Union Instability as an Engine of Fertility? A micro-simulation model for France.

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Extended Abstract

Abstract

Micro-level relationships between union formation or dissolution and childbearing may constitute the 'engine' of variation and change around replacement level fertility. Where unions and childbearing occur relatively late in the childbearing years and stability is relatively high, couples may settle for one child together and not be exposed to the risk of 'extra' children with a new partner. When unions and childbearing occur at moderate ages and unions frequently dissolve, however, many parents may produce a second (or third) child with a new partner. In this paper, we estimate the parameters of these micro-level relationships for female respondents to the 1999 French `Etude de l'Histoire Familiale´. We also present an initial micro-simulation of the implications of union dissolution for the intensities of first, second and third births in France.

1. Introduction

The so-called Second Demographic Transition is not so much a story about fertility as it is a story about the changing nature of intimate partnerships. We argue here that declines in union formation and union stability have made it more difficult for individuals to attain their desired number of children in a single union while at the same time increasing the probability of 'extra' children in a new union. The balance between these two opposing effects and the relative proportion of the populations at risk produce above- or below-replacement fertility.

Since divorce rates began to increase in the 1970s, several scholars have investigated their implications for childbearing. Women who remained in stable marriages had more children than those who divorced and did not remarry, fewer children than those who divorced and remarried, producing no net difference between ever-divorced and continuously married women (Cohen and Sweet 1974; Lauriat 1969; Thornton 1978; Kalwat 1983; Kucera 1983; Wineberg 1988; Clarke et al. 1993). The patterns are most consistent for U.S. white women. Among ethnic minority U.S. women, for example, stable marriages produced on average one more child than disrupted marriages, with or without remarriage (Thornton 1978; see also Wineberg 1988). Among women who married late, divorce and remarriage produced fewer children than did a stable marriage (Kalwat 1983).

More recent and more complex analyses have dealt separately with the two components of the relationship between union stability and childbearing. Several studies have demonstrated that childbearing is positively associated with union stability, at least during the period when children are young (Steele et al. 1995). The question for our purpose is whether children cause couples to remain together or whether couples are more likely to have children when they believe their union is stable. Lillard and Waite (1993) were the first to demonstrate with simultaneous hazard models that unions most likely to dissolve also produced fewer children. Effects were particularly pronounced for the risk of having a first child.

The second component, a positive effect of repartnering on fertility, is consistent with a large body of research on stepfamilies. Most of this research estimates effects of previous children on childbearing in new unions and finds a negative effect as might be expected from the larger number of children a stepfamily birth would produce (Bumpass 1984; O'Keeffe 1988; Wineberg 1990; Haurin 1992; Lillard & Waite 1993; Loomis & Landale 1994; Toulemon & LaPierre-Adamcyk 1995; Toulemon 1997; Buber & Prskawetz 2000; Olah 2001; Stewart 2002). In some studies, however, the high family size associated with stepfamily births did not deter couples from having at least one shared child (Griffith et al. 1985; Vikat et al. 1999; Toulemon 1997). Two studies of Swedish fertility (Hoem 1995; Vikat et al. 1999) demonstrated that 'extra' children were produced by repartnering. Both showed that the risk of having a second or third child in one's lifetime was significantly greater when that birth was the first in a union; that is, new unions produce 'extra' births that would not otherwise occur. Vikat et al. (1999) found also that the risk of a third lifetime birth was higher if the individual's third birth was only the second in the union, i.e., if it was the couple's second rather than third shared birth. Using more complete data – including that on both partners' children – Thomson and her colleagues (Thomson et al. 2002; Thomson & Li 2002) found that stepfamily couples with no shared child or only one shared child had an elevated birth risk, net of the effects of the couple's combined number of children. When children live with a repartnered couple, the likelihood of 'extra' births is reduced but not removed (Vikat, Thomson & Prskawetz 2004). Henz & Thomson (2005) showed that the stepfamily effect on childbearing was larger when controlling for the higher risk of dissolution in stepfamily than non-stepfamily unions.

These micro-level relationships have not been considered as possible 'engines' of variation and change around replacement level fertility. Where unions and childbearing occur relatively late in the childbearing years and stability is relatively high, couples may settle for one child together and not be exposed to the risk of 'extra' children with a new partner. When unions and childbearing occur at moderate ages and unions frequently dissolve, however, many individuals may produce a second (or third) child with a new partner. Our purpose in this paper is to examine the micro-level processes underlying the connections between union timing and stability and the risk of first, second and third births in France. We also present an initial microsimulation of the implications of union dissolution for total family sizes of two or three.

