, p) = COV(V_1 p) - (t / F_K) E(V_1 I p_F K - p^K)
\]

Note that \( COV(V, p), COV(V_1 p) < 0 \) and \( p_F K > p^K \) and \( t > 0 \)

\[\Rightarrow COV(V, p) < COV(V_1 p) \quad \square \]
Since, as we have seen, under-investment is proportional to \(-\text{COV}(V,p)\), traditional farms under-invest less than individual farms, the difference being proportional to the fixed share of manager salaries \(t\) and inversely proportional to the marginal productivity of capital \(F_k\). In short, price (or production) risk constitutes an incentive to produce below the certainty equilibrium output level, but for traditional farm managers that incentive is weaker than it is for individual farm operators. Hence traditional-farm over-investment (as compared to the individual owner-operated farm) will occur\(^5\). *Ceteris paribus*\(^6\), the lower sensitivity of decision makers' incomes to price risk in traditional farms as compared to individual farms is shown to be one possible reason for the fact that traditional farming is *large-scale* farming, relative to professional\(^7\) individual farms. Below we will review several other features that also affect the relation between decision makers' incomes and agricultural output price fluctuations which influence investment decisions.

### 10.3.3. Multiple or Single Ownership

Not only is the corporate governance structure characterised by the employment of management, also the farm is owned by many owners rather than one single owner. The farm feature of interest here is the number of owners relative to farm size. The individual farm is characterised as a small single-owner farm, the traditional farm as a large multiple-owner farm. Compare a single-owner farm of type \(s\) producing output \(F\) to a multi-owner farm of type \(m\) producing output \(kF\). Expected farm income is \(E(y)\) as in (1) for owners of farm type \(s\), but the \(n\) owners of type \(m\) have an income defined by

\[
E_{ym} = (k/n)y^F_m + B_m
\]

s.t.

\[
k,n > 1
\]

Selecting output levels such that profit is optimised means \(E(V,y_F) = 0\) for both types\(^8\). It follows that

*Proposition 2: Multiple ownership causes traditional farm owners' sensitivity to risk compared to that of professional individual farm operators to decrease, and hence investment to increase, with decreasing ratio of farm output level \((k)\) to farm fragmentation \((n)\).*

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Proof:

\[
E(V_y y_F)_h = E(V_y y_F)_m = 0 \\
E(V_y p)_h = E(V_y (k/n)p)_m \\
E(V_y (p - \bar{p})_h = (k/n)E(V_y (p - \bar{p})_m \\
(k/n) < (> 1 \iff COV(V_y p)_h < (> COV(V_y p)_m \quad \square
\]

Typically, \( k/n < 1 \) if Czech traditional farms are compared to professional individual farms. An illustration of the \( k/n \) ratio based on the survey findings is provided in table 10.2.

**Table 10.2: Governance Structures and Output Levels, Individual and Traditional Farms**

<table>
<thead>
<tr>
<th></th>
<th>traditional farms (n=64)</th>
<th>individual farms (n=184)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1998 output level (mln Crowns): 330.00</td>
<td>1998 output level (mln Crowns): 1.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of which:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>professional (n=119): 1.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other (n=45): 1.22</td>
</tr>
<tr>
<td>managers:</td>
<td>5</td>
<td>manager/worker/owner: 1</td>
</tr>
<tr>
<td>workers:</td>
<td>95</td>
<td>workers:</td>
</tr>
<tr>
<td></td>
<td>of which</td>
<td>full-time permanent 0.2</td>
</tr>
<tr>
<td>members:</td>
<td>80</td>
<td>full-time temporary 0.1</td>
</tr>
<tr>
<td>other:</td>
<td>15</td>
<td>part-time permanent 0.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>part-time temporary 0.1</td>
</tr>
<tr>
<td>outside members/owners: 245</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Source: survey findings

The figures show that, on average, per-member revenue levels differ by a factor 223 (330/1.48) from those of professional single owners, while there are on average 325 co-owners in traditional farms (the sum of all members and owners). Thus \( k/n < 1 \) holds on average; of 64 traditional farms, only 4 have average revenues per member exceeding the professional individual-farm average level of revenues. Multiple ownership constitutes a tendency toward smaller sensitivity to price risk in traditional farms;

Three qualifications to this finding must be made. First, we have here considered all formal members as effective members, i.e. as individuals with some influence on farm decision making. In fact, only a minority is actually involved in the process. An attempt to account for this fact and calculate average revenue levels for this more relevant group of members was made, as follows.

Assuming that (1) members weigh the costs of exerting influence (e.g. costs of collecting information, of travel, of deliberation, etc.) to its benefits (farm strategy in owners’ interest), (2) that costs are largely fixed, and (3) that benefits are proportional to the size of the ownership
state, only those members with relatively large stakes in the farm should be considered. A proxy for ownership stakes that could be used was the size of land owned by members. This was reported in the survey in three categories: less than 5, 5-10 and over 10 hectares. It was assumed that only the last category contained influential members (this was 8% of all members on average). Members’ claim to revenues in this group was then assumed to be proportional to the share of farm land they owned (as distinct from the assumption of overall equal claims employed above).

Assuming minimal land ownership in the other two categories (.5 and 5 hectares on average), claims to revenues of the influential members proportional to their share in land were calculated. This procedure resulted in much higher revenue levels per members in this group than the overall average used above (a nine fold increase on average). Still, even under these strict assumptions only a quarter (11 out 43 valid observations\(^9\)) had average revenues per member exceeding the professional individual-farm average level of revenues. In short, the conclusion stands also in this further approximation of reality.

Another qualification is that even these ‘genuine’ members may not be as eager to pursue a particular farm strategy, such as risk reduction. In the analysis it was assumed that for each agent, only his or her claim to revenue level controls his or her willingness to exert efforts in (co-)deciding on farm strategy, particularly risk reduction. In fact, various conditions other than ownership stakes weaken this incentive for traditional farm members compared to single farm owners. First, their efforts in decision making do often not result in realisation of their desired strategy options, since they have to share leverage with other members and, notably, with management. In contrast, single owners solely control farm strategy, and face an ‘effort/reward balance’ that constitutes a larger incentive to take the trouble of influencing strategy.

