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Divorce and inequality

Stratification in the risk and consequences of union dissolution

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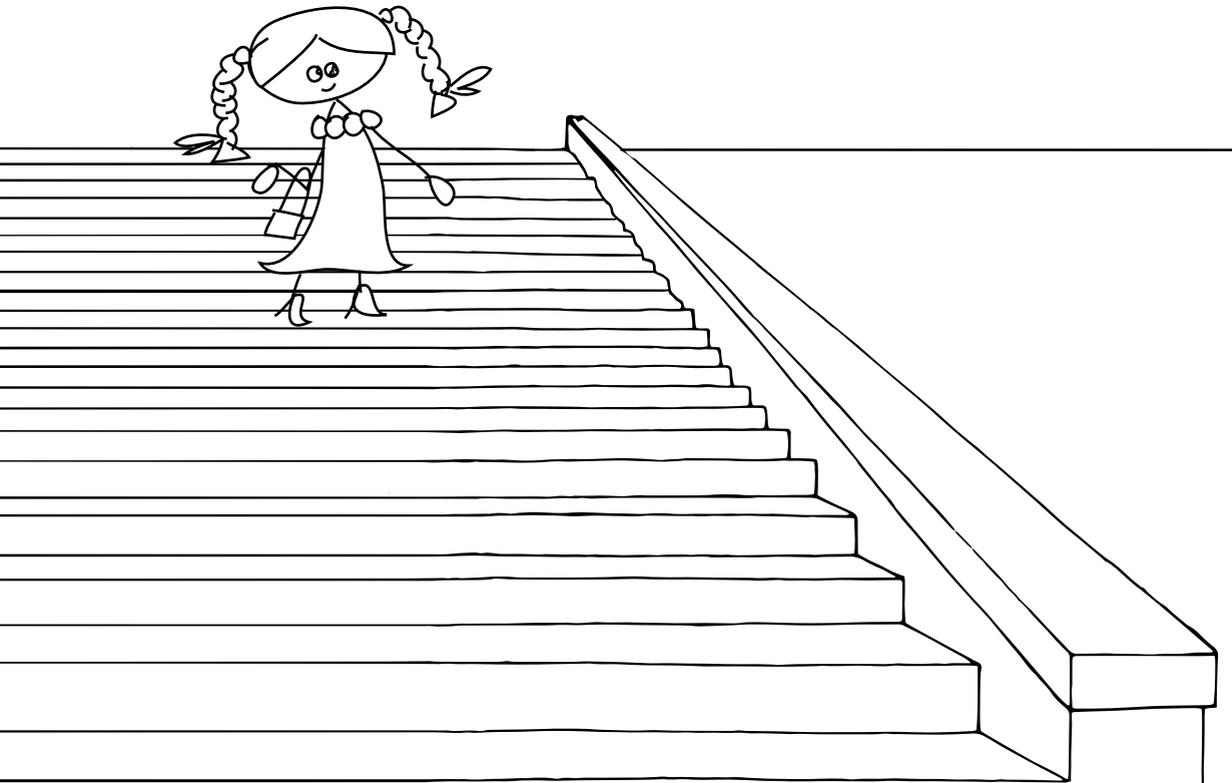### Citation for published version (APA):

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CHAPTER 4

Stratification in the consequences of union dissolution

Mechanisms driving convergence in women's living standards

ABSTRACT[3]

Union dissolution is a critical event for women's living standards. Previous work has found that women in high-income unions incur a larger dissolution penalty than women in low-income unions. This study proposes two mechanisms explain the "convergence" in living standards after dissolution. The compensation mechanism concerns the ability to compensate the loss of partner earnings with alternative sources of income. The relative independence mechanism concerns how much women stand to lose from dissolution in the first place. To test these mechanisms, we drew on a unique administrative dataset from the Netherlands, covering women who experienced dissolution within ten years after union formation (N = 57,763). A decomposition analysis showed that convergence was not driven by compensation: women from all income groups decreased their household size and re-partnered, women from low-income unions increased transfer income, and women from high-income unions increased personal earnings and decreased tax payments. Instead, convergence was driven by relative independence: women from lower-income unions depended relatively less on their partners because they relied more on transfer income prior to dissolution. These results demonstrate how partners' interdependence moderates the consequences of life events. The welfare state plays a crucial role in this process.

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[3] A slightly different version of this chapter has been revised and resubmitted to an international peer-reviewed journal as Hogendoorn, B. (2021). Why do socioeconomic differences in women's living standards converge after union dissolution?

4.1 INTRODUCTION

Romantic unions have become increasingly unstable during the past half a century, and more than a third of all unions today end in separation or divorce (Kalmijn and Leopold 2021; Perelli-Harris et al. 2017). Union dissolution has large financial consequences for women. Women lose 7% to 44% of their household income following union dissolution (Holden and Smock 1991; Andreß et al. 2006; De Vaus et al. 2017; Bonnet et al. 2021; Uunk 2004) and these losses often persist for several years (Leopold 2018). Especially compared to men, who experience little change, union dissolution is a critical event for women's standard of living.

Concerns about union dissolution have focused on women in low-income unions. Women in low-income unions appear more vulnerable to the consequences of dissolution than women in high-income unions, because they are less often dual earners, tend to assume a larger share of housework and childcare, and are more likely to become the sole custodial parent after dissolution (Cancian et al. 2014; Harkness 2013; Mansour and McKinnish 2014). Moreover, increases in public transfers after dissolution are limited (Bonnet et al. 2021; Tach and Eads 2015). Theory therefore predicts that socioeconomic differences in women's living standards are exacerbated following dissolution.

Surprisingly, however, a vast literature documents that women in higher-income unions experience larger losses upon union dissolution (Bonnet et al. 2021; Brewer and Nandi 2014; Duncan and Hoffman 1985; Fisher and Low 2016; Jarvis and Jenkins 1999; Rowe and Lown 1990; Uunk 2004; Weiss 1984; Weitzman 1981). Whereas women from high-income unions witness steep declines in their standard of living, women from low-income unions witness little change or even improve their situation somewhat. Socioeconomic differences in women's living standards thus seem to decrease following dissolution, a phenomenon we will refer to as "convergence".

These findings raise questions about the mechanism by which women's living standards converge. Previous studies have pointed to the compensation mechanism, whereby women compensate the loss of partner earnings by reemployment, repartnering, increased tax-benefit income, and favorable custody arrangements (Bonnet et al. 2021; Fisher and Low 2016; Jarvis and Jenkins 1999; Tach and Eads 2015). If women from low-income unions have a compensatory advantage over women from high-income unions, this might explain the convergence in living standards after dissolution. In this study, however, we argue that another mechanism could be at work. The relative independence mechanism applies when, prior to dissolution, women depend relatively little on their partner because partner earnings make up a small portion of the total household income (Lister 1994; Oppenheimer 1997). If women in low-income unions are relatively more independent than women in high-income unions, they stand to lose less upon leaving that union, which might explain the convergence in living

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standards after dissolution. Neither of these mechanisms have been formally explored to date, leaving the question of convergence unanswered.