2. Data

The data for this study come from the French `Etude de l'Histoire Familiale´ (EHF) 1999, which was conducted together with the census in March 1999 (Cassan, Héran, Toulemon 2000). In this study, 235 000 women and 145 000 men completed an additional questionnaire on their origin, children, partnerships, working life, social origin and languages spoken in the family. We restricted our sample to birth cohorts after 1940. Immigrants were only included if they arrived in metropolitan France before they reached age 15, i.e. they underwent their transition to adulthood in France. Moreover, we excluded observations where the event took place before the age of 15. About 146 000 women remained in our sample, where 73% experienced a first birth, 52% had a second birth and 20% had a third birth. In the survey, the respondents were asked about their union histories (marriage or living in a union, defined as sharing the same household for six months or longer). If respondents reported more than two unions, entry and ending dates were recorded only for the first and most recent (including union ongoing at the survey). First unions were reported by 82% of the sample, of which 20% had ended. Among those experiencing union dissolution, 52% had formed at least one subsequent union. Of the most recent unions, 14% had ended by the time of the 1999 survey.

3. Modeling birth and union intensities in France

We identified eight processes from which we need parameters to adequately simulate the contributions of union stability to fertility: conception of the 1^{st}, 2^{nd}, 3^{rd}, and 4^{th} birth, formation and dissolution of the first and most recent higher-order union. We start with rather parsimonious models of these processes focusing on the relationships between union status and parity. In order to observe changes over time we additionally control for the birth cohort of the respondent.

Birth intensities

We model first birth intensity (Table 1) as a function of mother's age, union status and birth cohort. The estimated effects of age are assumed to be constant during each single year of age until age 45 and exhibit a bell-shaped pattern. We distinguish seven categories for union status, incorporating length of ongoing union and union order. The highest intensities of first birth are observed for women in a first or higher order union for at most 2 years. Independent of union order, being in a union more than 2 years decreases the risk of a first birth. The lowest intensity of a first birth is found for women who have never been in a union, followed by women who are currently out of union. Additionally, we control for the birth cohort of the respondent by 10-year cohorts, i.e., 1940–49, 1950–59, 1960–69, and 1970–79. In order to account for the temporal variation in the age profiles of first birth intensities across cohorts, we do not assume proportional cohort effects but rather introduce interactions between age and birth cohort in the hazard estimation of first births. We model the age-cohort interaction using linear age splines with nodes at ages 20, 23, and 26 with the age schedule of the 1950-59 cohort as the

reference spline.[1] Note the strong increase of the estimated slope coefficients for ages above 20 across cohorts (Table 1).

For higher-order birth intensities we also control for age of younger/youngest child (Table 2–4). Union status is classified in relation to previous birth(s). Birth intensities are highest at age two of the previous child for second and third births and at age one of the previous child for the fourth child. Second birth intensities are lowest for women who are currently not in a union and highest if they are currently in a union that is not the same as the birth union of the first child (0.428 vs. 1.89, Table 2). Compared to the reference category (i.e., in the first child's birth union), having the first child before the current union increases second birth intensity.

For third births (Table 3) we find a similar pattern as for second births. The lowest risk is for women who are currently in no union (0.889), followed by women who are in the same union that also produced the first and second child (reference category). Mothers who had at least one of their previous births prior to the current union experienced higher third-birth intensities. If both children were born in a previous union third birth intensities are highest (4.466).

Similarly, the fourth-birth intensity (Table 4) is higher the fewer the number of children born in the current union, i.e. women with all three births before the ongoing union show 3.57 higher risk of conception leading to a fourth child than women, who are in the same union which produced all three births (reference category). If the third birth or the second and the third births were in the ongoing union, the risk is reduced to 1.71 and 1.32, respectively, compared to the fourth birth intensity for mothers in the birth union of all the three children. Women not in a union also have higher fourth birth rates than women with three children in the same union.
Our results so far indicate that second, third and fourth birth intensities are elevated to a considerable extent if women are in a union, where the prior births were produced before the ongoing union.