Third, the notion of choice between engaging in farm decision making and abstaining from it is applicable to multiple farm owners, but not as easily to single farm owner/operators. Being an individual farmer implies decision making; to abstain from it is to quit farming, with all that it implies for income security, housing, and lifestyle. So the costs of not influencing farm strategy are much larger for single-owner farm operators.

The flip side of the coin is that their costs of influencing are much lower. Partly this is because some costs do not exist for individual farmers (e.g. deliberation), partly also because various cost categories that the multiple-farm member weighs are not relevant for individual farmers, because they were already made anyway, i.e. are sunk costs (e.g. costs for travel between home and farm and for collecting information). So, while pursuing risk reduction in farm strategy formulation may imply considerable and new costs for traditional-farm members,
for individual farmers it rather means bringing a new focus to a decision process they were already involved in. While the above analysis emphasised the lower pay-off in farm revenues to decision making for traditional farm members, they actually also face higher costs of decision making. Both these costs and the discouraging impact of having to share influence are less amenable to quantification - but not therefore less real.

A final qualification is that this analysis neglects non-agricultural income (B in equation 1), which is typically large for traditional farm owners and small for professional individual farm operators. The effect (for farm risk exposure and investments) of this lump sum transfer itself is plausibly large, and will be analysed below. Its existence implies that the present argument is applicable to a part rather than all of owners’ incomes, which in turn means that its significance for farm risk exposure is relatively small.

10.3.4. Lump-sum Transfers
There are four types of lump sum transfers to those who decide over agricultural production levels (owners or managers) in traditional farms. These include subsidies; credit (both annually and as ‘bad’ debts); revenues from non-agricultural production (which, if non-stochastic, can be treated as lump-sum transfers); and non-agricultural wage income or allowances for owners. All of these are more important in traditional than in individual farms, and especially in professional individual farms.

Such lump-sum transfers decrease sensitivity to agricultural price risk, possibly in two ways. First and most obviously, in the notation introduced in (1), the cash or liquidity inflow from non-agricultural production (if non-stochastic), credit and subsidy all increase B and y. Since a larger share of y is now constituted by stable revenues (B), fluctuations in agricultural prices (p) and revenues (pF) result in smaller fluctuations in income (y) than if B would be smaller or absent; hence COV(V,y,p) decreases in B. Second, if utility from income E(Vy), and hence risk aversion both decrease in income (Vy < 0), increasing that income by adding or increasing its lump-sum part (B) decreases income sensitivity to risk in general, including agricultural price risk10. This leads to

Proposition 3: Stable revenues from non-agricultural production, better access to credit and subsidies, and owners’ non-farm income are all lump-sum transfers that decrease sensitivity to risk and hence increase output level in traditional farms (t) relative to individual farms (i).
Proof:
\[ E(V, y)^i = E(V, y^i) - 0 \]
\[ \wedge E(y^i) > E(y^i) \quad \Leftrightarrow \quad E(V, y^i) > E(V, y^i) \quad \Box \]
\[ \wedge \text{var}(y^i) > \text{var}(y^i) \quad \Leftrightarrow \quad \text{COV}(V, p^i) < \text{COV}(V, p^i) \quad \Box \]

10.2.5. On-Farm Consumption

The above arguments all focused on exposure to price risk. As such, they were applicable to traditional and to professional individual farmers who actually market most of their produce, but not directly to the multitude of very small farms that are worked part-time or in addition to a non-farm income or allowance. The behaviour of such producers differs in many aspects from that of market-oriented farmers (De Janvry et al., 1991).

In 1998, there were 92,845 Czech agricultural productive enterprises that had the legal form of natural persons (podniky fyzických osob, zemědělská pravoryba) – i.e. were individual farms. Of these, only 22,971 were also registered as commercial enterprises (podniky podle výměry ohospodařování). The rest of individual farms is probably roughly overlapping with the category of ‘other’ individual farmers in this chapter. Of the ‘commercial’ farmers, over half worked less than 10 hectares. It is likely that on these small farms a significant share of farm output is consumed by the producer, used as gifts, or bartered. In the ‘other’ individual farms, this share is likely very large, often close to one. In contrast to larger individual and to traditional farms, the fact that household consumption (or non-monetised exchange) and farm production are interwoven becomes relatively important for production decisions in this, the overwhelming majority of individual farms. Food is now both an input and an output.

As Roe and Graham-Tomasi (1986), Finkelshtain and Chalfant (1991) and Barrett (1996) have shown for family agriculture, home-consumption has the effect of income risk reduction. It does so by affecting both income and outlays choices of the farm family. Producing households face both a make/buy and a consume/sell decision with regard to food. On the outlay side of household decisions, the choice is between buying or producing a particular food item in the consumption basket. If prices of that item fluctuate, this constitutes a decrease of risk-corrected income. Production rather than purchase of that item (or a substitute) then replaces the risky component of real family income with a new food price constituted by the more stable opportunity costs of land, labour and capital assets used in the production process.

With regard to the sales decisions of the farm household, the choice is between selling and consuming produce. If the off-farm price varies, consumption rather than marketing also reduces income risk. It replaces an uncertain sale price with relatively stable opportunity costs of
production. In terms of the notation introduced in (1), consumption is equivalent to replacing part of money income from production with a stable, lump-sum in-kind transfer to it, valued at stable input costs. The difference with lump-sum transfers analysed above is that it is now endogenous, i.e. depending on output level.

Risk reduction through own consumption of produce obviously occurs more often on individual than on traditional farms, for several reasons. First, the option to choose between buying and producing presumes one decision unit (the family) weighing both options. This is so in individual, but not in traditional farms. Therefore deciding on a change in the wage system from monetary to in-kind is costly in traditional as compared to individual farms.