Hence, this study examines the convergence in women's living standards following union dissolution. We draw on longitudinal register data from the Netherlands to follow women in coresidential unions that started between 2003 and 2005 for ten years. Matching separating women (N = 57,763) to partnered women, we estimate the dissolution penalty by predissolution income group. We then decompose the dissolution penalty into changes in household composition, ex-partner earnings, personal earnings, new partner earnings, transfer income, and tax payments, and show how these changes give rise to compensation and relative independence.

The results contribute to the field in several ways. First, they give greater insight into socioeconomic differentials in the dissolution penalty. Previous research has shown that the dissolution penalty differs by income group but has paid little attention to the income sources underlying these differences. Using population-register data, we provide a precise comparison between income groups and their sources of income. Furthermore, the results demonstrate the dual role of social policy, which affects both the ways in which women compensate the loss of partner earnings and the extent to which women financially depend on their partner. The Netherlands poses an interesting context here because its policies are relatively generous to low-income households (Wang and Van Vliet 2016). Finally, this study presents the compensation and relative independence mechanism for the event of union dissolution. These mechanisms easily extend to other events, aiding wider debates on demography and social stratification.

4.2 THEORETICAL EXPECTATIONS

The notion that union dissolution results in convergence can be traced to the work of Biblarz and Raftery (1993). Their study of occupational mobility showed that family dissolution increased the resemblance between sons of different occupational backgrounds, because sons of high-status fathers became more likely than sons of low-status fathers to experience downward mobility if they grew up in a non-intact family. Similar forms of convergence have been found for children's education and earnings following parental union dissolution (Bernardi and Boertien 2016; Bratberg et al. 2014).

Although previous work has been concerned more with child than with adult outcomes, it draws attention to two mechanisms relevant for adults. The first mechanism regards compensation (cf. Bernardi 2014). Compensation may be achieved by reducing household size, expanding earnings from labor, adding new earners to the household, increasing transfer income, or lowering tax payments. This mechanism has been central in the literature and, consequently, much work has focused on child custody arrangements, reemployment,

repartnering, and changes in tax-benefit income. The second mechanism is what we name "relative independence". Relative independence entails a situation in which women stand to lose relatively little from union dissolution. This may be achieved when women earn similarly to (or out-earn) their partner or when they supplement the total household earnings with public transfers. This mechanism has been less central in the literature, but brings into focus partners' interdependence and the role of the welfare state therein.

The direction and strength of these mechanisms drive the degree to which women's living standards converge following union dissolution. Arguments on compensation paint a mixed picture. On the one hand, women from lower-income unions are closer to the income thresholds for receiving welfare, so they are better positioned for replacing income losses with welfare transfers (Bonnet et al. 2021). On the other hand, women from higher-income unions tend to be more highly educated, more active in the labor force, and better able to increase their working hours (Jansen et al. 2009; Tamborini et al. 2015), so it may be easier for them to increase their earnings. Women in higher-income unions also pay taxes in higher tax brackets, so they benefit from the move to a lower tax bracket when splitting from their partner (Avram et al. 2014). Changes in household composition probably benefit women across all income groups. While women in lower-income unions have larger families before dissolution (Balbo et al. 2013) and therefore more scope to reduce the number of household members they share their income with, they are less likely to share child custody with their ex-partner (Cancian et al. 2014), so that actual reductions in household size may differ little. Repartnering probably also benefits women across income groups, since both the probability and the consequences of repartnering appear unrelated to predissolution household income (Fisher and Low 2016; Shafer and James 2013). Together, these arguments suggest that the compensation mechanism operates in countervailing directions, making it an unlikely candidate for explaining the convergence in living standards following union dissolution.

Instead, relative independence may be the dominant mechanism to explain the convergence in women's living standards. The main argument is that lower-income unions rely less on earnings, since they supplement earnings with more public transfers and tax allowances. This applies especially where the tax-benefit system is strongly redistributive, as in Northern and Northwestern Europe (Avram et al. 2014). An additional argument might be that women in low-income unions earn more similarly to their male partners than women in high-income unions. This has been found for the United States (Qian 2017; Winslow-Bowe 2006), though it is unclear whether this pattern holds true in Europe, where generous public transfers and expensive childcare encourage women in the lower socioeconomic strata to specialize in unpaid work (Evertsson et al. 2009). Because of the greater contribution of public transfers (and possibly women's earnings) in lower-income unions, earnings of the male partner make up a smaller portion of the total household income. These arguments suggest

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that women in lower-income unions are relatively more independent, which could explain why living standards converge following union dissolution.

All in all, this leads to the following expectations (Table 4.1). Women from higher-income unions have a compensatory advantage regarding personal earnings and tax payments, neither an advantage nor disadvantage regarding household composition and new partner earnings, and a compensatory disadvantage regarding transfer income. Furthermore, women from higher-income unions are relatively more dependent on initial partner earnings, and this outweighs all other effects.

4.3 THE DUTCH CONTEXT

We examine the consequences of union dissolution using the Netherlands as a case study. Approximately three quarters of the Dutch working-age population coreside with a partner (Statistics Netherlands 2021b). Of these, 13% live in non-contractual cohabitation, 13% in contractual cohabitation, 4% in a registered partnership, and 70% in marriage (Poortman and Mills 2012; Statistics Netherlands 2021b). In the first year of coresidence, only 18% are registered partners or married spouses. Fiscal differences between union types are minimal (Christl et al. 2021). Legal differences between cohabitation, on the one hand, and registered partnership and marriage, on the other, concern mainly pensions and inheritance. Registered partnership and marriage are nearly equal (Perelli-Harris and Gassen 2012).

The net divorce rate in the Netherlands is 45 divorces per 100 marriages, similar to that in Norway (44) and the United Kingdom (47) and around the European average (Eurostat 2021). The dissolution of unmarried cohabitation is also around the European average (Kaplan and Stier 2017). Dissolution is more common for unions that were formed at a young age, with partners who immigrated, in which the woman out-earns the man, without children, and with a lower household income. For example, a standard deviation decrease in household income increases the odds of dissolution by almost a third (Kalmijn et al. 2007).