Because the pattern of birth spacing following the birth of the first child remained fairly stable across cohorts, we assume cohort effects on the age specific birth intensities to be proportional for higher order births. Note the differences in the cohort effects across birth order: While the effects of birth cohort are small for second and third births, the differences across cohorts are higher for fourth births, but only for the older cohorts.

Union formation and dissolution

We estimated separate models for the formation and dissolution of first and the most recent higher-order union. Table 5 and 6 summarize the results for union formation. For first unions we find a clear hump shape pattern of the intensity of union formation where the clock is the number of years since age 15. We also control for the number of births,

[1] The nodes were selected according to the BIC and how well they replicated the first birth intensities, when estimated for the different cohorts separately, for those cohorts who have completed their reproductive career by the time of the survey.

whether the respondent is currently pregnant, and the age of the youngest child. Being pregnant considerably increases the risk of entering a first union, particularly, if it is the first child. The presence of children is not a barrier to form a first union. Compared to childless women, mothers experienced higher intensities of first union formation if they had one child under age 3 or more children with the youngest age 7 or older. Only mothers with three children, the youngest under age 7, had significantly lower intensity of first union formation compared to the reference category, women with no births and not pregnant).

For the formation of higher-order unions (Table 6), intensity estimates are monotonically decreasing by duration since the end of the first union. Being pregnant significantly increases the risk of entering a higher-order union, but only when pregnant with a first child or prior children were born in a previous union. If at least one of the prior children was born outside a union, the risk of a pregnant woman entering a union is not statistically significantly different from the risk of childless women. The presence of children significantly reduces higher-order union formation rates, independent of whether the children were born outside a union or in a previous union. The negative effect of children on higher-order union formation lessens as children age.

We model dissolution of first and most recent higher-order unions (Tables 7–8) as a function of union duration, the number of births in relation to the present union history, age of the youngest child and the respondent's age. The risk of dissolution of the first union (Table 7) among non-pregnant women is highest for mothers whose children were born previous to the ongoing union and it is lower for mothers with all children in their current first union than for those with at least one child before the current union. The risk of separation is lower during a pregnancy and increases with the age of the youngest child (except for women with two births, one in current union, where the youngest child's age does not make a difference).

For the most recent higher-order union (Table 8), the risk of dissolution is also considerably decreased by the presence of children born in the union, particularly when the youngest child is below age 3, as well as by an ongoing pregnancy. The effect weakens the older the youngest child is. If all children were born prior to the union, the risk of dissolution of the ongoing higher-order union differs whether the children were born in the previous union or not. Compared to childless women, the risk of dissolution is lower if all children were born in a prior union, while no difference is found for women with all children before the current union and at least one of the births outside a union.

4. First results of the microsimulation model

We use a competing risk cohort micro-simulation model, applying the parameters estimated in the hazard models. We used *Modgen*, developed at Statistics Canada, to simulate four birth cohorts, each encompassing one million women, representing women born in 1940–49, 1950–59, 1960–69, and 1970–79.

In the first simulation analysis, we study the effect of a union dissolution on the expected number of births to childless women in a first union. We generate separate simulations for each of the four cohorts. Figure 1 shows the expected number of births by union duration for women who experience union separation and those who do not in a given year. Union disruption decreases the completed fertility for childless women in all cohorts, where the depressing effect weakens for longer union durations. Inspecting simulation results by age at union formation (result not shown), we find that the younger the women at first union formation, the smaller on average the difference in the expected number of births between women who experience a union dissolution and those who do not.

In a next step, we analyse the expected number of further births to a woman with one child. Figure 2 shows the expected additional births as a function of years since the conception of the first birth, distinguishing between women who experience or do not experience a union dissolution in a given year. In contrast to the results for childless women, union disruption does not decrease the completed fertility of women with one child if the disruption occurs after three years of the first child's conception. For the younger birth cohorts, there is even a slight positive effect on expected additional births if the union is dissolved 3 to 9 years after the conception of the first child.

Inspection of simulation results by age of mother at first birth shows that for women having their first child early in life increases the expected additional births slightly more for those experiencing a union dissolution than for those who do not (result not shown). For example, among the 1950-59 birth cohort, expected additional births of women age 15 to 19 at the first birth is higher for those who dissolved a union than for those who did not if the union dissolution occurs between 2 to 9 years. Conversely for women from the same cohort aged 30 to 33 at the first birth, fertility of those with a union disruption is lower up to 4 years since the conception of the first child and about the same afterwards compared to those without a union break-up. One the one hand, it takes time to experience all the events that lead to stepfamily fertility and on the other hand, early first birth may be a common cause of higher subsequent fertility and higher risk of union disruption.

