Changing partnership and fertility

Maria Winkler-Dworak,[1] *Eva Beaujouan,*[1]

Paola Di Giulio,[1] *Martin Spielauer*[2]

Abstract: Family dynamics are changing in Europe, but how cohort completed fertility is affected by partnership behaviours and how this has changed over time is rarely studied. We use microsimulation techniques to investigate the effect of the increasing prevalence of union dissolution on completed fertility levels in Italy, Norway and Britain, three countries with very different systems of value. We find that the net effect of union instability is to decrease fertility (by about 0.5 children for Italian and 0.2 to 0.4 children for British cohorts, explorations are ongoing for Norway) but the magnitude of the difference depends on the timing of union formation and separation. As expected, re-partnering produces more children in new partnerships if the separation occurs earlier. Nonetheless, it is only if separation takes place after the second birth and if all women re-partner that additional childbearing would almost compensate for births lost due to union disruption.

Keywords: Family forms, fertility, microsimulation, union dissolution, re-partnering

Affiliations:

1. Wittgenstein Centre for Demography and Global Human Capital (IIASA, VID/ÖAW, WU), Vienna Institute of Demography/Austrian Academy of Sciences
2. Statistics Canada

1. Introduction

Like most Western countries, European countries have witnessed significant changes in the pattern of family formation since the 1960s. Over the past few decades, men and women have been marrying less, and they have been cohabiting and divorcing more (Kiernan 2004); they have also been having fewer children than their predecessors, and at older ages. Because of the decreasing stability of marriages and consensual unions, higher-order unions have become more widespread (Billari 2005) and childbearing is no longer restricted to only one marital or consensual union (Kiernan 1999; Pinnelli et al. 2002). One of the most widely used concepts framing the observed changes in family formation and fertility in Europe is the narrative of the 'Second Demographic Transition' (SDT) (Lesthaeghe 2010, 1995; van de Kaa 1987). The SDT theory links the changes in family behaviour with ideational changes and transformation in values, rising importance of individual autonomy and self-actualisation, and an increasing symmetry of gender roles (Lesthaeghe 2010).

Although the narrative of SDT plausibly describes the "behavioural and normative changes, which took place recently in Europe, the theory has little or no predictive power" (Lutz 2007, p.16). In 2011, more than 500 population experts were invited to participate in an online questionnaire about future demographic trends (Lutz et al. 2014). In particular, the experts were asked to judge how much each of a series of "arguments" were valid to explain specific demographic components associated with future population dynamics, and also to gauge their likely impact. Table 1 reports the three arguments most valid in the 'low fertility' strand, and their assessed impact on future fertility (Basten et al. 2014). While there was little disagreement on the effect of educational expansion and postponement, there was no consensus on the impact of partnership instability on fertility, so that despite the acknowledgement of its importance, the mean net impact averages to zero.[1]

Table 1 IIASA–Oxford expert survey; arguments most likely to affect future fertility

Argument	Validity Score	Mean Net Impact on fertility	Index of Disagreement
'More young adult years enrolled in education and training'	0.78	-0.26	0.03
'Delayed childbearing yet more common'	0.75	-0.23	0.12
'Partnership dissolution and re-partnering more common'	0.73	0.00	0.85

Source: Basten et al. (2014), Zeman (2014)

[1] In fact, one-quarter of the experts estimated a negative impact of union disruption on fertility, while around another one-quarter of them expected the impact to be positive. The remaining half of the experts assigned a zero effect to union dissolution on fertility.

In fact, three contrasting forces have been identified as critical with regard to how union disruption might affect fertility. On the one hand, union dissolution reduces the opportunities for conceiving and bearing children. At the same time, it produces a pool of persons who may enter new partnerships and have additional children in step-families (Thomson et al. 2012). Moreover, union instability may lead to a delay of family formation, as many women and men are unable, or unwilling, to form a lasting union at younger ages, which is often seen as a precondition for parenthood (Basten et al. 2014, p. 60). It is the balance of these opposing forces that influences not only future completed fertility levels and family size but also the diversity of family compositions.

In this article, we develop a microsimulation model in order to investigate the interrelationship of partnership and childbearing for selected European countries. In particular, we estimate hazard regression models of birth and union events for Italian, British, and Norwegianwomen born in the 1940s to the mid-1990s, which will serve as parameters to our microsimulation model. The microsimulation generates hypothetical populations of women with different union and childbearing histories for all cohorts, even for those cohorts who are still in their reproductive age at the time of observation. We then assess how family forms are related with cohort fertility levels, and how the relationship changed as family forms were becoming more complex across cohorts.

2. Background

As outlined above, partnership instability may affect fertility in three contrasting ways. On the one hand union dissolution reduces opportunities for conceiving and bearing children; on the other end, it produces a pool of persons who may enter new partnerships and produce ‘extra’ children. Thirdly at younger ages, union instability may lead to a delay of family formation, as many women and men are unable or unwilling to form a lasting union, which is often seen as a precondition for parenthood. Establishing the overall effect of union instability on completed fertility levels, i.e. the balance of these two opposing forces, is not straightforward (Basten et al. 2014). But surely, union dissolution increases the heterogeneity of childbearing, as some individuals will have “additional” births after re-partnering, while for others union dissolution curtails time in union and reduces fertility (van Bavel et al. 2012).

Empirically, Thomson et al. (2012) find using micro-simulation techniques that union instability is actually not enhancing macro fertility for women in France. Meggiolaro and Ongaro (2010) find equivalent results in Italy using Poisson regressions. This is also in line with more descriptive results on French men and women (Beaujouan 2010) and on the effect of divorce on completed fertility levels in 23 European countries (van Bavel et al. 2012). However, the amplitude of the negative impact of divorce varied across countries and gender, though without a clear pattern (van Bavel et al. 2012). As expected, European divorced men and women display a higher dispersion of childbearing behaviour than non-divorced ones, where the authors conclude that "[this] might also prelude transition towards a positive divorce–fertility link, as may already be the case to some extent for remarried men" (van Bavel et al. 2012, p. 773).

However, countries differ greatly by the cultural, institutional and legal context in which childbearing takes place (Klüsener et al. 2012; Perelli-Harris and Sánchez Gassen 2012). For instance, while in Italy partnerships and childbearing are established in a traditional setting, in France today most births take place within unmarried unions, and also in Great Britain both unpartnered and unmarried births are frequent. Although in many countries being in a marriage is still seen as the ideal setting to start and complete family plans (Barlow and Probert 2004; Thornton and Young-DeMarco 2001), we have witnessed a change in the link between marriage, cohabitation and fertility (Perelli-Harris et al. 2010b), and sometimes in the proportion of births outside any union. The link between childbearing and instability evocated earlier could thus be itself affected by the change in partnership circumstances at birth, and the variety in the dynamics of partnerships over time and across countries would then be a determining factor of the variation in fertility outcomes.