Table 4.1 Theoretical expectations of changes in income components

Mechanism	Income component	Direction
Compensation	personal earnings	+
Compensation	tax payments	+
Compensation	household composition	o
Compensation	new partner earnings	o
Compensation	transfer income	–
Relative independence	ex-partner earnings	– –

Notes: + more favorable to women from higher-income unions, o no socioeconomic gradient, – more favorable to women from lower-income unions.

The financial consequences of dissolution in the Netherlands have been studied by Manting and Bouman (2006). They found that men are on average unaffected, whereas women witness drops in living standards of 17% in the first year after dissolution and continue to be disadvantaged in the five years after. These drops are slightly lower than the European average (Uunk 2004). If children are involved, legal custody is by default exercised jointly, though in practice 71% of children reside with their mother, 25% are in shared residence, and 5% reside with their father (Poortman and Van Gaalen 2017). Shared residence is more common among ex-partners with higher incomes (Bakker and Mulder 2013).

Incomes in the Netherlands are heavily influenced by the welfare state. Public transfers contribute 80% of gross household income in the bottom quintile, 60% in the second quintile, 35% in the third quintile, 15% in the fourth quintile, and 10% in the top quintile, and progressive taxation result in further redistribution (Statistics Netherlands 2012). Transfers take place primarily at the couple level. For instance, social assistance, healthcare benefits, housing benefits, child assistance, and childcare subsidies are means-tested at the couple level, and child benefits are a universal transfer at the child level. Transfers from unemployment, sickness, and disability insurances are granted at the individual level, but their use is limited, their duration is maximized at two years, and they are included in couple means-tests. Taxation is individual but includes allowances at the couple level. There is no distinction by marital status, as fiscal unity is imposed on nearly all couples.[4]

Private transfers play a minor role in the Netherlands. Partner alimony and child support contribute less than 1% to gross household income (Statistics Netherlands 2012). Of these, partner alimony is the largest component and incorporated in the tax records, whereas child support is a small component and not observed. Indeed, Dutch child support hardly improves the living standards of separated women (Hogendoorn et al. 2020). Monetary transfers from older parents to their working-age children are infrequent (Dimova and Wolff 2011). Coresidence with extended family or friends, and the associated access to income, is rare compared to other countries and episodes are typically short lived (Das et al. 2017).

4.4 METHOD

4.4.1 Data

We used longitudinal data from the Dutch administrative registers. These data covered all residents in the Netherlands and combined information from the population register,

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[4] There are three types of fiscal unity in the Netherlands. Non-partners are taxed individually, cannot share tax allowances, and only their own means are tested when requesting benefits; benefit partners are taxed individually and cannot share tax allowances, yet are jointly means-tested; fiscal partners are taxed individually, but may share tax allowances and are jointly means-tested. Contractual cohabitants, registered partners, and married spouses are automatically fiscal partners. Non-contractual cohabitants are under most conditions automatically fiscal partners and, even those who are not, automatically qualified as benefit partners between 2005 and 2013 if they cohabited for more than six months. Hence, in our data, nearly all couples are subject to joint means tests.

education registers, social insurance bank, and tax records. We followed coresidential unions formed between 2003 and 2005 for ten years, the period during which household incomes were available without a break in definition.

The study population was selected from the union file. This unique file identified coresidential unions by joint residential moves, marriage, registered partnership, contractual cohabitation, parent-child relationships, joint home ownership, joint participation in a pension fund, or the request of couple-level benefits. This resulted in high coverage, where the only unions that were not covered were those that had never moved, did not register their relationship, did not have children, did not own a home, and did not engage in any joint income provisions.[5]

We selected all heterosexual unions formed by women between age 21 and 55 (N = 338,664).[6] The lower bound represents the age until which individuals can legally claim maintenance from their parents, the upper bound the age from which early retirement schemes are available. We restricted the sample to women outside of full-time education, because student incomes are little indicative of economic standing (N = 293,641). We only included women whose unions survived at least two full years, because the analysis required at least two observations before dissolution (N = 271,215). From these, we selected women who experienced union dissolution within ten years since union formation (N = 61,961). These women were followed from union formation, through union dissolution, until the end of the ten-year observation period or until censoring (by emigration, death, widowhood, or reaching age 55). The dissolution year itself was excluded, because some women accidentally listed their ex-partner on the tax returns of that calendar year. This resulted in a population of 590,766 person-years nested in 60,989 persons. After list-wise deletion of missing values, the population comprised 547,937 person-years nested in 60,394 persons.

4.4.2 Measures

Union dissolution was measured as the termination of a coresidential union, following a separation from the household by one or both partners. Living-apart-together relationships were not considered and living-together-apart relationships could not be distinguished. In case a couple interrupted their union for less than a year, this interruption was disregarded, since interruptions within a calendar year could not be distinguished in the tax records. *Time since union dissolution* was measured as the number of calendar years since union dissolution.

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[5] We used union file as updated in spring 2021. The file retroactively identified couples if they had lived together at two addresses or if they had met any of the other conditions between 2003 and 2021. To illustrate, at least 65% of Dutch couples move to a new address within five years after union formation (Feijten and Mulder 2002), 87% of couples have registered their relationship (Poortman and Mills 2012), 70% of couples have children (Statistics Netherlands 2021b), and at least 57% of households receive couple-level benefits (Bos 2016).

[6] In rare cases, women had formed multiple unions between 2003 and 2005 (0.03% two, < 0.01% three unions). When this occurred, we selected the first union for analysis.

Household disposable income was measured as the annual sum of labor earnings, business income, and investment income of all household members, after taxes and transfers, in euros. All incomes were inflated to their 2015 values. Household income was adjusted for household composition and economies of scale using an empirically grounded equivalence scale for the Netherlands. This equivalence scale assigned a weight of 1 to each adult and a weight of 0.8 to each child under 18, after which each person was assigned the total household income divided by the square root of the weighted household size (Siermann et al. 2004).[7] *Predissolution income group* measured the relative income position before dissolution. For each union cohort and at each union duration, we selected all women who had not yet separated as well as all women who would not separate within ten years, and divided their household disposable incomes into quintiles. Each separating woman was then assigned the quintile of her second year before dissolution.

Household disposable income was disaggregated into the following components. *First partner earnings* comprised labor earnings and business income of the male partner with whom the woman was initially in a union. *Personal earnings* comprised the labor earnings and business income of the focal woman. *New partner earnings* comprised labor earnings and business income of new partners, if any. *Other income* comprised the earnings and business income of other household members as well as (usually minor) dividends and capital gains and (usually negative) interest payments. *Transfer income* comprised social security income and (usually minor) partner alimony of the household. *Taxes and contributions* comprised all income taxes and compulsory social security contributions of the household.