Second, on wage-labour farms there are considerable transaction costs of allocating produce to workers. So both deciding on and implementing a change in payment system are costly there while modest in single-family farms. Third, the risk reduction effect is also less important for traditional farms since a considerable share of output must be consumed in order to effect appreciable risk reduction. Per-person consumption is limited physically, and given large output volumes (in relation to the number of potential consumers in the farm) there may simply not be enough consumers to effect a risk reduction that justifies the costs.

The relevance of these observations to the present topic is that the practice of own consumption, typical for non-professional individual rather than traditional farms, discourages farm expansion. Increasing farm size reduces the effect of risk reduction from home consumption. Small, individual farmers may therefore be caught in a ‘size trap’: they face an increase in income risk when they expand, which must be subtracted from the possible gains. Through this mechanism, the presence of risk may imply a disincentive to expand for the smaller individual farms. In addition, if they monetise the bulk of their output transactions they become subject not just to price risk, but also to the larger sensitivity to it compared to traditional farms, as explained in the preceding sections. Increasing farm size thus may imply a decrease in both income and competitiveness.

Finally, very small individual farms are often worked in addition to a wage or allowance income. Thus there is a relatively stable, non-agricultural lump-sum transfer to farming, with the effect of decreasing sensitivity to agricultural price risk, as shown above. Also this risk management advantage would decrease upon farm expansion, since total labour time is fixed on the owner-operated farm.

We analyse here only the effect of own consumption (we have already seen that lump-sum transfers decrease sensitivity to risk in proposition 3). Compare a professional to an ‘other’, i.e. small/hobby individual farm, denoting them by superscripts a and b, respectively. Farms of
type b market a share $\alpha$ of their output $F$ and consume the rest. Consumed output is valued at certain price $p_v$, and equals a stable lump-sum transfer of quantity $B = p_v(1-\alpha)F$ to uncertain money income $E(y)^b$. If $\alpha$ is positive, some own consumption is preferred over marketing all of the output. Expected marginal utility from selling - equal to $E(p)$ - is then apparently smaller than marginal utility from consumption (which is $p_v$). Thus, income for type a is defined as in (1), while income for type b is defined by

$$E(y)^b = \alpha E(pF) - c(L,K) + p_v(1-\alpha)F$$

where

$$0 < \alpha < 1$$

$$E(p) < p_v$$

The implication of the above is

**Proposition 4:** Consumption of own production and larger non-farm income shares in small individual farms decrease the sensitivity of income to risk and discourage farm expansion of smaller compared to larger individual farms.

Proof:

$$E(V, y^a) = E(V, y^b) = 0$$

$$E(V, p^a) = E(V, (\alpha p + p_v(1-\alpha))^b = \alpha E(V, p)^b + p_v(1-\alpha)E(V, y)^b$$

$$E(V, p^b) = \alpha + (p_v(1-\alpha)E(V, y)^b / E(V, p)^b) = \alpha + (1-\alpha) (p_v / E(p))$$

$$p_v / E(p) > 1 \iff E(V, p - \bar{p})^a > E(V, p - \bar{p})^b$$

$$\text{COV}(V, p^a) > \text{COV}(V, p^b)$$

**10.2.6. Does Diversification Matter?**

We will finally consider one possible objection to the relevance of the above arguments. These all aim to show that operators of traditional farms are less sensitive to price risk, and therefore less prone to reduce output levels in response to it. Alternatively, it could be argued that traditional farms indeed are less risk exposed because of their larger diversification. In that case, a smaller output-reducing response to risk would result from the farm output mix reducing actual risk exposure, not governance structures affection risk perception.

This objection seems relevant in the setting of farming in the transformation. As outlined in chapter 3, traditional farms indeed have a higher level of diversification, both within the area
of agricultural production and with respect to activities outside the agricultural domain. Both features are inherited from the socialist era and, although reduced, continue to characterise traditional farms.

However, diversification within agriculture was not important for risk reduction during transformation, for two reasons. First, in 1998 the actual variety in output mix was perhaps not much larger in traditional than in individual farms. Table 10.3 shows the average numbers of heads of cattle and hectares of crops for individual and traditional farms in the survey sample.

Table 10.3: Product Mix by Farm Types: Physical Numbers

<table>
<thead>
<tr>
<th>Products, in average number of animals or hectares</th>
<th>farm type (n)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>co-operative (n=39)</td>
<td>corporate (n=28)</td>
<td>professional individual (n=120)</td>
<td>other individual (n=62)</td>
</tr>
<tr>
<td>dairy cows</td>
<td>419</td>
<td>327</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>calves and beef cattle</td>
<td>680</td>
<td>559</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>pigs</td>
<td>2094</td>
<td>1112</td>
<td>247</td>
<td>40</td>
</tr>
<tr>
<td>poultry</td>
<td>9833</td>
<td>4261</td>
<td>1204</td>
<td>78</td>
</tr>
<tr>
<td>sheep</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>cereals</td>
<td>1111</td>
<td>911</td>
<td>112</td>
<td>20</td>
</tr>
<tr>
<td>potatoes, sugarbeet</td>
<td>73</td>
<td>70</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>fruit</td>
<td>10</td>
<td>25</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>fodder crops</td>
<td>330</td>
<td>295</td>
<td>28</td>
<td>18</td>
</tr>
</tbody>
</table>

Source: survey findings

The figures suggest that both traditional and individual farms produce a variety of products. In order to analyse the differences over farm types, diversification was measured by construction of a diversification index D. By definition, this should increase in the number of products and decrease in the share in revenues of a particular product. D can then be defined as

\[
D = 1 - \sum_{i=1}^{n} \left(\frac{r_i}{r}\right)^2
\]

s.t.

\[0 < r_i, r < 1\]

where \(r_i\) is the share of revenues from product or product group \(i\) in total revenues \(r\) from \(n\) products or product groups. If \(D = 0\), there is no diversification (i.e. one product only), while \(D\) gets closer to 1 as more products are added or as the shares of products become more equal. Obviously, the value of \(D\) depends on the method of disaggregating production. If \(D\) is calculated including separately each of the 10 main products in Czech agriculture (\(n=10\)), its value is .74 for professional and .78 for other individual farms in the sample, but .84 for
Chapter 10

traditional farms, with negligible differences between corporate and co-operative farms. If crops and livestock are aggregated (n=2), individual farms score .45 while traditional farms score .50, now with small differences within both groups of farm modes. So, while traditional farms are indeed more diversified, the difference is not large.