The aim of this research is to extend the understanding of the link between union dynamics and fertility and its change across recent birth cohorts. We set our working frame, based on the one implemented in Thomson et al. (2012): our models assume that childbearing is contingent on union status and stability and, at the same time, we take into account potential effects of children already born on union formation and dissolution. More specifically, we estimate hazard regression models of conception risks up to the fourth birth as a function of the current union status and of the union status at prior births. Furthermore, we estimate the formation and disruption of first and second partnerships conditional on the number of previous births and the

union in which they take place. We extend this framework by additionally differentiating between marriage and unmarried cohabitation (cf. Bélanger et al. 2010).

Finally, in order to evaluate the influence of cultural, institutional and legal context on the link between childbearing and partnerships, we contrast the outcome of the microsimulations for Italy, Great Britain and Norway.[2] While partnerships and childbearing in Italy usually follow traditional patterns (Rosina and Fraboni 2004), a slight increase of out-of-wedlock births and divorce rates has been observed very recently (Meggiolaro and Ongaro 2010, Basten et al. 2014). By contrast, in Great Britain and Norway fertility outside marriage is socially accepted and union dissolution has become a common experience, especially for cohorts born after 1960 (Basten et al. 2014, Kravdal 2008). Thus we expect a stronger negative effect of union instability on fertility in Italy than in Great Britain and Norway, where partnership dissolution and childbearing after a separation are more common. On the other hand, the expected negative effect in Italy might be mitigated by the late union formation and childbearing pattern, as fertility levels are generally low, also for those with an intact union during their childbearing years.

3. Data

The Italian data come from the multi-purpose household surveys on "Family and Social Subjects", carried out in 2003 and 2009. The first is internationally known as the Italian GGS survey, and we use the version that has been harmonised by the participants to the Nonmarital Childbearing Network (Perelli-Harris et al. 2010a, see www.nonmarital.org). The 2003 survey provides information about 49,500 respondents, while the 2009 survey had 44,000 respondents, males and females of all age groups in both cases. In our study we keep only women born from 1940 onward, excluding those who had a first child or entered a first partnership before the age of 15 or after the age of 49, or were born abroad. Eventually, 30,255 women remained in our sample.

For Great Britain, we employ parameter estimates from identical hazard regression models derived in Beaujouan et al. (2015). Their analysis is based on a series of datasets that comprise information on past fertility and partnership histories, i.e. 10 datasets (2000–2009) from the Centre for Population Change GHS database 1979-2009 (see Beaujouan et al. 2014 for details) merged with the first wave of the Understanding Society Survey (2009). The quality of this

[2] The parameter estimates for Great Britain come from Beaujouan et al. (2015).

merged database is good for partnership histories (Berrington et al. 2011) but only reasonable for birth histories, the number of births being underestimated in the latest surveys of the GHS database (Ní Bhrolchaín et al. 2011). Their working sample consists of 61,718 women with consistent partnership and childbearing histories and selected on the same criteria as described above for Italy.

The Norwegian data also come from GGS, conducted in 2007/2008. Again, we use the harmonised version from the Nonmarital Childbearing Network (Perelli-Harris et al. 2010a). Validation of GGS-based cohort indicators shows that the latter provide an accurate account of demographic trends in Norway for cohorts born since the mid-1940s (Vergauwen et al. 2015). The survey includes information about 14,880 males and females born between 1927-1988. Applying the same criteria as for the other two countries results in a working sample of 6,589 Norwegian women.

Table 2 contrasts the family trajectories by age 40 of Italian, British and Norwegian women, over the cohorts 1940–49 to 1960–69. Overall, Italian women are more likely to remain un-partnered than British and Norwegian women, and the proportion and contrast has grown slightly in the last cohort. When there has been a first union, its issue differs widely across cohorts and countries. The overall proportion of women separating is much higher in Britain and in Norway than in Italy, and even more so in the recent period (23%/22% against 6.5% in the 1940–49 birth cohort, and 38%/42% against 13.5% in the 1960–69 birth cohort). Because of this, the proportion of women in intact unions at age 40 has gradually decreased and reaches 57% in Britain, 55% in Norway, and 77% in Italy in the last cohort. Re-partnering, however, is much more widespread in Norway and Great Britain than in Italy.

Table 2 Unions and births to Italian and British women born 1940-69.

	Italy			Great Britain			Norway		
	Birth cohort			Birth cohort			Birth cohort		
	1940-49	1950-59	1960-69	1940-49	1950-59	1960-69	1940-49	1950-59	1960-69
Birth and union histories to age 40									
Never in a union	5.39%	5.74%	9.29%	3.12%	3.98%	5.29%	4,00%	3,09%	3,56%
First union									
Intact	87.98%	83.76%	76.95%	73.78%	66.36%	56.95%	74,14%	65,94%	54,65%
Separated/not re-partnered	5.07%	7.69%	9.19%	8.18%	9.31%	11.33%	10,37%	11,27%	10,43%
Re-partnered	1.55%	2.81%	4.57%	14.92%	20.35%	26.43%	11,49%	19,69%	31,36%
Childless	11.69%	13.18%	19.85%	13.90%	15.86%	15.96%	11,47%	11,58%	12,45%
1st birth									
Before first union	3.31%	3.25%	3.17%	5.56%	6.26%	9.39%	11,28%	10,62%	8,49%
Cohabiting first union	0.77%	1.19%	2.78%	0.93%	2.75%	9.30%	3,10%	11,19%	27,01%
Married first union	83.66%	80.99%	71.85%	76.61%	68.40%	55.70%	71,97%	60,57%	38,07%
After first union	0.57%	1.39%	2.35%	3.00%	6.73%	9.65%	2,18%	6,04%	13,98%
2nd birth									
In 1st childbearing union	64.48%	59.88%	51.75%	65.74%	60.89%	55.23%	62,42%	61,34%	61,44%
After 1st childbearing union	0.43%	0.84%	0.87%	1.87%	2.69%	3.74%	2,95%	3,58%	3,76%
3rd birth									
In 1st childbearing union	22.69%	16.34%	11.76%	24.84%	20.92%	18.43%	25,36%	24,22%	27,22%
After 1st childbearing union	0.23%	0.36%	0.43%	2.49%	3.04%	3.95%	2,47%	3,45%	4,30%
4th birth									
In 1st childbearing union	6.92%	3.50%	2.02%	7.30%	6.11%	4.78%	6,79%	4,18%	5,70%
After 1st childbearing union	0.13%	0.15%	0.15%	1.98%	1.76%	1.97%	0,81%	1,38%	1,75%

Source: Authors' analysis of data from FSS 2003/09 (Italy) and Centre for Population Change GHS database 1979-2009 and USOC 2009 (Great Britain).