A similar analysis is performed for women with two children (Figure 3). Union disruption also increases expected additional births for women with two children, though the effect becomes smaller the later the union dissolution occurs (see Figure 3) and the older the mother at second birth (result not shown).

We conclude from our first results that union instability and fertility are not necessarily negatively correlated. Union disruption has a depressing effect on completed fertility only for childless women, while union instability is almost neutral to fertility for women with one child and even increases fertility for women with two children.

We do not deny that relationships between union and birth processes affecting our results may arise from common exogenous conditions. For example, education may produce conditions that enable couples to have more children, resolve conflicts and maintain the relationship, or conditions that offer alternatives to both partnership and parenthood. We do not use the term 'engine' to suggest that union formation and dissolution are causes of childbearing but as a metaphor for their complex interactions. We think it is important to identify the implications of potential causal mechanisms in the partnership-parenthood connection through simulation only of their demographic components. An extension of our work would consider not only whether a variety of common conditions account for or interact with relationships between union and birth processes.

5. Further steps

In a next step we are aiming to estimate the overall effect of union dissolution on fertility, i.e. the expected number of births for those who never dissolved a union versus those who experienced a union dissolution independent of when the union disruption occurs.

In order to explore the robustness of our results we will conduct a sensitivity analysis. In particular, we will investigate several scenarios of union and fertility behaviour, e.g.:

- Age at 1st birth shifts upward (but not after age 40) or downward (but not before age 20) by an average of one year;
- Age of youngest child at subsequent birth shifts upward (but not after age 10) by an average of 6 months;
- Likelihood of birth prior to first union cut in half or doubled;
- Age at 1st union shifts upward (but not after age 35) or downward (but not before age 20) by an average of one year;
- Relative likelihood of conception for couples with children born before current union reduced or increased by 25%.

References

Cassan F., Héran F., Toulemon L. 2000, Study of family history. France's 1999 Family Survey. *Courrier des statistiques*, English series, n° 6, 2000 annual issue: 7–19.

Clarke, S., I. Diamond, K. Spicer, and R. Chappell. 1993. "The Relationship Between Marital Breakdown and Childbearing in England and Wales." *Studies on Medical and Population Subjects* 55: 123-36.

Cohen, S. B., and Sweet, J. A. 1974. "The impact of marital disruption and remarriage on fertility." *Journal of Marriage and the Family* 36:87-96.

Griffith, Janet D., Helen P. Koo, and C. M. Suchindran. 1985. "Childbearing and Family in Remarriage." *Demography* 22:73-88.

Haurin, R. J. 1992. The Determinants of Fertility in Remarriage: An Analysis of White American Experience. Unpublished Doctoral Dissertation, Ohio State University. Ann Arbor, Michigan, University Microfilms International.

Hoem, Britta. 1995. "Kvinnors och Mäns Liv, Del 3, Barnafödande." [Women's and Men's Lives, Part 3, Childbearing.] Demografiska Rapporter 2.3. Stockholm: Statistics Sweden.

Kalwat, J.S. 1983. "Divorce, remarriage, and childbearing: a study of fertility differences between women in first and second marriages." Princeton, N.J, Princeton University.

Kucera, M. 1984. "Plodnost zen v opakovanych manzelstvich [Fertility in women in repeated marriages]." *Demografie* 16:289-96.

Lauriat, P. 1969. "The effect of marital dissolution on fertility." *Journal of Marriage and the Family* 31:484-493.

Lillard, Lee A., and Linda J. Waite. 1993. "A Joint Model of Marital Childbearing and Marital Disruption." *Demography* 30:653-681.

Upchurch, D. M., Lillard, L. A., and Panis, C. W. A. 2002. "Nonmarital childbearing: Influences of education, marriage, and fertility." *Demography* 39:311-20.

Loomis, Laura Spencer, and Nancy S. Landale. 1994. "Nonmarital Cohabitation and Childbearing Among Black and White American Women." *Journal of Marriage and the Family* 56:949-962.