The second and most important reason why diversification was not very relevant is that, for diversification to effect risk reduction, there must be negative covariances between prices or price series of product or product groups. Unfortunately, prices of the 10 main agricultural products moved largely synchronously during transformation (see table 10.4 in the next section). None of the bivariate Pearson correlation coefficients relating to all possible pairs of the 1989-1998 time series is negative and significant. On the contrary, they are mostly close to one – except the time series for the potato prices, which is also positively correlated to all other series, but closer to zero.

It may be noted, as an aside, that the larger diversification in traditional farms might have sustained large farm size in another way. The cost of diversification, though, is foregoing the possible economies of scale since factors of production have to be divided over many production processes. This drawback can be addressed by increasing total farm size, so that one or various commodities can still be produced at what is perceived as their optimal size. Thus diversification pays off (if at all) only at larger farmer sizes, and constitutes a tendency for traditional farms to stay large.

Whilst the effect of within-agriculture diversification on risk exposure of traditional relative to individual farms is thus limited in the period considered, this is not true for the other type of diversification, i.e. in activities outside the agricultural domain. These can be composed of relatively stable (i.e. non-stochastic) or of fluctuating revenues. In the first case, it is equivalent to a lump-sum transfer (of non-agriculturaling profit) to the agricultural activities of that farm, which decreases sensitivity to agricultural risk (proposition 4).

If revenues from other activities do fluctuate over time, they typically have the effect that agricultural risk is partly diversified away, given the non-synchronous price movements of food and other products. This decreases the covariance of total (agricultural and other) income and agricultural prices. Thus, at constant levels of risk from agricultural production, total income risk decreases, and so does the sensitivity to agricultural risk COV(V,p). In sum, what diversification differences existed tended to decrease not actual risk from agricultural production, but rather income risk for traditional-farm decision makers – a distinction that also characterised the preceding arguments.
10.2.7 Conclusion of the Analysis

Tying the threads of the analyses in this section together, a concise recapitulation of the results would read as follows. Given price risk, Sandmo’s (1971) result suggests that all farms under-produce compared to the certainty alternative. However, traditional farm managers or owners are expected to do so less than individual farm operators. There are two general reasons. First, given equal market price variations in agricultural produce for both types, fluctuations of traditional farm revenues are smaller, and, second, those smaller fluctuations are not fully translated in the incomes of decision makers in traditional farms.

First, fluctuations of traditional farm revenues are smaller than those in individual farms because (1) they have better product diversification through non-agricultural activities, the stochastic part of which likely balances agricultural risk, and (2) they receive stable lump sum transfers of various kinds (credit, subsidies, and the relatively stable component of non-agricultural revenues). Second, manager incomes do not fully reflect what fluctuations there are, because they are largely wages rather than profit. Owner incomes also do not vary proportionally with farm revenue fluctuations, as individual farm incomes (equal to profit) do. This is so because (1) traditional farm owners have large non-farm incomes while professional individual farm operators do not, and (2) income per owner is smaller in traditional farms than in individual farms due to their large number relative to revenue levels.

In consequence, irrespective of the system of sharing decision-making power between managers and owners of traditional farms, decision makers there are plausibly less sensitive to risk than in farms operated by single owners. It might be suggested that this was so because there is actually less risk connected to agricultural production due to agricultural diversification in traditional farms, but this explanation is not tenable. Price movements of agricultural products during transition, which were similar, would not have facilitated risk reduction through diversification.

Finally, on very small individual farms – the majority – arguments about price risk exposure have limited relevance because a non-negligible share of produce is consumed by the owner and relatives friends. This has the effect of partly insuring these individual farmers against food price fluctuations. Due to this, as well because of their larger non-farm income shares, such small individual farmers would suffer a large increase in exposure to risk in the case of farm expansion to a commercial size, which might be one reason why so many have remained small.

We have thus considered an explanation for both the fact that very few of the smaller individual farms expand to commercial sizes, and for the fact that those who did so continue to be smaller than traditional farms. The striking implication of this analysis is that both large,
multi-owner, manager-operated farms, and very small subsistence-type farms can diminish price risk for their owners’ incomes, while commercial family farms cannot. In this respect, transitional agricultural may be said to have a three-tier rather than the commonly posed dual structure.

10.4. An Assessment

10.4.1. Testing the Theory

In the introduction to this chapter, the question of the limited emergence of individual farms was reformulated in terms of their limited size; and it has been linked to the presence of price risk. Both the existence of risk and the gap in farm sizes between the alternative types are readily observable. That could be the end of it. One problematic observation (there is a farm size gap between the two types) has been explained in terms of several other observations (there is price risk; the two types differ in various farm features). The above theoretical framework connects the two observations logically through a series of proposed mechanisms. The conditions for those mechanisms to operate were empirically verified, and a rival explanation shown to be irrelevant in this setting.

Alas, not all that is logical and possible actually happens. The account would therefore be further strengthened by observation of a testable empirical implication. Fortunately, while the mechanisms proposed above are varied, they all have one implication, namely with regard to the sensitivity to risk of farm operators. Traditional farms operators (be they managers or owners) are assumed to be less sensitive to risk than are individual farm operators, while within the last group operators of professional farms are expected to have a larger sensitivity of income to risk than do ‘other’ individual farmers, if their output is valued at market prices.