In parallel, the number of women childless at age 40 remains relatively low in Norway (12%), has increased slightly in Britain (14% to 16%), but has jumped from 12% to 20% in Italy. Again, the context of births differs widely between the three countries. First of all, while births outside a union or before the first union remain rare in Italy (slightly more than 3% of all women experience this event), in Great Britain their level has passed from 5.5% to 9.4%, while in Norway the share of first births before a first union even declined across cohorts. Births in cohabitation have not spread as much in Italy as in Great Britain or Norway, affecting less than 3% of all Italian women compared to more than 9% of British women born in 1960-1969. In contrast, 27% of their Norwegian peers born in the 1960s had their first birth in a cohabitation. Consequently, the proportion of births in married first unions has dropped much less in Italy than in Great Britain and in Norway, while already starting from higher levels: in the last cohort 72% of women had their first baby in a marriage in Italy and 55.5% in Great Britain and only 38% in Norway.

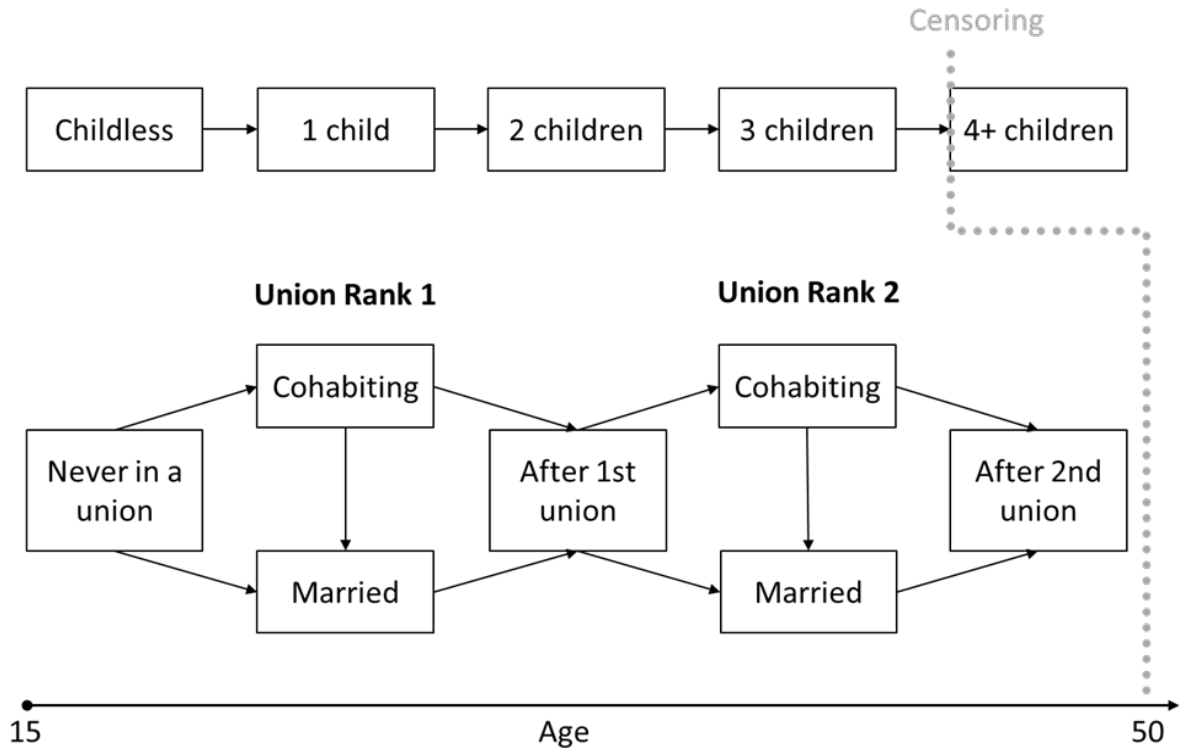
Differences in the context of first and further births act in accordance with the spread of separations and re-partnering, which is stronger in Great Britain and in Norway: many more births of all orders took place after the first union in these two countries, and also after the first childbearing union. Further births (of order 2+), already less frequent in Italy, remain extremely rare in step-families (less than 1% for births beyond the first one over the three birth cohorts). Childbearing after the first fertile union seems to really make a difference in Great Britain, because while risks of further births tend to decrease in a first childbearing union, they tend to increase in subsequent ones. For instance, the share of women having a second birth in their first childbearing union passed from 65.7% in the 1940–49 birth cohort to 55% in the 1960–69 birth cohort, while it increased from less than 2% to more than 3.5% after the first childbearing union in Great Britain. In Norway, the number of second or third births after the first fertile union rose similarly to Great Britain, yet the share of Norwegian women having a second or third birth in their first childbearing union remained quite stable across cohorts.

4. Method

4.1. Micro-simulation

We develop a continuous-time, competing risk micro-simulation model, comparable to the one employed by Thomson et al. (2012), but additionally differentiating between marriage and unmarried cohabitation (Bélanger et al. 2010). The state-space representation of the model is sketched in Figure 1, and further described in the following section. All women are assumed to be childless and never in a union at age 15. For the birth processes, we consider the transitions up to parity 4, while we model transitions into and out of marital/non-marital partnership up to union rank 2. We censor at conception of the fourth child or at age 50, whichever occurs first. In order to estimate the transition rates between the states we use hazard regression, which will be described below. The simulation model is implemented in Modgen, a generic microsimulation programming language developed and maintained at Statistics Canada (2009). The microsimulation model generates 50,000 synthetic life courses of birth and union events for each cohort, based on the parameters produced from the hazard regression analysis. Simulations of events at later ages depend on the parameters observed only for older cohorts. This holds particularly for the most recent cohort 1980–93/4, where we had to postulate the same cohort-specific rates as in the 1970–79 cohort for higher-order birth and union processes. Eventually, we analyse the simulation output by comparing completed fertility levels of the simulated life courses with one or another type of union history. Considering that behaviours remained unchanged in the last cohorts after the observed ages, we notably give a prediction of how the prevalence of various family forms might be changing in cohorts still of reproductive age. Rather than of the impact of various partnership behaviours on completed fertility, we speak about their relationship, because of the endogeneity of behaviours. Further, the hypothesis made on the last cohorts that transition rates remain constant does not take into consideration the possible shifts in later transitions, which have not been observed yet, when earlier transitions would have taken place with different timing than in earlier cohorts. This will be addressed in the discussion.

Figure 1 State space representation of the model



4.1. Hazard regression of transition rates

For the hazard regression of progression to each birth order and to the formation and dissolution of union for first and second unions we use piecewise constant exponential models. Conception is determined to have occurred nine months prior to a reported birth. Union and marriage formation are treated as competing risks, as women out of a partnership can choose either to marry or to enter an unmarried cohabitation by employing stratified models with transition-specific covariates. In the same way, marriage and separation of cohabiting union are treated as competing risks. The covariates for all transitions include age, birth cohort and detailed combinations of past unions and births.