Olah, Liva Sz. 2001. The first shared birth in second unions in Sweden and Hungary: A gender perspective. Chapter 3 in In Oláh Livia Sz, Gendering Family Dynamics: The Case of Sweden and Hungary. Stockholm University Demography Unit –Dissertation Series, 3. Stockholm University.

O'Keeffe, J.E. 1988. Starting a Second Family: The Effect of Children From a Husband's Prior Marriage and the Payment of Child Support on Birth Expectations in Women's First and Second Marriages. Unpublished Doctoral Dissertation, University of Californi-Los Angeles. Ann Arbor, Michigan, University Microfilms International.

Steele, Fiona, Kallis, Constantinos, Goldstein, Harvey, and Joshi, Heather. 2005. "The relationship between childbearing and transitions from marriage and cohabitation in Britain." *Demography* 42(4):647-673.

Stewart, Susan D. 2002. The effect of stepchildren on childbearing intentions and births. *Demography* 39(1), pp. 181-197.

Thomson, Elizabeth. 1997. Her, His and Their Children: Childbearing in Stepfamilies. NSFH Working Paper 67, Center for Demography and Ecology, University of Wisconsin- Madison, Madison, WI.

Thornton, Arland. 1978. "Marital Resolution, Remarriage and Childbearing." *Demography* 15: 361-80.

Toulemon, Laurent. 1997. The fertility of step-families: The impact of childbearing before the current union. Paper presented at the annual meetings of the Population Association of America, Washington, DC.

Toulemon, Laurent, and Evelyne Lapierre-Adamcyk. 1995. Demographic patterns of motherhood and fatherhood in France. Paper presented at the International Union for the Scientific Study of Population Anthropology and Demography Committee Seminar on Fertility and the Male Life Cycle in the Era of Fertility Decline, Zacarecas, November.

Vikat, Andres, Elizabeth Thomson, and Jan M. Hoem. 1999. Stepfamily fertility in contemporary Sweden: The impact of childbearing before the current union. *Population Studies* 53: 211-225.

Wineberg, H. 1988. "Fertility of women married once or more than once." *Sociology and Social Research* 72:260-266.

Wineberg, Howard. 1990. "Childbearing after Remarriage." *Journal of Marriage and the Family* 52:31-38.

Table 1: Estimated coefficients and standard error for the intensity of conception leading to a first birth.

Covariate	exp(β)	se(β)	Covariate	exp(β)	se(β)
Mother's age			**Union status**		
15	0.056***	(0.003)	never in union	0.092***	(0.001)
16	0.160***	(0.006)	first union<2y	1	
17	0.309***	(0.008)	first union>2y	0.822***	(0.009)
18	0.432***	(0.008)	after first	0.189***	(0.007)
19	0.437***	(0.007)	last union<2y	0.931*	(0.028)
20	0.375***	(0.006)	last union>2y	0.822***	(0.031)
21	0.345***	(0.005)	after last union	0.201***	(0.034)
22	0.330***	(0.004)	**Cohort**		
23	0.315***	(0.005)	1940-1949	1.488***	(0.031)
24	0.325***	(0.005)	1950-1959	1	
25	0.315***	(0.005)	1960-1969	0.553***	(0.012)
26	0.310***	(0.006)	1970-1979	0.383***	(0.011)
27	0.295***	(0.006)	**Interaction of age and cohort**		
28	0.273***	(0.006)	Spline for ages 15–20		
29	0.255***	(0.006)	1940-1949	1.939***	(0.115)
30	0.221***	(0.006)	1950-1959	1	
31	0.200***	(0.006)	1960-1969	1.085	(0.070)
32	0.164***	(0.006)	1970-1979	1.282**	(0.108)
33	0.150***	(0.006)	Spline for ages 20–23		
34	0.124***	(0.006)	1940-1949	0.966	(0.032)
35	0.104***	(0.006)	1950-1959	1	
36	0.093***	(0.006)	1960-1969	1.333***	(0.044)
37	0.078***	(0.006)	1970-1979	1.339***	(0.061)
38	0.059***	(0.005)	Spline for ages 23–26		
39	0.040***	(0.004)	1940-1949	0.740***	(0.025)
40	0.035***	(0.005)	1950-1959	1	
41	0.023***	(0.004)	1960-1969	1.214***	(0.038)
42	0.008***	(0.002)	1970-1979	1.613***	(0.085)
43	0.010***	(0.003)	Spline for ages 26+		
44	0.007***	(0.003)	1940-1949	0.535***	(0.055)
45-49	0.004***	(0.001)	1950-1959	1	
			1960-1969	2.521***	(0.284)
			1970-1979	2.073	(2.558)
Sample size	1679700				
Degrees of freedom	40				
Log-Likelihood	-85328				
BIC	171229				

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Table 2: Estimated coefficients and standard errors for intensity of conception leading to a second birth.