The test is therefore: do traditional farm managers indeed exhibit a smaller reaction to changes in price risk than operators of professional individual farms, and will these in turn show a larger reaction than other individual farmers? Ideally, one would like to track that reaction – which is an adjustment of output mix— for a sample of farms over a number of years, regressing, for instance, price risk for a given crop on hectares planted to that crop (as in Chavas and Holt, 1990 and Chavas et al., 1983). This ‘best practice’ approach relies on a sufficiently long time series for meaningful results, and the short transformation period as well as the nature of the survey renders it unfeasible. Instead, in the present study it was considered that a lower
sensitivity to risk implies, *ceteris paribus*, a higher exposure to risk. Hence a measure for risk exposure that could be applied to the survey data was constructed.

### 10.4.2 Measuring Risk Exposure

Price risk is commonly defined as the difference between expected and realised output prices (e.g. as in Tronstad and McNeill, 1989:631). Expected prices were defined as the average over the preceding 3 years plus a trend (cf. Lin, 1977; Hurt and Garcia, 1982; Chavas and Holt, 1990). Deviations of actual from expected price developments were calculated for each of the 10 main products in Czech agriculture. The per-product squared deviations in per cent terms were calculated, in each farm observed in the survey, through a weighted summation. Since output price risk is studied, the weighting factor, for each of the 10 products, was the ratio of product revenues to total revenues. This share was calculated on the basis of production volumes as reported by the respondents. Thus the measure for price risk exposure $R_y$ for each farm was:

$$
R_y = \frac{i=1}{\Sigma_{y=1}^{i=10}} \Sigma(\text{rev}_{i,y} \cdot \text{risk}_{i,y})
$$

where

$$
\text{rev}_{i,y} = \frac{r_{i,y}}{\Sigma(r_{j,y})}
$$

$$
\text{risk}_{i,y} = \{\text{p}_{i,y} - \Sigma(\theta_n \cdot \text{p}_{i,y-n}) / \Sigma(\text{p}_{i,y-n})\} ^2 - \Sigma(\theta_m \cdot \text{p}_{i,y-m}) / \Sigma(\text{p}_{i,y-m})
$$

where

- $\text{rev}_{i,y}$ = share in revenues of product $i$ in year $y$
- $r_{i,j,y}$ = revenues of product $i,j$ in year $y$
- $\text{risk}_{i,y}$ = price risk from product $i$ in year $y$
- $\text{p}_{i,y}$ = real indexed price of product $i$ in year $y$
- $i = 1,2,..,10$
- $\theta_n, \theta_m > 0; \Sigma\theta_n, \Sigma\theta_m = 1$

In words, for a given year $y$ and a given product $i$, the per cent deviations of actual from expected prices are squared. Expected prices are defined as the average over the last three years plus the trend. This squared deviation is *product risk* $\text{risk}_{i,y}$. The 10 product risk measures are combined, for each farm, in a weighted summation on the basis of product shares in total revenue.
revenues, to yield price risk exposure $R_y$. Different combinations of values for the weights $\theta_n$ and $\theta_m$ - which determine how important previous prices and price trends are in current price expectations - were tried. The findings reported below did not qualitatively change in the various combinations. Therefore the unweighted average ($\theta_1 = \theta_2 = \theta_3 = .33$) was used.

It is helpful at this point to note that $R_y$ is designed so as to capture not just general market risk (which is $\text{risk}_{i,y}$) but output price risk as experienced in each single farm. Not only does it increase with increasing variability in output prices, but it also does so more for products which are more important for total revenues in that farm.

We have noted that risk exposure and risk sensitivity vary inversely, ceteris paribus. The most important of the ‘other’ factors is history, especially for traditional farms. The production structure in some year in the transformation, which controls the value of $R_y$, may be an inheritance from the socialist era rather than (or in addition to) a variable at the discretion of managers and owners during transition. Traditional managers’ risk sensitivity and the risk reduction they effected during transition might have been as large as (or larger than) individual farmers’, while this need not show in traditional-farm production structures, and thus risk exposure in the year $y$.

This possibility could be taken into account, since respondents reported their production structures both in 1992 (the first effective post-reform year) and at the moment of surveying in 1998. This allows for a static comparison in risk exposure between the two years of observation (although it cannot reflect the response to risk experienced in the intervening years).

The survey data allow for the calculation of risk exposure measures for each of the four types of farms in the survey. Two remarks on the farm subgroups are in order here. First, as in other chapters, ‘professional’ individual farmers were defined as those who derived more than 75 per cent of money income from farming and worked at least 40 hours weekly in their farm. This information was, however, available for 1998 only, and it is not valid to assume that 1998 professional farmers were already so in 1992. Consequently $R_{1992}$ is calculated without differentiation between professional and other individual farmers. This measure is therefore likely an over-estimation of individual farmers’ risk exposure, both because of the own consumption and the larger non-farm income of ‘other’ individual farmers.

Second, co-operative farms and farming companies were in 1992 very similar in all relevant aspects analysed above. But during the transformation, and especially after 1995, differences within the traditional-farming sector increased as profitable activities tended to become concentrated in the corporate rather than the co-operative farming mode. Often debts and activities with adverse prospects were left in the co-operative farm, while valuable assets and
profitable farm activities were transferred to a (newly established) corporate farm. The co-operatives, although formally surviving, effectively became ‘empty shells’ from a business point of view (see Csaki et al. (1999:31,36,28) and chapter 5 for more details).

For our present analysis the important implication is that it were increasingly the corporate rather than the co-operative farms that reflected the strategy preferences of traditional farm operators. If we want to trace decisions on farm strategy, including product selection, observing corporate farms will therefore be more informative. The decisions on changes in the product mix of co-operative farms were increasingly controlled by considerations other than the profit motive assumed in the analysis. Analysis of such farms is therefore both less appropriate in view of the theory and also less interesting, since they were not meant to be viable businesses by their managers to start with. Since the proportion of such ‘skeleton’ farms in the sample is naturally unknown, all co-operative farms will be included in the analysis, but their characteristics in 1998 can be expected to differ significantly from those of corporate farms. In particular, given the relation between profitability and risk, they can be expected to operate less risk exposed.