For conception of the first live birth, the baseline duration is measured by the age of the woman, or more specifically, the time since the 15th birthday. For higher-order births, it is the age of the youngest child. The baseline duration of forming a union of rank 1 independent of the type of the union is again the woman's age (since her 15th birthday). For the formation of a union of rank 2, the baseline duration is measured by the time since the end of the union of rank 1 (separation of married or unmarried cohabitation). The baseline clock for converting an

unmarried cohabitation into a marriage or separating is measured by the time since formation of the unmarried cohabitation, and for divorce, by duration of marriage.

To account for cohort differences in the timing of the events, we include a duration–cohort interaction using linear duration splines.[3] The competing risk processes were estimated by using stratified models with transition-specific covariates. As outlined above, observations are censored by the respondent's 50th birthday or the conception of the fourth child or by the date of survey, whichever occurs first. Model selection is based on the BIC statistics. All models were estimated by maximum likelihood as implemented by the R package "eha" (Broström 2014).

5. Results

5.1. Results of the hazard regressions

The following paragraphs summarise the relationships between union dynamics and fertility for Italy, Great Britain, and Norway estimated in the hazard regressions. The full set of estimated parameters can be found in Winkler-Dworak et al. (2015) and in Beaujouan et al. (2015).

Birth intensities

The Italian and Norwegian first-birth risks exhibit the usual bell-shaped pattern with increasing age of the women, where the intensities decline across cohorts. However, the reductions are more pronounced at younger ages across cohorts, implying a delay of parenthood to later ages for more recent cohorts. In contrast, first-birth risks for Great Britain are marked by high rates of teenage pregnancies. Higher-order birth risks generally decline with the mother's age in all three countries. It is only in recent Norwegian cohorts that very young mothers tend to postpone a second birth.

Birth risks vary with the partnership status and with the context of previous births (if any). Births are more likely at all parities among married women than among the others: those never in a union are also less likely to experience a first birth, and in general women not currently in a partnership are less likely to have a (further) child than those in a union/cohabitation. In

[3] When accounting for cohort differences in the timing of events, we had to assume the same duration-specific profile of the base hazard for the two most recent cohorts due to a lack of observations at longer durations in first and second birth and first union formation regressions.

addition, higher-order birth risks are elevated if the prospective birth is the first or second in a new partnership. Moreover, first-birth risks decline with total union duration (including the length of an unmarried cohabitation preceding a marriage), where older cohorts used to proceed much quicker to motherhood after union formation compared to younger cohorts. In Great Britain, women in a second union also conceive a first birth faster after a union formation than their peers in a first union.

Union formation and dissolution

Union transitions show the increasing diffusion of cohabitation and union separations in the younger cohorts, and the constant retreat from direct marriage. In fact, the decline in first marriage rates is much more pronounced at younger ages, implying also a shift of marriages towards older ages.

We estimated all union transitions conditional on the number of past births and the union status at birth, on age and cohort. Pregnancy as well as the presence of a young child encourages the formation of a first union, both cohabitation and marriage, while having an older child before any union is related to a smaller risk of partnering or entering a marriage for British, Italian and Norwegian women. For second unions, the presence of children, unlike pregnancy, inhibits re-partnering. In Great Britain, those having their previous children out of union even seem less likely to re-partner than those having them in the first union, while there is no clear pattern visible for Italy.

Once cohabitation is entered, the union remains stable and the cohabitation is more often transformed into a marriage if the woman is pregnant. By contrast, the presence of children depresses the risk of marriage, whether or not the current partner was their father in Italy and Great Britain, but only if the child was born before the union in Norway. At the same time, it lessens separation risks, though in Britain this holds only for children born from the current first cohabiting union. Similarly, sharing or expecting a child with the current partner reduces the risk of dissolving a marital union compared to childless women. Children born before the current union inflate the divorce risk relative to childlessness, in Great Britain even outweighing the protective effect of shared children for first marriages and only to a lesser degree for a second marital union.

5.2. Results of the microsimulation

The results of the hazard regression are fed into the microsimulation which generates 50,000 hypothetical life histories of childbearing and union events for each cohort. Table 3 compares the completed family size of the simulated cohorts for Italian and British women (computations for Norwegian women are still ongoing) depending on whether their first union remained intact or dissolved during their reproductive years or at least until the conception of their fourth child as we only consider union disruptions which may interfere with childbearing.

Table 3 Expected completed fertility by union dissolution and cohort

First union	1940-49	1950-59	1960-69	1970-79	1980-93/4
			Italy		
Intact	2.07	1.93	1.83	1.76	1.77
Dissolved	1.52	1.43	1.31	1.25	1.27
			Great Britain		
Intact	2.25	2.19	2.18	2.08	2.09
Dissolved	2.02	1.92	1.91	1.77	1.72

Note: Estimates from life histories of 50,000 women in each cohort using Modgen.

Overall, we find a negative effect of union instability on completed fertility levels for both Italian and British cohorts. More specifically, Italian women who experience a union dissolution on average end up with half a child less than their peers in an intact first union, where the difference is stable across cohorts. As expected, the difference in Italy is larger than in Great Britain, where women with a disruption of their first union on average bear 0.23 to 0.37 children less than those in an intact union. Strikingly, in Britain the gap has been widening across cohorts despite the fact that re-partnering has become more frequent.

Table 4 compares the expected mean number of children by various types of union histories for Italy (upper panel) and Great Britain (lower panel). Before investigating the net effect of union dissolution on fertility, we first differentiate between women with pre-union first births and those who have their births after a first union is entered, as women with pre-union births usually show higher fertility levels than women with union births. In fact, the elevated fertility of women with a first pre-union birth is entirely due to younger ages at which these births occur. Indeed, Great Britain's fertility pattern is marked by high rates of teenage pregnancies (Beaujouan et al. 2015) explaining the stable high fertility levels of women with a first pre-union birth in populations under British fertility and union rates. In contrast, the completed fertility of women with pre-union births is lower in populations subject to fertility and union

rates of the younger Italian cohorts due to strong reductions in fertility rates particularly at younger ages across cohorts.