The analysis also included several other variables. *Age* was measured in years. *Ethnicity* was a binary indicator of Dutch-born versus foreign-born. *Working hours* was measured in full-time equivalents (fte): the number of hours in paid work as a proportion of full-time paid work. *Marital status* was a binary indicator of cohabitation versus registered partnership or marriage. *Adults* was measured as the number of resident persons aged 18 and over. *Children* was measured as the number of resident persons aged less than 18. *Union duration* was measured as the number of calendar years since union formation. *Unemployment rate* was measured as the annual rate of unemployment in the population aged 21-55.

Table 4.2 describes the population two years before union dissolution. Differences between income groups were most pronounced concerning ethnicity, working hours, children, and income sources. Women in lower-income groups were more often born abroad, worked fewer hours, and had more children than women in higher-income groups. They and especially

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[7] In households with one adult, the equivalence factors were 1.00 (zero children), 1.33 (one child), 1.51 (two), 1.76 (three), 1.95 (four). In households with two adults, equivalence factors were 1.37 (zero), 1.67 (one), 1.88 (two), 2.06 (three). In all other cases, the equivalence scale was $\sqrt{1 * Adults + 0.8 * Children}$.

their partners also earned less, received more transfers, and paid fewer taxes. These descriptives give a first indication that women in lower-income unions depended relatively less on their partner, because the welfare state provided a larger share of their household income.

4.4.3 Matching

The analysis examined differentials in the dissolution penalty. To estimate the dissolution penalty, we employed a difference-in-differences design. We compared women who separated to similar women who had a partner. For example, if separating women lost 20% of their income upon union dissolution and partnered women gained 5% in the same year, the dissolution penalty would amount to 25 percentage points.

Table 4.2 Descriptive statistics two years before union dissolution

	All	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
		By predissolution income group				
Individual characteristics						
Age	33.87	34.04	33.57	33.17	33.71	35.35
	(7.50)	(7.38)	(7.49)	(7.62)	(7.63)	(7.14)
Foreign-born	0.22	0.36	0.22	0.17	0.13	0.14
Full-time equivalent	0.63	0.34	0.61	0.74	0.82	0.86
	(0.37)	(0.36)	(0.33)	(0.30)	(0.26)	(0.24)
Union characteristics						
Married	0.40	0.46	0.43	0.38	0.34	0.36
Adults	2.07	2.00	2.08	2.12	2.12	2.08
	(0.49)	(0.51)	(0.50)	(0.50)	(0.49)	(0.42)
Children	0.91	1.42	1.05	0.71	0.51	0.44
	(1.02)	(1.12)	(0.97)	(0.89)	(0.80)	(0.78)
Union duration	3.27	3.05	3.19	3.25	3.43	3.66
	(2.55)	(2.52)	(2.54)	(2.56)	(2.54)	(2.54)
Income components						
First partner earnings	42,447	18,068	34,143	43,421	54,658	88,200
	(38,938)	(20,862)	(21,502)	(26,614)	(31,555)	(61,903)
Personal earnings	26,954	9,289	20,347	28,847	38,141	56,238
	(24,594)	(12,706)	(14,838)	(16,235)	(18,569)	(36,038)
New partner earnings	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)
Other income	-3,615	-2,288	-3,395	-3,905	-4,279	-5,338
	(15,963)	(9,014)	(9,585)	(12,661)	(21,408)	(27,545)
Transfer income	6,380	10,202	6,509	4,950	3,981	3,844
	(10,873)	(10,967)	(10,035)	(10,060)	(9,899)	(12,274)
Taxes and contributions	-31,008	-11,511	-22,669	-31,290	-42,217	-69,421
	(25,445)	(8,539)	(9,714)	(12,506)	(16,820)	(38,319)
Household disposable income	25,774	13,651	20,943	26,413	32,591	48,524
	(15,498)	(8,640)	(5,154)	(9,715)	(9,680)	(21,065)
N	60,394	15,957	13,727	12,393	10,349	7,968

Source: Statistics Netherlands, own calculations.

The difference-in-differences design hinged on the comparability of separating and partnered women. To ensure comparability, we used a matching approach. Each woman who separated was matched to a similar woman who was (still) partnered. The matching was exact on the variables predissolution income group, union duration, ethnicity, marital status, children, and adults. The matching was probabilistic on the variables age, working hours, partner earnings, personal earnings, other income, transfer income, and taxes and contributions; that is, we calculated the difference between separating women and potential matches for each of these variables, discarded potential match pairs for whom the difference on one or more variables exceeded one standard deviation, and prioritized match pairs with smaller differences. This form of near-exact matching ensured both univariate balance (i.e., group means) and multivariate balance (i.e., individual scores) of separating and partnered women, reducing model dependence and residual variance (Iacus et al. 2012).

Previous work has shown that some women anticipate the financial consequences of union dissolution by increasing their employment in the year before dissolution (Poortman 2005; Thielemans and Mortelmans 2019, 2021). To allow for anticipation effects, we matched separating women using their characteristics in the second year before dissolution. For partnered women, we used their characteristics at the corresponding union duration. (Separating and partnered women were matched at the same union duration, so their clocks were synchronized.)

Following this procedure, 96% of all separating women found a suitable match. Some partnered women appeared as matches multiple times because we allowed replacement; standard errors were adjusted accordingly. The resulting dataset contained a treatment group of 526,983 person-years nested in 57,763 separating persons and a control group of 526,983 person-years nested in 43,780 partnered persons. The treatment and control group were well balanced on all covariates (see Table A.31 of the Appendix). All code for the data selection, matching procedure, and analysis will be made available via the Open Science Framework (https://osf.io/vnufm/?view_only=326f3bb873ba4520aeb3086304feac7c, *currently anonymized for peer review*).

4.4.4 Estimation

The analysis aimed to decompose the dissolution penalty into changes in household composition and changes in income sources. To do so, we had to make several decisions. One decision regarded the way by which to untangle the dissolution penalty. Recall that household disposable income Y_{it} is the sum of all income sources S_{it}^k divided by an equivalence factor f_{it}:

$$Y_{it} = \frac{S_{it}^1 + S_{it}^2 + S_{it}^3 + \cdots}{f_{it}}$$

This shows that dissolution affects household disposable income via changes in household composition, captured by the denominator f_{it}, and via changes in income sources, captured by the numerators S_{it}^k. Because it is not possible to untangle changes in the denominator and numerators within one framework, we divided the analysis in two parts. The first part considered changes in household composition, without yet considering changes in income sources. The second part then considered changes in income sources, conditional on changes in household composition.