10.4.3 Calculations and Findings

In table 10.4 the development of prices of the 10 food products in the Czech Republic is shown, as well as the risk attached to production of each product, if quantified by the suggested formula.
### Table 10.4: Prices and Price Risk in Czechoslovak Agriculture, 1989-1998

<table>
<thead>
<tr>
<th>Product</th>
<th>indexed real farm gate product prices</th>
<th>risk_{1992}</th>
<th>risk_{1998}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>100</td>
<td>94</td>
<td>55</td>
</tr>
<tr>
<td>barley*</td>
<td>100</td>
<td>90</td>
<td>43</td>
</tr>
<tr>
<td>rape seed*</td>
<td>100</td>
<td>93</td>
<td>41</td>
</tr>
<tr>
<td>oats</td>
<td>100</td>
<td>90</td>
<td>38</td>
</tr>
<tr>
<td>rye</td>
<td>100</td>
<td>86</td>
<td>43</td>
</tr>
<tr>
<td>potatoes*</td>
<td>100</td>
<td>121</td>
<td>70</td>
</tr>
<tr>
<td>sugar beet</td>
<td>100</td>
<td>109</td>
<td>73</td>
</tr>
<tr>
<td>milk*</td>
<td>100</td>
<td>90</td>
<td>39</td>
</tr>
<tr>
<td>beef and veal</td>
<td>100</td>
<td>90</td>
<td>41</td>
</tr>
<tr>
<td>pork</td>
<td>100</td>
<td>90</td>
<td>50</td>
</tr>
</tbody>
</table>

Notes:
1. Original prices are farm gate prices in current Czech Crown per ton for all products.
3. Potato figures refer to consumption potatoes.
5. A complete series of milk prices was available for class II milk only in 1994-1998. Price developments of class I milk deviate only a few percents from class II.


It is shown that risk values differ considerably over products, in both years. Also the risk values were much lower in 1998 than in 1992, reflecting the greater price stability in 1998. With regard to the relevance of the arguments here presented, there are two observations. First, since these arguments relate to marginal adjustments in response to market prices, they are likely to have become more relevant during the transformation, since farm strategy became increasingly controlled by relative prices on established markets rather than by fundamental institutional change related to the creation of markets. At the same time, since the arguments rely on the presence of price risk, increasing price stability during transformation implies a more modest role for these arguments in explaining farm size.

Turning from the relevance to the truth of this account, table 10.5 shows the values of risk exposure measures in 1992 and 1998 for both governance types and for their subgroups, if applicable.
The findings can be summarised as follows. First, table 10.5 shows that both the 1992 and the 1998 risk exposure scores of traditional farms were, on average, higher than those of individual farms, the difference being statistically significant in both cases ($\alpha < 1\%$). Thus the two main implications of the theoretical arguments are corroborated: traditional farms are both larger and operate more risk exposed than individual farms.

Second, the difference had increased in 1998 compared to 1992 in relative terms, from about a 3:4 to a 2:3 ratio. This means that, although larger risk exposure in traditional farms may still have been inherited from the socialist era, it was not reduced relative to individual farm exposure levels by their managers or owners during transformation. This is in line with their assumed smaller sensitivity to price risk. It appears justifiable to attribute the persistent difference to decision makers' preferences rather than only to history.

Third, within the groups of the two farm types, professional individual farms produced less risk exposed in 1998 than other individual farms; and co-operative farms produced less risk exposed in 1998 than corporate farms. Although both observations are in line with expectations, the differences are too small to be statistically significant. This, in turn, implies that the overestimation of risk exposure in 1992 due to the inclusion of non-professional farmers in 1992 is probably not large.

Finally, product selection is likely controlled by location as well as governance type. Therefore risk exposure measures were also calculated after aggregation of farms by types and then by agricultural region (for definition of regions, see chapter 5). The results are given in table 10.6, which shows that in each of the three regions higher risk exposure of traditional farms is observable, in both 1992 and 1998. However, due to the smaller number of observations per region, none of the differences is statistically significant. If all farms in one region are aggregated, average risk exposure differs statistically significantly between region 3 and 4 in
1992 and between regions 2 and 3 in 1998, but not in other comparisons (both results are significant for $\alpha < 3\%$). Differences between regions are smaller, in relative terms, than those between farm types in 1998, but not in 1992. These figures indeed suggest the presence of regional effects, which however do not affect the main results.

<table>
<thead>
<tr>
<th>Table 10.6: Regional Differences in Risk Exposure by Farm Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>value risk exposure measure and # respondents (n) in...</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1992 region</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>farm type</td>
</tr>
<tr>
<td>professional individual</td>
</tr>
<tr>
<td>n</td>
</tr>
<tr>
<td>other individual</td>
</tr>
<tr>
<td>n</td>
</tr>
<tr>
<td>corporate</td>
</tr>
<tr>
<td>n</td>
</tr>
<tr>
<td>co-operative</td>
</tr>
<tr>
<td>n</td>
</tr>
<tr>
<td>all</td>
</tr>
<tr>
<td>n</td>
</tr>
</tbody>
</table>

Sources: Table 10.4 sources, survey findings and author's calculations

10.5 Discussion

10.5.1 Methodological Limitations

In this chapter an explanation for limited individual farming was offered that is theoretically tractable and consistent as well as empirically verifiable and, in fact, corroborated by the available data. The conclusion that risk may imply a larger incentive to under-produce for individual than for traditional farms stands, but should be qualified in several respects. Attention should again be drawn here to the fact that we have measured risk exposure not risk response; that the risk exposure measure is debatable; and that the assessment was done in a snapshot approach for 2 years only. All three features of the empirical work are imposed by the data, and constitute considerable methodological shortcomings compared to what has been done in studies on similar subjects in developed market economies (e.g. Chavas and Holt, 1990).