Table 4 Expected births in populations with varying union experience

		By cohort age-specific birth/union rates				
		1940-49	1950-59	1960-69	1970-79	1980-93/4
		Italy				
1st births before 1st union		2.32	2.08	2.00	1.97	1.98
1st births in/after first union		2.14	2.00	1.94	1.96	1.95
Separations occur …						
While childless	Separated	0.65	0.60	0.53	0.60	0.63
	Union intact	1.92	1.78	1.61	1.56	1.57
At parity 1	Separated	1.25	1.26	1.30	1.40	1.38
	Union intact	2.16	2.03	1.98	2.02	2.03
At parity 2	Separated	2.12	2.10	2.08	2.10	2.10
	Union intact	2.48	2.35	2.29	2.29	2.29
Parental status at separation						
Childless	No re-partnering	0.35	0.25	0.21	0.19	0.21
	Re-partnering	1.09	0.96	0.84	0.89	0.91
One child	No re-partnering	1.17	1.15	1.14	1.18	1.17
	Re-partnering	1.48	1.49	1.56	1.69	1.67
Two children	No re-partnering	2.09	2.05	2.05	2.06	2.05
	Re-partnering	2.52	2.35	2.26	2.28	2.30
		Great Britain				
1st births before 1st union		2.44	2.39	2.43	2.44	2.42
1st births in/after first union		2.30	2.22	2.18	2.10	2.08
Separations occur …						
While childless	Separated	0.92	0.97	1.10	1.03	1.06
	Union intact	1.99	1.91	1.89	1.75	1.70
At parity 1	Separated	1.65	1.66	1.70	1.72	1.80
	Union intact	2.33	2.28	2.26	2.20	2.20
At parity 2	Separated	2.25	2.28	2.31	2.30	2.35
	Union intact	2.53	2.51	2.52	2.48	2.48
Parental status at separation						
Childless	No re-partnering	0.18	0.27	0.45	0.46	0.51
	Re-partnering	1.07	1.10	1.21	1.13	1.15
One child	No re-partnering	1.21	1.22	1.31	1.38	1.45
	Re-partnering	1.77	1.81	1.86	1.90	1.95
Two children	No re-partnering	2.11	2.14	2.16	2.18	2.21
	Re-partnering	2.35	2.39	2.42	2.41	2.47

Note: Estimates from life histories of 50,000 women in each cohort using Modgen.

Next, the middle section of each panel in Table 4 ("Separations occur…") shows a population where all women form a union before having children (if any): it compares the expected fertility levels in case the first union dissolves to the corresponding levels in case it remains intact, depending on the family stage at which the separation takes place. For Italy, women dissolving the first union before a first birth occurs (if any) have on average 1.27 to 0.94 children less than women whose first unions do not dissolve, while the difference amounts to 1.07 to 0.65 children per woman for British rates. So the gap due to the separation of first unions before any birth

has been diminishing in both countries. If the first union dissolution occurs after the first birth, differences between populations would be smaller, i.e. only 0.91 to 0.64 and 0.68 to 0.4 according to Italian and British parameter estimates, respectively. If unions dissolve after the second birth, differences between populations would shrink even further, from 0.36 to 0.19 and 0.28 to 0.12 children under rates observed in the Italian and British cohorts, respectively. Hence, union instability reduces completed family size but the later the separation occurs in the family stage (i.e. the higher the number of children born in the union), the smaller the effect. Strikingly, the effect is smaller in populations under rates observed in younger cohorts than under rates observed for the 1940s cohort, which is contrary to the differences in the overall completed fertility levels in Table 3, suggesting that the latter might result from a compositional effect. Indeed, in populations subject to the fertility and union transition rates observed for the younger cohorts, separations occur at lower parities than in populations under rates observed for the 1940s cohort. While in the 1940s birth cohort only about 30 per cent were childless at union disruption, this figure would be expected to rise to almost 50 per cent in the most recent cohort.

Finally, the lower section of each panel in Table 4 contrasts the expected number of births in populations where all women remain single to populations where all women form a second partnership after the first union is dissolved, by parity at separation. We find that for populations with a lower parity at separations more children are added via re-partnering than in populations with a higher parity at first union disruption. While there are only minor differences among the populations under rates pertaining to the different British cohorts, an interesting disparity shows among populations dissolving with one or two children for Italian rates. Whereas for women with two children at separation, re-partnering adds more children in populations under rates observed for the 1940s than for more recent cohorts, the opposite is true for populations where women had just one child at separation.

Contrasting expected fertility levels of populations where all women form a new partnership to those of populations with intact first unions, we find that re-partnering compensates only partly for births not had due to union disruption, if the latter occurs at earlier family stages. It is only in populations where all women had two children at separation and all re-partnered that we find almost the same expected completed fertility levels as in populations with all first unions intact. Hence, re-partnering may be particularly important for third and more births.

We noted above that for given parities, the net effect of union dissolution on completed fertility levels is smaller in populations under rates observed for more recent cohorts than under rates observed for cohorts born in the 1940s and 1950s. However, union formation and childbearing rates in recent cohorts differ markedly from their predecessors by a postponement of the entry into first unions and parenthood to later ages. In fact, Italian women born in the 1940s on average entered a first union at age 23.7 and had a first birth at 25.1 years. In contrast, under the rates for the Italian 1980–93 cohort, women would have formed a first union only by age 28.3 and would have had a first birth at 29.7 years. The corresponding estimates for Great Britain are 22.3 and 24.3 years for the 1940s cohort and 23.5 and 26.7 years for the most recent cohort, respectively.

Table 5 Expected births in populations by timing of union events, Italy

		By cohort age-specific birth and union rates				
		1940-49	1950-59	1960-69	1970-79	1980-93/4
First unions at age < 30						
Separations occur …						
While childless	Separated	0.76	0.74	0.72	0.88	0.90
	Union intact	2.15	2.01	1.98	2.08	2.09
At parity 1	Separated	1.27	1.28	1.33	1.48	1.46
	Union intact	2.21	2.07	2.04	2.13	2.14
At parity 2	Separated	2.13	2.10	2.08	2.11	2.11
	Union intact	2.50	2.36	2.31	2.33	2.33
First unions at age 30+						
Separations occur …						
While childless	Separated	0.15	0.08	0.10	0.19	0.20
	Union intact	1.02	0.98	1.00	1.13	1.14
At parity 1	Separated	1.02	1.06	1.10	1.20	1.19
	Union intact	1.46	1.52	1.57	1.71	1.72
At parity 2	Separated	2.00	2.04	2.03	2.05	2.05
	Union intact	2.08	2.09	2.09	2.14	2.14
Separations at age < 30						
Parental status at separation						
Childless	No re-partnering	0.71	0.61	0.55	0.56	0.57
	Re-partnering	1.30	1.23	1.15	1.27	1.27
One child	No re-partnering	1.40	1.37	1.35	1.37	1.38
	Re-partnering	1.75	1.71	1.82	1.99	1.93
Two children	No re-partnering	2.38	2.23	2.22	2.25	2.23
	Re-partnering	3.02	2.61	2.59	2.55	2.56
Separations at age 30+						
Parental status at separation						
Childless	No re-partnering	0.11	0.07	0.09	0.11	0.12
	Re-partnering	0.48	0.32	0.30	0.46	0.49
One child	No re-partnering	1.07	1.08	1.09	1.15	1.14
	Re-partnering	1.14	1.21	1.27	1.47	1.49
Two children	No re-partnering	2.03	2.03	2.03	2.05	2.04
	Re-partnering	2.12	2.18	2.14	2.22	2.24

Note: Estimates from life histories of 50,000 women in each cohort using Modgen.