Another decision regarded the definition of relative income. We used a proportional definition (Tach and Eads 2015):

$$p_{it}^Y = \frac{Y_{it}}{\text{abs}(Y_{i,-2})}$$

Here, p_{it}^Y was the proportion of household disposable income Y in year t compared to the second year before dissolution $t = -2$. Incomes were anchored in the second year before dissolution, rather than the precise year of dissolution, to avoid anticipatory effects into the baseline. The absolute value function ensured that gains and losses appeared as positive and negative changes, respectively. While relative income changes could also be modeled using a standard logarithmic definition, we preferred the proportional definition because proportions are additively decomposable:

$$\frac{Y_{it}}{\text{abs}(Y_{i,-2})} = \frac{S_{it}^1 / f_{it}}{\text{abs}(Y_{i,-2})} + \frac{S_{it}^2 / f_{it}}{\text{abs}(Y_{i,-2})} + \frac{S_{it}^3 / f_{it}}{\text{abs}(Y_{i,-2})} + \cdots$$
$$= p_{it}^Y = p_{it}^{S1} + p_{it}^{S2} + p_{it}^{S3} + \cdots$$

A last decision regarded the estimator. We used fixed-effects regressions to estimate the dissolution penalty. Fixed-effects regressions consider within-individual change over time, that is, how a transition into union dissolution is accompanied by a change in proportional income. A benefit is that time-invariant unobserved heterogeneity is automatically controlled for. A downside is that the estimates are sensitive to outliers: income losses might be underestimated if a few women experience extreme income gains following dissolution (Tach and Eads 2015). Hence, we identified outliers using robust regression techniques for panel data. We temporarily subtracted the within-individual medians of proportional household disposable income and its explanatory variables, fitted a regression model to the de-medianed scores using the MS-estimator, and obtained the standardized residuals (Verardi and Wagner 2011). The 1% most extreme residuals were eliminated, and models were run as usual.

Having made these decisions, the analysis proceeded as follows. First, we established the dissolution penalty. To do so, we estimated the following model:

$$p_{it}^Y = \alpha_i + \boldsymbol{\beta T_{it} Q_i} + \boldsymbol{\gamma} D_i \boldsymbol{T_{it} Q_i} + \boldsymbol{\delta} U_{it} \boldsymbol{Q_i} + \varepsilon_{it}$$

Here, p_{it}^Y was the proportion of household disposable income, α_i an individual intercept, $\boldsymbol{T_{it}}$ time since union dissolution dummies, $\boldsymbol{Q_i}$ predissolution income quintile dummies, D_i a dummy indicating treatment or control group, U_{it} the annual unemployment rate, and ε_{it} an idiosyncratic error term.[8] Women in the control group were assigned the dissolution year of their match. The coefficients $\boldsymbol{\gamma}$ estimated the dissolution penalty. As outlined in the theory section, we expected the penalty to be larger for women from higher-income unions.

Next, we established the role of changes in household composition in the dissolution penalty, without yet considering changes in income sources. This situation could not be observed in the data since, in real life, both household composition and income sources change upon dissolution. To solve this, we assigned to each woman in the treatment group the total (non-equivalized) income of her match in the control group, and divided this income by her own equivalence factor. We then used this hypothetical situation to estimate the following model:

$$\widetilde{p_{it}^Y} = \alpha_i + \boldsymbol{\beta T_{it} Q_i} + \boldsymbol{\gamma} D_i \boldsymbol{T_{it} Q_i} + \boldsymbol{\delta} U_{it} \boldsymbol{Q_i} + \varepsilon_{it}$$

Here, $\widetilde{p_{it}^Y}$ was the proportion of household disposable income based on the observed household composition, observed income sources before dissolution, and hypothetical income sources after dissolution. The coefficients $\boldsymbol{\gamma}$ estimated the dissolution penalty if only the household composition had changed. As outlined in the theory section, we did not expect a difference between women from low-income and women from high-income unions.

Finally, we established the role of changes in income sources in the dissolution penalty, given any changes in household composition. To do so, we estimated the following model:

$$p_{it}^{S^k} = \alpha_i + \boldsymbol{\beta T_{it} Q_i} + \boldsymbol{\gamma} D_i \boldsymbol{T_{it} Q_i} + \boldsymbol{\delta} U_{it} \boldsymbol{Q_i} + \varepsilon_{it}$$

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[8] We experimented extensively with alternative model specifications. Eventually, we interacted time since union dissolution dummies with the treatment indicator only in the first year before dissolution and all the years after dissolution. The reasons were that the treatment effect in further years before dissolution was virtually non-existent due to matching, that effect was not of theoretical interest, adding it into the model would not improve the model fit, and adding it would substantially reduce model parsimony. For the same reasons, we used the national unemployment rate instead of full-fledged period effects.

Here, $p_{it}^{S^k}$ was each (equivalized) income component of household disposable income p_{it}^Y. The coefficients $\boldsymbol{\gamma}$ estimated the dissolution effect on each income component. As outlined in the theory section, we expected the effects on personal earnings and taxes to be more positive for women from higher-income unions, the effect on new partner earnings to be similar across unions, and the effect on public transfers and initial partner earnings to be more negative for women from higher-income unions, with the effect on initial partner earnings outweighing all other effects.

The results yielded a decomposition of the dissolution penalty. For each component, they showed what separating women lost compared to partnered women, holding constant the other components. This gave insight into the relative importance of each component for the financial consequences of union dissolution.

4.5 RESULTS

4.5.1 Dissolution penalty

We first established the dissolution penalty. The left-hand panel of Figure 4.1 shows the observed development of household disposable income for separating women in the years before and after dissolution, comparing it to the matched group of partnered women. A clear gradient emerged, in which women in higher-income unions had higher incomes and diverged from women in lower-income unions as their unions progressed. This divergence came to an end upon union dissolution. Women from higher-income unions lost considerably more than women in lower-income unions, resulting in income convergence.

These observations were confirmed by the fixed-effects model. The right-hand panel of Figure 4.1 shows the estimated dissolution penalty. The penalty was considerably larger for women from higher-income unions. One year after dissolution, women in the bottom quintile had lost 3 percentage points of income compared to their partnered matches. This number amounted to 15 points in the second quintile, 16 points in the third quintile, 20 points in the fourth quintile, and 28 points in the top quintile. These numbers confirm that women's living standards converged upon dissolution.

Moreover, the convergence persisted as time passed. Women across all income groups recovered in the years after dissolution. Although women in higher-income groups recovered slightly faster, the convergence brought about by dissolution could still be noticed many years later.