Covariate	exp(β)	se(β)
Age of first child		
0	0.114***	(0.001)
1	0.227***	(0.003)
2	0.304***	(0.003)
3	0.260***	(0.003)
4	0.212***	(0.003)
5	0.166***	(0.003)
6	0.129***	(0.003)
7	0.096***	(0.003)
8	0.079***	(0.003)
9	0.065***	(0.003)
10-14	0.044***	(0.001)
15-19	0.023***	(0.002)
20-35	0.017***	(0.004)
Union status: current and of prior birth		
not in union	0.428***	(0.008)
union with first birth	1	
union but 1st birth before	1.135***	(0.022)
union but first birth in previous union	1.893***	(0.060)
Mother's age		
15-19	1.714***	(0.037)
20-24	1.124***	(0.011)
25-29	1	
30-34	0.836***	(0.010)
35-39	0.430***	(0.012)
40-44	0.102***	(0.009)
45-49	0.010***	(0.004)
Cohort		
1940-1949	1.079***	(0.012)
1950-1959	1	
1960-1969	1.072***	(0.010)
1970-1979	1.001	(0.019)
Sample size	605920	
Degrees of freedom	25	
Log-Likelihood	-134144	
BIC	268621	

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Table 3: Estimated coefficients and standard errors for intensity of conception leading to a third birth.

Covariate	exp(β)	se(β)
Age of second child		
0	0.054***	(0.001)
1	0.091***	(0.002)
2	0.102***	(0.002)
3	0.095***	(0.002)
4	0.079***	(0.002)
5	0.068***	(0.002)
6	0.058***	(0.002)
7	0.050***	(0.002)
8	0.041***	(0.002)
9	0.037***	(0.002)
10-14	0.025***	(0.001)
15-19	0.014***	(0.002)
20-35	0.013***	(0.004)
Union status: current and of prior births		
not in union	0.888***	(0.035)
in union that produced the 1st and 2nd birth	*1*	
in union with 2nd birth but 1st birth out of union	1.226***	(0.031)
in union with 2nd birth but 1st birth in previous union	1.510***	(0.074)
in union, but all births before current union and at least one out of union	1.845***	(0.080)
in union, but all births in prior union	4.466***	(0.205)
Mother's age		
15-24	1.948***	(0.035)
25-29	*1*	
30-34	0.660***	(0.011)
35-39	0.331***	(0.010)
40-44	0.061***	(0.006)
45-49	0.009***	(0.003)
Cohort		
1940-1949	1.102***	(0.017)
1950-1959	*1*	
1960-1969	1.102***	(0.018)
1970-1979	1.111*	(0.048)
Sample size	652453	
Degrees of freedom	26	
Log-Likelihood	-77940	
BIC	156229	

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Table 4: Estimated coefficients and standard errors for intensity of conception leading to a fourth birth.

Covariate	exp(β)	se(β)
Age of third child		
0	0.051***	(0.002)
1	0.078***	(0.003)
2	0.071***	(0.003)
3	0.070***	(0.003)
4	0.059***	(0.003)
5	0.054***	(0.003)
6	0.047***	(0.003)
7	0.047***	(0.003)
8	0.035***	(0.003)
9	0.034***	(0.003)
10-14	0.025***	(0.002)
15-19	0.016***	(0.003)
20-35	0.005***	(0.003)
Union status: current and of prior births		
not in union	1.271***	(0.058)
union with 1st 2nd and 3rd birth	1	
union with 2nd and 3rd birth but 1st birth before current union	1.322***	(0.054)
union with 3rd birth but 1st and 2nd before current union	1.713***	(0.089)
union but first three before current union	3.568***	(0.238)
Mother's age		
15-24	2.145***	(0.084)
25-29	1	
30-34	0.542***	(0.017)
35-39	0.294***	(0.013)
40-44	0.079***	(0.008)
45-49	0.006***	(0.003)
Cohort		
1940-1949	1.239***	(0.035)
1950-1959	1	
1960-1969	1.071*	(0.036)
1970-1979	0.999	(0.112)
Sample size	278178	
Degrees of freedom	25	
Log-Likelihood	-25285	
BIC	50884	

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Table 5: Estimated coefficients and standard error for the intensity to form a first union.