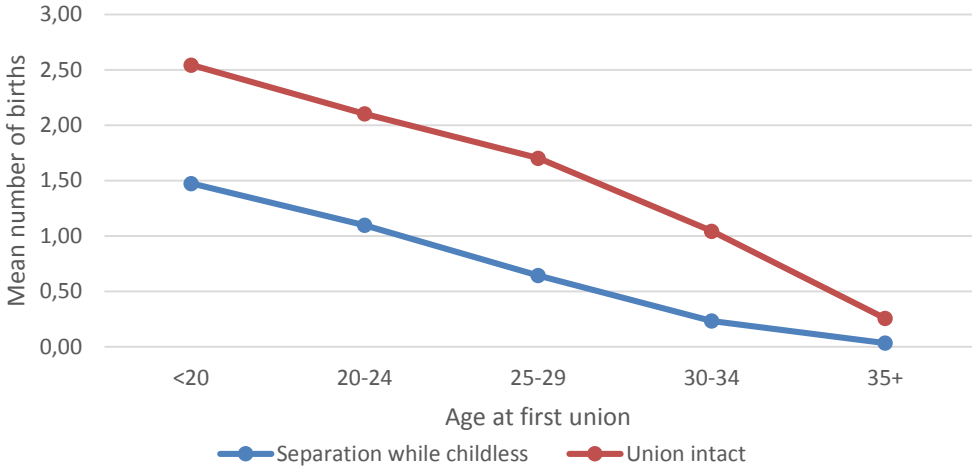
These contrasts suggest that the timing of family formation also affects the impact of union instability on fertility. Indeed, Thomson et al. (2012) showed that union dissolution reduces completed fertility to a greater degree if unions are formed before rather than after age 30. Table 5 and Table 6 replicate the presentation of completed fertility levels by the timing of union events for our Italian and British estimates.

Table 6 Expected births in populations by timing of union events, Great Britain

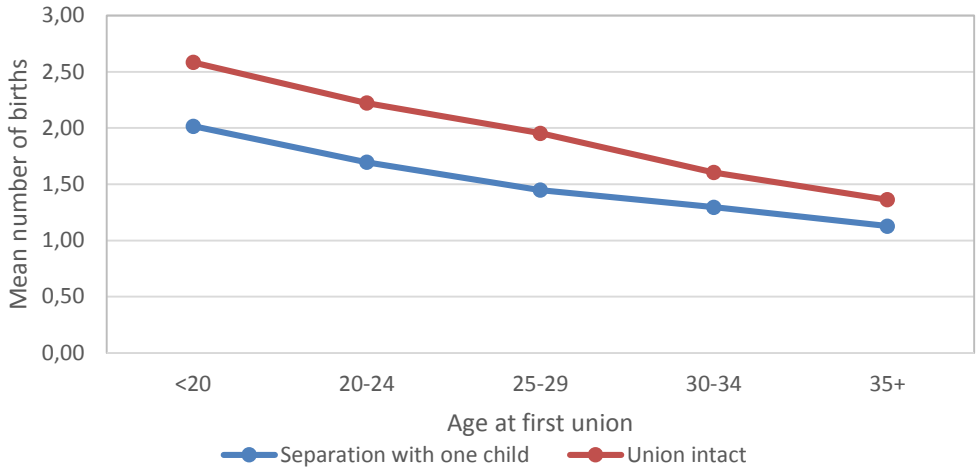
		By cohort age-specific birth and union rates				
		1940-49	1950-59	1960-69	1970-79	1980-93/4
First unions at age < 30						
Separations occur …						
While childless	Separated	1.15	1.20	1.32	1.20	1.22
	Union intact	2.30	2.28	2.30	2.19	2.20
At parity 1	Separated	1.68	1.70	1.76	1.76	1.83
	Union intact	2.42	2.38	2.38	2.30	2.30
At parity 2	Separated	2.29	2.32	2.36	2.35	2.39
	Union intact	2.61	2.59	2.59	2.55	2.56
First unions at age 30+						
Separations occur …						
While childless	Separated	0.06	0.15	0.20	0.21	0.24
	Union intact	0.67	0.72	0.86	0.81	0.77
At parity 1	Separated	1.24	1.15	1.17	1.23	1.24
	Union intact	1.71	1.66	1.63	1.59	1.56
At parity 2	Separated	2.11	2.06	2.08	2.09	2.11
	Union intact	2.13	2.15	2.17	2.14	2.13
Separations at age < 30						
Parental status at separation						
Childless	No re-partnering	0.76	0.76	1.04	0.99	0.97
	Re-partnering	1.59	1.50	1.56	1.43	1.43
One child	No re-partnering	1.69	1.80	1.86	1.86	1.85
	Re-partnering	2.07	2.09	2.17	2.16	2.19
Two children	No re-partnering	2.74	2.73	2.89	2.81	2.77
	Re-partnering	2.76	2.80	2.88	2.85	2.83
Separations at age 30+						
Parental status at separation						
Childless	No re-partnering	0.04	0.09	0.17	0.19	0.21
	Re-partnering	0.23	0.38	0.49	0.47	0.49
One child	No re-partnering	1.05	1.09	1.13	1.17	1.19
	Re-partnering	1.22	1.28	1.40	1.42	1.43
Two children	No re-partnering	2.04	2.06	2.08	2.09	2.09
	Re-partnering	2.12	2.18	2.23	2.24	2.25

Note: Estimates from life histories of 50,000 women in each cohort using Modgen.

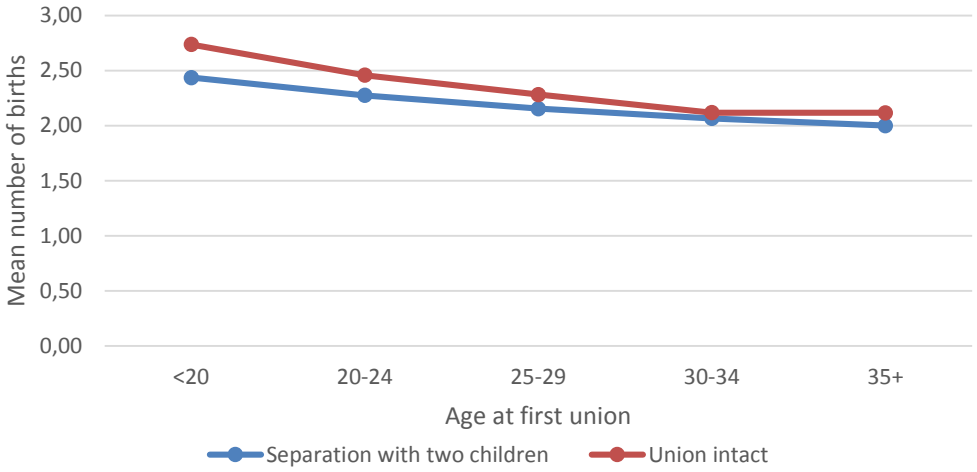
Figure 2 Simulated number of births by age at first partnership and timing of separation, British women born 1970-79