Figure 4.1 Observed (left) and estimated (right) changes in household disposable income after union dissolution

Predissolution income group

◆ Q1 ◆ Q2 ◆ Q3 ◆ Q4 ◆ Q5

— Separating women -- Partnered women
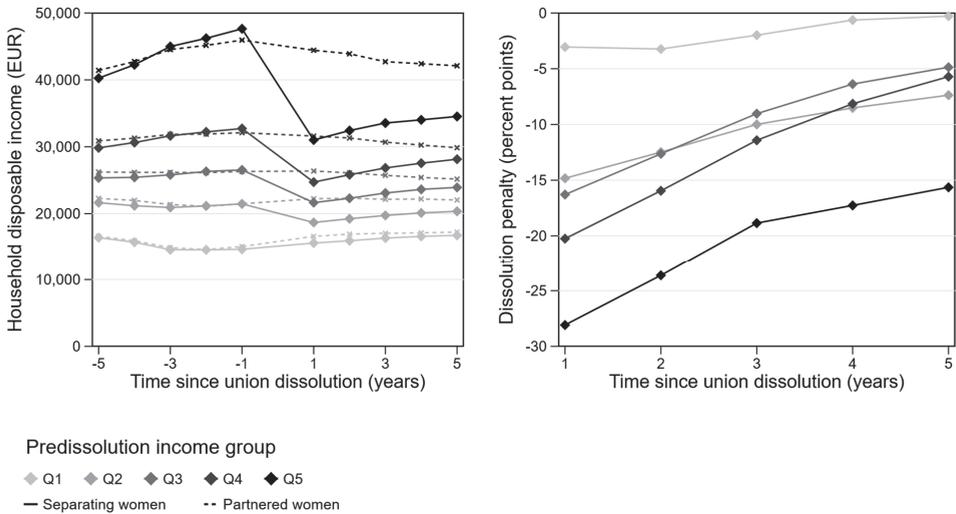
Notes: The dissolution penalty estimates are based on a matched sample and are controlled for individual fixed effects, time since union dissolution dummies, the national unemployment rate, and all their interactions with predissolution income group. Complete model estimates are available in Table A.32 of the Appendix.
Source: Statistics Netherlands, own calculations.

4.5.2 Household composition

Next, we examined whether the convergence in women's living standards could be explained by compensation. One factor in the compensation mechanism is household composition. Figure 4.2 shows the financial gains of changes in household composition, without yet considering changes in income sources. The figure reveals that changes in household composition benefited women across predissolution income groups. One year after dissolution, women in the bottom quintile would have gained 20 percentage points compared to their partnered matches if they had reduced their household size but not changed their income sources. This number amounted to 18 points in the second quintile, 19 points in the third quintile, 20 points in the fourth quintile, and 23 points in the top quintile.

The household composition gains slowly decreased as time passed. This was because some separated women found a new partner, expanding their households, and because some partnered women watched their children leave the household, contracting their households. In any case, the gains remained similar across predissolution income groups, so household composition could not explain why women's living standards converged following union dissolution.

Figure 4.2 Financial gains of changes in household composition after union dissolution

Predissolution income group

◆ Q1   ◆ Q2   ◆ Q3   ◆ Q4   ◆ Q5
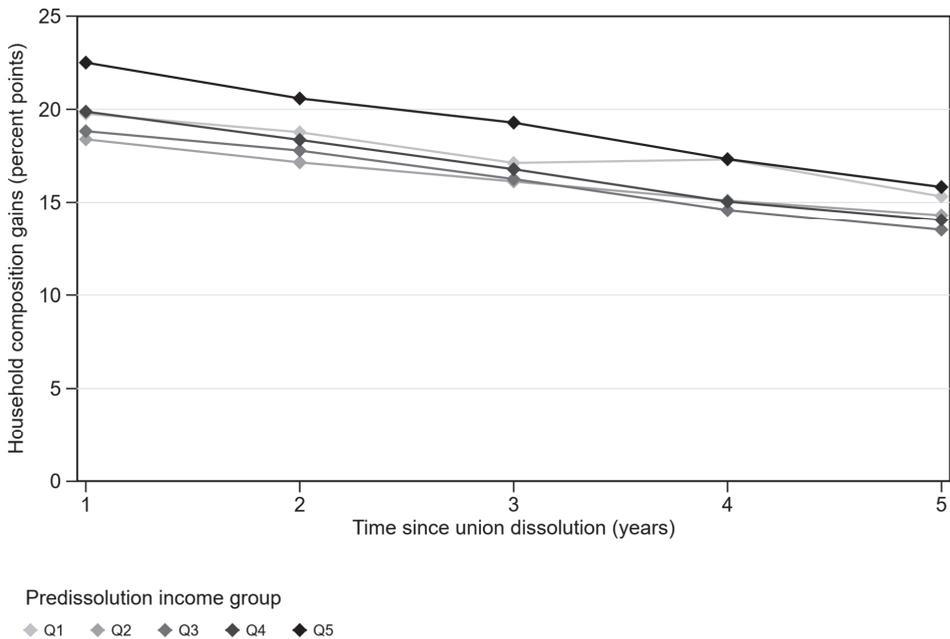
Notes: Complete model estimates are available in Table A.32 of the Appendix.
Source: Statistics Netherlands, own calculations.

4.5.3 Income sources

Another factor in the compensation mechanism are personal earnings. Figure 4.3 shows a decomposition of the dissolution penalty in the first year after union dissolution, given changes in household composition, with the part above the zero-line showing compensation via several income sources. The figure reveals that women compensated the loss of partner earnings with additional personal earnings, and this applied especially for women in higher-income unions. For instance, women in the bottom quintile increased their earnings by 15 percentage points compared to their partnered matches. This number amounted to 23 points in the second quintile, 28 points in the third quintile, 34 points in the fourth quintile, and 36 points in the top quintile. These numbers confirmed our expectation that women from high-income unions were better equipped to increase their personal earnings than women from low-income unions. Nevertheless, the pattern of earnings increases ran counter to the convergence in living standards, so earnings increases could not explain why women's living standards converged following dissolution.

Women could also compensate losses by bringing in earnings from a new partner. Figure 4.3 reveals that repartnering did benefit women, though the benefits were small. Increases in partner earnings amounted to 6 percentage points in the bottom quintile, 8 points

in the second quintile, 11 points in the third quintile, 9 points in the fourth quintile, and 8 points in the top quintile. Women could further compensate losses via other income sources, such as increases in capital gains or reductions in interest payments. We did not formulate theoretical expectations for increases in other income, but Figure 3 reveals that these did benefit women. Increases in other income amounted to 20 percentage points in the bottom quintile, 22 points in the second quintile, 22 points in the third quintile, 19 points in the fourth quintile, and 14 points in the top quintile. These numbers show that increases in new partner earnings and other income benefited women across predissolution income groups. This means that new partner earnings and other income could not explain why women's living standards converged following dissolution.