As to the theory, attention should be drawn not so much to shortcomings in what was presented as to possible extensions that could qualify the hypotheses. First, we have empirically lumped together several theoretically distinct mechanisms with one joint implication. It would be important to know which of these is the more relevant one. Although some indication of this has
been given, there is room for more detailed empirical work here. Second, risk perception is just one factor controlling output mix and levels. We have tried to account for regional factors and history, but also this could be more satisfactorily done in a regression approach. In addition, factors such as price level (rather than variability) and institutional factors affecting farm sizes (i.e. endogenous farm growth in the start-up phase; changes in support programs) would merit separate attention, both theoretically and empirically.

An overall assessment of this contribution is that it proposes an explanation not hitherto considered explicitly in the literature, which is theoretically defendable and is not rejected in this first, admittedly crude, empirical test. Since its conclusion should be accepted with caution, there is a case for further research of the issue, also because of the possible implications for the effectiveness of agricultural policies.

10.5.2 Risk Exposure and Survival

This account, while attempting to explain one phenomenon, also begs several new questions. In particular it would be strange that, while selection of production strategies that are systematically and excessively risk exposed is punished in developed, competitive markets, traditional farms (having an innate tendency to overexposure to price risk) are apparently not weeded out by competition in favour of the more prudent individual farmers. Several answers to this puzzle may present themselves to readers familiar with the Central and Eastern European setting (see on the following e.g. Swinnen et al, 1997; Csaki et al, 1999; Sarris et al, 1999; and sections 7.6.4. and 9.5. in this book).

In the transitional economies, bankruptcy is often legally complex and rather easy to postpone. The underdevelopment of the legal and, especially, judicial system delays the exit of weaker firms. A related observation is that payment discipline is often still weak. Firms frequently operate in a situation of interdependencies inherited from the former economic system, which shows in such diverse phenomena as ‘bad’ debts to banks or excessive regional specialisation in agribusiness. Also legal enforcement of contract obligations is problematic and time consuming. Moreover the allocation of subsidies and credit is not generally towards the most efficient recipient. Often it is based on relations in the economic system rather than on a set of consistent rules.

These circumstances hinder the development of normalised payment practices and financial transparency in farms. A crucial point is that they often advantage traditional farms, which are long integrated in the economic system, more so than individual farms. Development of level playing field competition in agricultural markets between the alternative governance
types is then impossible. In the context of the risk-based view on restructuring, such market imperfections may be seen as allowing traditional farm managers to preserve overexposure to risk in product selection, perhaps even without perceiving it. Differential access to credit and subsidies, more ‘bad’ loans and more lenient payment practices may compensate the financial loss of overly risk exposed production. The tendency of traditional farms to stay large and operate risk exposed may thus be perpetuated.

10.5.3 Generalising the Explanation
A question that naturally arises is the applicability of the present explanation to structural change in agriculture in other Central and Eastern European countries. This is limited, even though the account has been specified in a very general way, with little reference to particular, country-specific institutional settings. The main limitation on generalising it is its market-based approach. Decisions of farm operators and managers are assumed to be primarily driven by changes in the level and, especially, variability of output prices.

This specification of the setting presumes that other factors are less relevant – an assumption that would only be sensible in a stable market environment. Where it is not, these reaction to price fluctuations do exist, but are of minor importance compared to other factors. Price volatility is hardly a powerful explanation if, during a large part of the transformation period, there have been on-going institutional changes affecting farm structure and size (as in Romania and Bulgaria); or major shocks to the economy (as in Albania and former Yugoslavia). The present account would be most usefully applied to countries advanced in the post-socialist transformation, who already early on had completed agricultural reforms, and have not experienced major economic shocks since.

Of all countries where de-collectivisation was an issue, the Czech and Slovak Republics and Hungary would best fit that description. This is therefore best taken as an explanation for Central European agriculture. But to the extent that other countries strive to create stable market environments, this explanation suggest that structural change in agricultural sectors with traditional-type farms may stagnate even after all the conventional enabling conditions for individual farms have been created.

10.5.4 Changes in Individual Farm Structures
In order to better appreciate the partial nature of this explanation, compare the implication of this approach for the development of Czech (and Central European) agriculture. As was shown in chapter 6, most individual farms in the sample were established in 1990 (27), 1991 (66), 1992
Official data show the same pattern. Between 1989 and 1994 the number of people working in what is classified as ‘natural person businesses’ (podniky fyzických osob) – comprising of mainly individual farms and practically equal to the number of businesses- rose from 2,000 to 31,217, and the share in total agricultural land (TAL) increased from virtually nothing to 22 %. In the second stage of the agricultural transformation, the number of people rose slightly to 34,000 in 1995, then fell back to 33,000 in 1996 and stabilised at 32,000 and 32,500 in 1997 and 1998; the share in TAL increased only slightly from 22 to 23 % (MACR 1999: TA2.2/03).

So, while the main conclusion of this chapter is that an increase in risk discourages individual farming, the sample information as well as official sources show that there was a surge in the establishment of individual farms in 1991-1995 (which were high-risk years) and hardly start-ups afterwards (when risk had decreased considerably). At first sight, this could be interpreted as a contradiction. But that would be to ignore two issues.

First, there are a number of differences between decisions on starting a farm and those on expanding or contracting farm size, notably with regard to reversibility of the decision and to welfare (income and lifestyle) consequences of it. The latter type of decisions is likely controlled by more, and more complex, factors than the former. This analysis refers exclusively to the relation between risk and farm size for existing farms.

A second point is the one made above, that this is an explanation assuming established markets and attributing explanatory power to marginal changes in farm size in relation to marginal change in price variability. As such the explanation is better suited to account for the period after the institutional changes in the agricultural sector rather, i.e. the ‘second stage of the transformation’ starting in 1994-1995. In earlier years, such adaptation processes were plausibly of marginal importance relative to many other factors. These include the more extensive individual-farm credit and subsidies support programs, and the initial enthusiasm for individual farming, no doubt partly based on ignorance regarding requirements for and hardships of family farming. In this period traditional farms were also forced to implement de-collectivisation procedures which implied decreasing in size.