(a) Childless



(b) One child



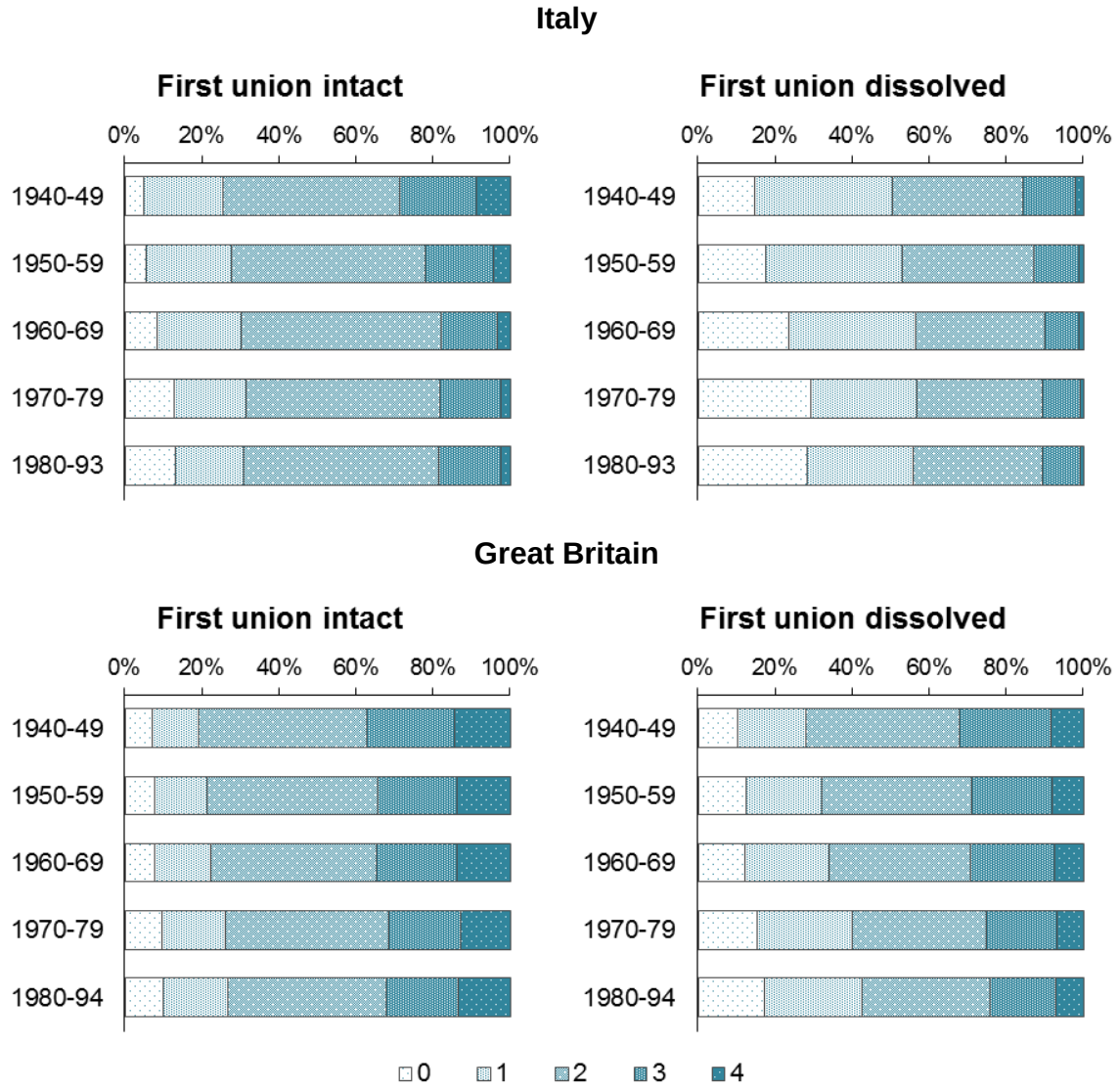
(a) Two children

Indeed, we find a smaller gap in the completed fertility levels between women with an intact union and those separating if first unions are formed after age 30 for both Italian and British estimates. As Thomson et al. (2012) argue, this finding seems counterintuitive at first sight, as an earlier union formation might imply more time to re-partner and compensate for lost births if the first union is dissolved. However as can be seen from Figure 2, it is the completed fertility of women in intact unions which drops sharper than that of separated women if union formation is postponed after age 30. In fact, women forming first unions after age 30 might be selective of those who desire smaller families or no children at all (Thomson et al. 2012, p.188). On the other hand, women with delayed union formation and childbearing are also more likely to run out their "biological clocks" and have difficulty conceiving at older ages (Beaujouan and Solaz 2008). The latter argument may hold also for women separating after age 30, as fewer children are added via re-partnering if unions are dissolved later (cf. Table 5 and Table 6, lower panel).

Summing up, our findings show that union disruption during childbearing years actually reduces the average completed family size, using parameters estimated from Italian and British cohorts, but that the reduction is smaller if unions are formed later and separations take place at higher parities.

Figure 3 shows the expected parity distribution by union disruption estimated for Italy and Great Britain. In fact, our results verify only a slight increase in the dispersion of family sizes for these two countries. For Italian union and childbearing rates, we rather find a strong reduction of the share of women with two and more children while the shares of childless women and of women with only one child markedly increase if first unions are dissolved. This finding is not unexpected as re-partnering and further childbearing in subsequent unions is still rare in Italy.

Figure 3 Expected parity distribution by union disruption and cohort, Italy and Great Britain



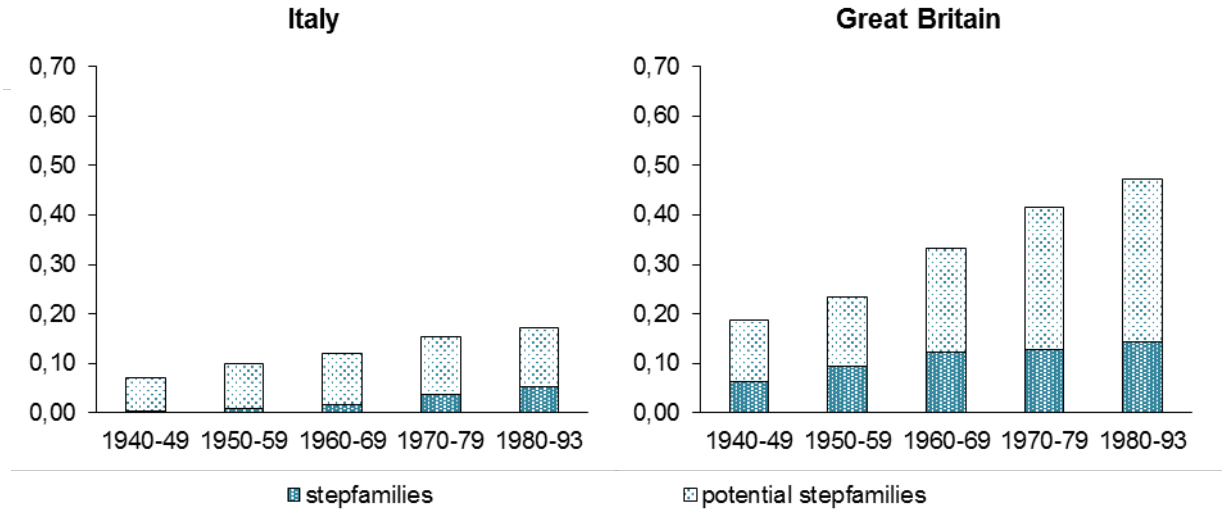
Note: Estimates from life histories of 50,000 women in each cohort using Modgen.