Could certain groups of women have a compensatory advantage via the tax-benefit system? Figure 4.3 reveals that increases in transfers mainly benefited women from low-income unions. The amount of transfer income increased by 29 percentage points among women in the bottom quintile, 13 points in the second quintile, 8 points in the third quintile, 5 points in the fourth quintile, and 3 points in the upper quintiles. Decreases in tax payments and social security contributions, on the other hand, mainly benefited women from high-income unions. The portion of income spent on taxes decreased by 14 percentage points among women in the bottom quintile, 24 points in the second quintile, 22 points in the third quintile, 23 points in the fourth quintile, and 31 points in the top quintile. In other words, the tax-benefit system provided substantial compensation to women across predissolution income groups, with only a minor advantage by women from lower-income unions. This means, again, that taxes and transfers could not explain why women's living standards converged following union dissolution.

Hence, we turned to the relative independence mechanism. Table 4.2 already showed that, prior to dissolution, low-income unions supplemented their earnings with relatively much transfer income. Figure 4.3 shows what this meant for women who separated, as the part below the zero-line shows the relative losses of partner earnings upon dissolution. It turns out that women from higher-income unions lost a considerably larger share of household income by splitting from their partner. The contribution of partner earnings dropped by 86 percentage points among women in the bottom quintile, 105 points in the second quintile, 107 points in the third quintile, 110 points in the fourth quintile, and 119 points in the top quintile. This implies that the relative dependence on partner earnings was much higher among women in high-income unions than among women from low-income unions. Put differently, women from lower-income unions were relatively independent, and this partly protected them against the financial consequences of union dissolution.

All in all, the results demonstrated the following with respect to compensation and relative independence. The compensation mechanism could not explain why women's living

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standards converged following union dissolution. Women from all predissolution income groups compensated losses with changes in household composition, increases in new partner earnings, and increases in other income, women from low-income unions further compensated with transfer income, and women in high-income unions further compensated with personal earnings and reductions in tax payments. Instead, the relative independence mechanism was the dominant mechanism. Prior to dissolution, women in low-income unions depended relatively less on their partner's contribution to the household than women in high-income unions, because their households received more transfer income. Consequently, the loss of partner earnings affected their standard of living relatively little.

Figure 4.3 Fixed-effects decomposition of the dissolution penalty
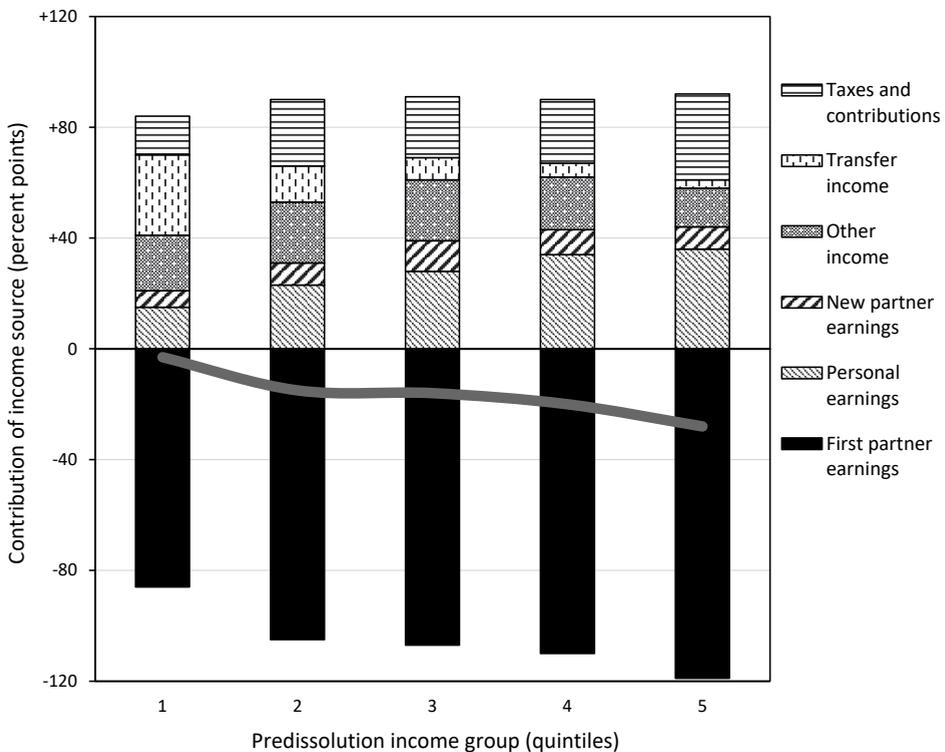
Notes: Decomposition in the first year after dissolution, conditional on changes in household composition. Estimates may exceed ± 100 percent points because they are pre-tax and pre-transfer; taxes and transfers are included as separate components. The curve indicates the total change in household disposable income. Complete model estimates are available in Table A.32 of the Appendix.
Source: Statistics Netherlands, own calculations.

4.5.4 Robustness checks

We conducted several robustness checks, the results of which are available in the Appendix. The first check concerned the estimation. The previous sections showed the average effect of dissolution on proportional income, excluding the 1% most extreme outliers. This might not provide a good estimate of the "typical" dissolution penalty. Hence, we estimated several alternative models. We first re-ran the main model, excluding different percentages of outliers. This showed that excluding less than 1% would change the results notably, but that excluding more than 1% would make little difference. We then ran models that were less sensitive to outliers on the full sample, namely a fixed-effects regression of average log income and a quantile regression of median proportional income. The results were very similar to the main results (Table A.33).

The second check concerned the equivalence scale. The previous sections relied on an empirically grounded scale used by Statistics Netherlands. Other scales might give different results. Hence, we repeated the analysis using two commonly used equivalence scales. The OECD-modified scale assigns a weight of 1 to the first adult, 0.5 to each subsequent adult, and 0.3 to each child, whereas the square root scale takes the square root of unweighted household size. The results for these equivalence scales were very similar to the main results. The only difference was that the OECD-modified scale yielded a slightly smaller dissolution penalty across income groups, as this scale rewards reductions in household size more (Tables A.34-A.35).

The third check concerned the stratifier. The previous sections compared women by predissolution income group, in line with the notion of income convergence. However, sociologists might also be interested in comparing women by social class, and predissolution income group is an unstable indicator of class as it fluctuates over the life course. Hence, we repeated the analysis by women's educational attainment. The results showed that income convergence by education level was less pronounced, because highly educated women compensated more via changes in household composition and personal earnings than less-educated women, and because the educational difference in relative independence was smaller (Table A.36). This is unsurprising since, compared to predissolution household income, a woman's education level is less closely related to her partner's earnings and more closely to her own earnings capacity.