Covariate	exp(β)	se(β)	Covariate		exp(β)	se(β)
Age of ego			**Parity and age of youngest child**			
15	0.004***	(0.000)	no births	not pregnant	1	
16	0.015***	(0.000)		pregnant	10.294***	(0.132)
17	0.042***	(0.001)	one birth	age 0-3y	1.374***	(0.028)
18	0.090***	(0.001)		age 3-7y	0.947	(0.033)
19	0.136***	(0.001)		age >7y	1.080	(0.052)
20	0.176***	(0.002)		pregnant	1.944***	(0.100)
21	0.203***	(0.002)	two births	age 0-3y	1.045	(0.044)
22	0.210***	(0.002)		age 3-7y	0.914	(0.064)
23	0.205***	(0.003)		age >7y	1.593***	(0.123)
24	0.191***	(0.003)		pregnant	1.195	(0.139)
25	0.171***	(0.003)	three births	age 0-3y	0.803**	(0.067)
26	0.145***	(0.003)		age 3-7y	0.755*	(0.099)
27	0.131***	(0.003)		age >7y	1.936***	(0.216)
28	0.117***	(0.003)	**Cohort**			
29	0.106***	(0.003)	1940-1949		0.979*	(0.009)
30	0.082***	(0.003)	1950-1959		1	
31	0.074***	(0.003)	1960-1969		0.902	(0.008)
32	0.070***	(0.003)	1970-1979		0.694	(0.007)
33	0.061***	(0.003)				
34	0.044***	(0.003)				
35	0.047***	(0.003)				
36	0.042***	(0.003)				
37	0.038***	(0.003)				
38	0.032***	(0.003)				
39	0.026***	(0.003)				
40	0.024***	(0.003)				
41	0.023***	(0.003)				
42	0.017***	(0.002)				
43	0.016***	(0.003)				
44	0.022***	(0.003)				
45+	0.013***	(0.001)				
Sample size	1276128					
Degrees of freedom	46					
Log-Likelihood	-117616					
BIC	235878					

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Table 6: Estimated coefficients and standard error for the intensity of entering the most recent higher-order union.

Covariate			exp(β)	se(β)	Covariate	exp(β)	se(β)
Time since of first union					**Ego's age**		
0			0.279***	(0.009)	15-24	0.952	(0.029)
1			0.154***	(0.005)	*25-29*	1	
2			0.134***	(0.005)	30-34	0.811***	(0.023)
3			0.131***	(0.005)	35-39	0.661***	(0.025)
4			0.114***	(0.005)	40-44	0.471***	(0.022)
5			0.109***	(0.006)	45-49	0.334***	(0.021)
6			0.106***	(0.006)	**Cohort**		
7			0.090***	(0.006)	1940-1949	0.818***	(0.023)
8			0.102***	(0.007)	1950-1959	1	
9			0.096***	(0.007)	1960-1969	1.220***	(0.031)
10			0.104***	(0.005)	1970-1979	1.471***	(0.060)
Union status of prior births							
no births		not pregnant	1				
		pregnant	1.648***	(0.137)			
one birth	not in union	age 0-3y	0.508***	(0.042)			
		age 3-7y	0.856*	(0.066)			
		age >7y	0.779**	(0.060)			
		pregnant	0.859	(0.166)			
	in previous union	age 0-3y	0.636***	(0.034)			
		age 3-7y	0.788***	(0.030)			
		age >7y	0.745***	(0.029)			
		pregnant	1.737***	(0.164)			
two births	one or both out of union	age 0-3y	0.610***	(0.043)			
		age 3-7y	0.765***	(0.058)			
		age >7y	0.805**	(0.057)			
		pregnant	1.133	(0.211)			
	both in previous union	age 0-3y	0.638***	(0.046)			
		age 3-7y	0.701***	(0.033)			
		age >7y	0.768***	(0.031)			
		pregnant	2.194***	(0.283)			
three births	one or more out of union	age 0-3y	0.671***	(0.062)			
		age 3-7y	0.762**	(0.075)			
		age >7y	0.883	(0.078)			
	all in previous union	age 0-3y	0.665**	(0.083)			
		age 3-7y	0.782**	(0.060)			
		age >7y	0.804***	(0.046)			
Sample size			190528				
Degrees of freedom			42				
Log-likelihood			-41105				
BIC			82721				

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Table 7: Estimated coefficients and standard error for intensity of dissolution of first union.