According to British rates, the differences in the parity distribution are more attenuated between women with a union disruption and women in an intact first union. In case of a union dissolution, the share of childless women and women with one child increases, while the share of women with two or more children decreases also for British rates. For higher parities, it is only for women with three children that there is almost no reduction in numbers if a union dissolution occurred. Overall, the fertility pattern in Great Britain is more dispersed in case of separation, with high levels of childlessness and higher shares of women at higher parities, as would be expected in case of union dissolution and possible re-partnering.

Given the smaller, or in the case of Great Britain, even absent reductions at parity three, Figure 4 displays the union status of birth among women with three children in complex families,

where we differentiate between step-families, i.e. births come from two different unions, and potential step-families, that is the births were in one union and at least one of the births was out of union. We term this constellation 'potential step-family', because in data from observed populations such a combination of in- and out-of-union births could stem either from at least two different partners or just from one partner who was not co-residing with the mother at the birth of at least one of the children. A similar argument applies also to the case where all three births were out of union, so we added them to the potential step-families. The difference to 100 per cent gives the share of women having all the births in one single union, either in the first or in the second one. As expected, step-families are rare in populations subject to Italian union and childbearing rates, while such family forms are more prevalent according to British rates, particularly when combined with out-of-union births. According to our microsimulation output for Great Britain only one-half of all the women with parity three would bear their children in just one single union for the most recent cohort.

Figure 4 Shares of women in step-families or potential step-families among women with three children



Note: Estimates from life histories of 50,000 women in each cohort using Modgen.

6. Discussion

While there was strong consensus among the experts of the IIASA–Oxford expert survey about the impact of fertility of educational expansion and postponement of parenthood (which is assumed to be negative), the experts disagreed on the effect of union dissolution and re-partnering on fertility. Indeed partnership instability affects fertility in different ways. On the one hand, we find that birth rates are much higher in marriages and cohabitations than in periods out of a union, particularly for first and second births. Hence, a union disruption, i.e. cutting the total time spent in a union, reduces completed family size. On the other hand, union dissolution produces a pool of persons who may enter new partnerships and produce 'extra' children. Even more, if a new partnership is entered, birth risks are elevated if all the woman's children were born to previous (resident or non-resident) partners, which means that the prospective birth would be the first in the step-family. However, step-families are also more fragile, as children born before the current union inflate separation risks of both cohabiting and marital unions, which might lessen the positive impact of further childbearing in step-families on completed family size.

Overall, we reveal a net effect of union dissolution which is to decrease female completed fertility by about 0.5 children for Italian and about 0.2 to 0.4 children for British cohorts. Our findings are in line with earlier studies on France using a similar framework (Thomson et al. 2012) and, albeit with different techniques, on Italy (Meggiolaro and Ongaro 2010) and France (Beaujouan 2010). Moreover, we find that despite increasing re-partnering and childbearing in subsequent unions, the effect of union dissolution on fertility is larger for more recent cohorts than for women born in the 1940s. However, the latter may be explained by a changing composition of women regarding the number of children already born at separation. The earlier the union disruption occurs in the family stage, the stronger the completed fertility is reduced.

Similar to Thomson et al. (2012), our results highlight the role of timing, not only of separation, but also of union formation. Strikingly, we find that union dissolution reduces completed fertility levels more if unions are formed earlier rather than at later ages. In fact, when first union formation is delayed, the fertility of women in intact unions drops more than for women who separate. As expected, re-partnering produces more children in new partnerships if the separation occurs earlier, not only in terms of age but also with respect to family stage that

means the number of children born before the separation. Nonetheless, it is only if separation takes place after the second birth and if all women re-partner that additional childbearing would almost compensate for births lost due to union disruption. Hence, if first-time parents are likely to have two children together, re-partnering succeeds to almost replace third and fourth children. Our microsimulation output estimates that about 14 per cent of all third children would be born in step-families and further 33 per cent in 'potential step-families' according to rates for the most recent British cohort.

In general, our simulation results are based on the experience of women only. Thomson et al. (2012) argue that the primary difference for men is that the presence of children may inhibit re-partnering and childbearing in subsequent unions less, since children are less likely to live with their father after separation. Hence, a simulation for men with high rates of separation and re-partnering might produce as many or more children than for men who do not separate or re-partner, as has been found to some extent for remarried men in Europe (van Bavel et al. 2012). Additionally, the estimated share of women in step-families might be underestimated as we do not model the market of men with whom separated women re-partner. If they form new partnerships with fathers, the share of complex families might be larger. On the other hand, if the combined parity is higher, the step-family couple will be less likely to have another child.

The mechanisms of our microsimulation model allow us to draw inferences about the future development of fertility for two of the arguments with highest validity of the IIASA–Oxford expert survey on future demographic change. First and most importantly, if union formation and childbearing are delayed further, fertility levels will decrease regardless of whether unions endure or are dissolved. However, the difference in completed fertility levels between women with and without union dissolution is expected to be smaller according to our findings in the case of delayed childbearing. If union dissolution becomes more common, particularly at lower parities, that is for childless women or women with one child, the negative impact of union dissolution on fertility might still be reinforced. Even if all women were to re-partner, our results show that additional childbearing in subsequent unions would only partly compensate for the births lost due to union disruption.

The future development of complex family forms is not only of mere academic interest but also relevant to policy-makers. There is a general consensus that some family forms are more vulnerable (i.e. either potentially or currently disadvantaged) (Philipov et al. 2014, Mynarska

et al. 2015): non-traditional families, like cohabiting and non-cohabiting couples, and single parents; patchwork families (e.g step-families or families with children from different parents); and lastly, large families. According to our microsimulation output, the share of all British mothers ever experiencing a pre-union birth would slightly rise across cohorts, and stabilise at a low level in Italy. However, the share of mothers having a union disruption is expected to strongly increase across cohorts for both countries, even exceeding 40 per cent of all mothers in Great Britain. Similarly, patchwork or step-families face higher disruption rates than partnerships with children only born in the current union. Single-parenthood (including lone-mothers at birth and those whose union has been dissolved) should thus increase in the three countries. Lastly, our microsimulation results yielded that the number of women having three or more children actually declines across cohorts for both countries and regardless whether a union dissolution occurs or not. It however demonstrates that the share of women in complex families will increase among women in large families. Thus, future policies for the support of parents and care of children must also address the increasing number—and their specific needs—of families living in these complex constellations.

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