After 1994/1995, de-collectivisation in the above sense was over and there was a roughly stable number of individual and traditional farms. If we analyse developments in this period (rather than compare 1989-1994 to 1995-1995), the development of individual farming does not seem to contradict the present account.

The increase in the number of individual farms between 1995 and 1998 (from 21,156 to 22,971) was larger than the increase in their share in TAL (22 to 24 %), and indeed the average
size of individual farms in 1995-1998 decreased from 34 to 26 hectares (MACR, 1999:TA2.1/04). It was almost entirely due to an increase in the number of the very small, or ‘non-professional’ individual farms, as the following figures show. The number of farms working between 10 and 50 hectares increased marginally from 7,985 to 8,102. Those in the 51-100 hectares size class decreased in number from 1,345 to 1,236. The number of farms working over a hundred hectares rose slightly from 1,379 to 1,425. But the number of farms smaller than 10 hectares increased considerably, from 10, 447 to 12,208. These data are in line with the theoretical suggestion that price risk discourages farm expansion: it was the number rather than the size of farms that increased.

10.5.5 Policy Implications
The policy implications of the suggested explanation differ from some and support other prescriptions implied by the conventional structure-efficiency approach (posing that, in competitive markets, ultimately those farm structures will emerge that are most efficient). In particular, it would follow that market liberalisation (in the sense of a decrease of price regulation) is not always a means to promote efficiency in post-socialist dual (in fact: three-tier) agricultural sectors. Market liberalisation proper would also imply a truly level playing field, i.e. the removal of differences in access to credit and subsidies, of ‘bad’ loans, and of payment arrears; and moreover the creation of a legal environment in which contracts are externally enforceable without excessive costs. If such a package of policies is applied, systematic overexposure to risk will bring its own punishment and the present argument becomes irrelevant. It is here that the analysis supports the consensus that reforms must be comprehensive, not partial in order to be effective.

Implementation of such ‘deep’ reforms is unfortunately a complex and long-term job, and a mere decrease in price regulation is often seen as a desirable first step towards a more efficient allocation of resources. Yet in the absence of competition and effective institutions, mere price liberalisation may have perverse effects. Price liberalisation causes price risk to increase and introduces incentives for traditional farms to increase in size relative to individual farms. If traditional farms are less efficient than individual farms, this implies, on average, an incentive to decrease efficiency on a sectoral level.

An efficient allocation of resources over alternative governance structures through the market mechanism therefore not only requires the removal of market distortions (such as price regulation and differential access to credit and subsidies). It also demands either price stability or removal of the advantages of established farms in transacting and financing production which are
typically implicit in the institutional environment. Given the impracticability of attaining either goal fully in the short to medium term (still apart from the desirability of perfect price stability), restructuring policies should have the dual focus of risk mitigation and institution building.

10.6 Conclusion

In this chapter it was argued that one reason for the limited emergence of individual farming and the continued importance of traditional farming in Central and Eastern Europe may be the presence of price risk, in combination with differences between the alternative farm types. These include both differences in economic relations (access to credit and subsidies) and in internal farm features: governance type, consumption behaviour, and diversification. Given output price risk, these factors imply different incentives to the traditional farm manager and the individual farm operator and tend to facilitate a divergence in farm size. The theoretical conclusion is that individual farmers are likely to be more sensitive to risk and accordingly to under-produce to a larger extent than do traditional farm managers.

An empirical assessment showed that risk exposure is indeed smaller for individual compared to traditional farms, even while the latter are usually more diversified in production. The risk-based view on structural change was thus shown to be in line with the available data. Although there are important qualifications to this conclusion, the suggestion is that consideration of risk and of governance structures may be fruitful in understanding structural change in agriculture during the transformation.
We analyse the implication of output price risk rather than fluctuations of input prices or of yields/productivity, since output prices appear to constitute the largest risk factor. Yet the same type of argument could be made for other risk sources.

Subscripts denote derivatives, superscripts refer to goods (or notes, as here).

In keeping with accounting conventions, the farmer is here assumed to value his own labour in monetary terms. This assumption can be relaxed without consequences for the subsequent analyses.

For the sake of brevity, in the rest of this chapter I will use the terms ‘traditional-farm owners’, or ‘owners of a corporate farm’ to refer to the people who in fact own only a part of a traditional farm (i.e. members in co-operative farms and shareholders in farm companies).

Note that Central and Eastern European farms are frequently loss-making, so that marginal costs are larger than marginal revenues and income y is negative. In such cases (p - pF_k) is positive and COV(V,V_F), COV(V,y) still negative, while the same results obtain.

The ceteris paribus condition captures other variables that affect price risk exposure such as the degree of diversification and location. The validity of these will be considered below.

As in chapter 5, professional individual farmers are those who derived more than 75 per cent of money income from farming and worked at least 40 hours weekly in their farm. The restriction to only professional rather than all individual farms is sensible, since other individual farmers typically do not market a considerable part of their produce, and to that extent are not subject to price risk. The present, and following argument do not apply to such producers. Their position with regard to risk will be analysed below in section 10.2.5.

Since the cost function is here not relevant, we consider E(V,y_F) rather than E(V,y_F) which gives more algebra but the same result.

On the other traditional farms there was no complete information on land ownership patterns, or there were no large owners.

This second effect is relevant only to the extent that decision makers' incomes depend on farm (agricultural or other) revenues. As we have seen, this extent is limited for both managers and owners.

Another implication is production at sub-optimal profitability levels since the most profitable product can never be the only one.

Price changes in per cent rather than in index points were used in order to avoid sensitivity of the risk measure to the base year of indexing.

There was no series available for the number of individual farms businesses rather than people employed in it for the entire 1991-1998 period. In 1998 there were 32,500 people employed in 22,971 businesses, with the majority being single-family businesses.