4.6 DISCUSSION

Union dissolution is a critical event for women's living standards. Surprisingly, previous research has found that women from high-income unions lose relatively much, whereas women from low-income unions witness little change (Bonnet et al. 2021; Brewer and Nandi 2014; Duncan and Hoffman 1985; Fisher and Low 2016; Jarvis and Jenkins 1999; Rowe and

Lown 1990; Uunk 2004; Weiss 1984; Weitzman 1981). This raises the question of why socioeconomic differences in women's living standards "converge" after dissolution.

Hence, this study examined the convergence in women's living standards following union dissolution. It proposed two mechanisms explain the convergence: compensation and relative independence. Using administrative data from the Netherlands, we estimated the dissolution penalty by predissolution income group. A decomposition analysis showed that the convergence in living standards was not driven by compensation. Women from lower-income unions had a compensatory advantage regarding transfer income, neither an advantage nor disadvantage regarding household composition and new partner earnings, and a disadvantage regarding personal earnings and tax payments. Instead, convergence was driven by the relative independence mechanism. Women in lower-income unions were financially more independent from their partner's earnings because they relied more on tax-benefit income, so they stood less to lose upon dissolution.

These results demonstrate the dual role of the welfare state. To an extent, the state reduces the negative consequences of union dissolution through postdissolution compensation. Reductions in taxes mitigate the losses of women from high-income unions, while increases in transfers mitigate the losses of women from low-income unions. However, the prime influence of the state passes through predissolution relative independence. Greater reliance on public transfers reduces the portion of partner-tied income that is lost upon dissolution. Attention to this dual role is important. Many studies have found a smaller dissolution penalty when looking at net income than at market income, yet noticed that this smaller penalty could not be fully explained by postdissolution compensation (Bonnet et al. 2021; Bratberg and Tjøtta 2008; Fisher and Low 2016; Jarvis and Jenkins 1999; Tach and Eads 2015). The current study shows that the welfare state also influences how much partner income is lost in the first place.

This leads to an interesting conclusion about the concept of independence. Women's independence is usually conceptualized with reference to the market. Women who earn more similarly to or who out-earn their partners are said to be more independent. Our study shows that independence can also be facilitated by the state. A large share of household income from public transfers enables women to maintain a standard of living relatively independently of a partner. Ironically, then, what we call welfare dependency actually grants women a form of autonomy: the autonomy to decide on the continuation of their relationships (Orloff 1993).

An ensuing question is which policies explain the relative independence of women from low-income unions. The Netherlands features several means-tested schemes, notably social assistance, child assistance, and childcare subsidies. The income thresholds of these schemes are generous enough to entitle most households in the lower quintiles to receiving them (Avram et al. 2014), protecting couples in the lower quintiles against the consequences of union

dissolution. At the same time, the very fact that most benefits are means tested, together with expensive childcare services and a tax credit for informal caregivers, discourages women in the lower quintiles from working full time (Evertsson et al. 2009) and limits earnings increases after union dissolution. A full understanding of the policies that influence compensation and independence, and how they work in different contexts, would therefore require further study. One possibility is the simulation study, in which incomes are simulated under existing and hypothetical policies using tools like Taxsim or Euromod (Popova and Navicke 2019). In the European context, a recent adaptation of the German Socio-Economic Panel for usage with Euromod provides a promising avenue for doing so (Bartels et al. 2021).

What do the results mean for social inequality? On the one hand, they paint a positive picture. Redistribution by the welfare state seems to protect women with a low socioeconomic status against the consequences of union dissolution. On the other hand, women with an intermediary or high socioeconomic status incur large losses. The convergence studied here could therefore be considered "perverse" or "convergence to the bottom" (Bloome 2017). In addition, the focus on income tells only part of the story. Women with a low status are little affected by dissolution on average, but this average masks upward and downward mobility. Other studies have shown that union dissolution increases women's risk of moving to the extremes of the income distribution (Ananat and Michaels 2008). Indeed, the share of women who fall below the poverty line is larger in the lower socioeconomic strata (Hogendoorn et al. 2020). This suggests that the protection of women in lower strata is noticeable yet incomplete.

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On a related note, this study reveals how social policy may moderate the intergenerational transmission of socioeconomic status. Parental separation reduces children's educational attainment, especially for children of highly educated mothers (Bernardi and Boertien 2017a). This larger penalty for children of highly educated mothers is mainly explained by larger losses in household income (Bernardi and Boertien 2016). Our findings show that this is because highly educated mothers are financially relatively dependent on fathers' earnings. Taken together, this suggests that universal, as opposed to means-tested, policies may reduce the parental separation penalty for children's of highly educated mothers. If this is true, however, then these policies will strengthen the relationship between family structure and the intergenerational transmission of education. Policies could thus invoke a trade-off between children's attainment and intergenerational equality.

Notwithstanding these findings, there are some limitations to this study. One limitation regards the measurement of living standards. Our measure did not include the value of unpaid care and housework, yet women spend significant amounts of time on unpaid work (Gupta et al. 2021; Mansour and McKinnish 2014). Accounting for unpaid work might change the dissolution penalty, though changes will probably be small (Bratberg and Tjøtta 2008). A more serious limitation is that income is distinct from expenditure. Expenses related to union

dissolution can be considerable and include divorce litigation, the repurchase of household goods, and double mortgage or rent payments. A broader view on women's living standards could benefit from the measurement of such expenses, which are not available in administrative registers. Furthermore, we used data from the 2003-2005 union cohorts. The findings might not fully generalize to later cohorts, as women's relative independence has increased in the 15 years since (Statistics Netherlands 2021a). At the same time, this increase has been limited and income policies and marriage and divorce legislation have remained similar, so our findings would probably not change much. Lastly, our findings rely on a decomposition analysis. The decomposition untangled the relative importance of household composition and income sources for the dissolution penalty. In reality, of course, these components interact. Increases in earnings reduce entitlements to transfers, households composed of fewer children become entitled to fewer child benefits, and so forth. A more comprehensive design might be able to incorporate these interactions, and our study represents just a first step in that direction.

To conclude, this study examined the compensation and relative independence mechanisms for the event of union dissolution. These mechanisms easily extend to other life events. Examples include labor market events, such as job loss, sickness, disability, or retirement, and demographic events, such as childbirth, home leaving, or bereavement. The consequences of these events, too, depend on the contributions of market and institutional arrangements and of other household members. Future work may examine these to shed more light on the nexus between life events, social policy, and stratification.