Covariate		exp(β)	se(β)	Covariate	exp(β)	se(β)
Union duration				**Ego's age**		
0-1		0.011***	(0.000)	15-24	1.049*	(0.024)
1-2		0.019***	(0.001)	*25-29*	*1*	
2-4		0.025***	(0.001)	30-34	0.994	(0.026)
4-6		0.029***	(0.001)	35-39	1.016	(0.036)
6-8		0.031***	(0.001)	40-44	0.925	(0.040)
8-10		0.033***	(0.001)	45-49	0.880*	(0.047)
10-12		0.031***	(0.001)	**Cohort**		
12-14		0.030***	(0.001)	1940-1949	0.624***	(0.012)
14+		0.027***	(0.001)	*1950-1959*	*1*	
Union status of prior births				1960-1969	1.645***	(0.029)
no birth in current union	*no births at all*	*1*		1970-1979	2.918***	(0.078)
	no births, pregnant	0.247***	(0.017)			
	all births < union	1.253***	(0.049)			
	one birth < current union, pregnant	0.620*	(0.124)			
	two births < current union, pregnant	1.235	(0.577)			
one birth in current union	age 0-3y	0.468***	(0.012)			
	age 3-7y	0.775***	(0.023)			
	age >7y	0.736***	(0.027)			
	pregnant	0.184***	(0.015)			
two births, one in current union	age 0-3y	0.841*	(0.066)			
	age 3-7y	0.833*	(0.075)			
	age >7y	0.777**	(0.063)			
	pregnant	0.468**	(0.131)			
two births in current union	age 0-3y	0.311***	(0.011)			
	age 3-7y	0.457***	(0.016)			
	age >7y	0.568***	(0.020)			
	pregnant	0.199***	(0.026)			
three births, one in current union	age 0-3y	0.593***	(0.077)			
	age 3-7y	0.716**	(0.091)			
	age >7y	0.891	(0.095)			
three births, two in current union	age 0-3y	1.017	(0.181)			
	age 3-7y	1.107	(0.214)			
	age >7y	1.211	(0.203)			
three births in current union	age 0-3y	0.275***	(0.015)			
	age 3-7y	0.403***	(0.021)			
	age >7y	0.547***	(0.025)			
Sample size		1912298				
Degrees of freedom		42				
Log-Likelihood		-84136				
BIC		168880				

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Table 8: Estimated coefficients and standard error for the intensity of dissolution of most recent higher-order union.

Covariate		exp(β)	se(β)	Covariate	exp(β)	se(β)
Union duration				**Ego's age**		
0-1		0.011***	(0.001)	15-24	0.559***	(0.077)
1-2		0.014***	(0.002)	*25-29*	*1*	
2-5		0.015***	(0.002)	30-34	1.453***	(0.129)
5-8		0.016***	(0.002)	35-39	2.511***	(0.242)
8-11		0.015***	(0.002)	40-44	2.940***	(0.325)
11-14		0.012***	(0.002)	45-49	3.635***	(0.471)
14+		0.010***	(0.002)	**Cohort**		
Union status of prior births				1940-1949	0.607***	(0.043)
no births in current union	*no births*	*1*		*1950-1959*	*1*	
	no births, pregnant	0.668	(0.141)	1960-1969	2.175***	(0.154)
	one or more out of union	1.006	(0.092)	1970-1979	6.102***	(0.792)
	all births in previous union	0.700***	(0.054)			
	one birth < current union, pregnant	0.322**	(0.134)			
	two births < current union, pregnant	0.451*	(0.175)			
one birth in current union	age 0-3y	0.639***	(0.076)			
	age 3-7y	0.909	(0.135)			
	age >7y	0.728	(0.151)			
	pregnant	0.129***	(0.067)			
two births, one in current union	age 0-3y	0.541***	(0.080)			
	age 3-7y	0.572***	(0.095)			
	age >7y	0.886	(0.139)			
	pregnant	0.464	(0.273)			
two births in current union	age 0-3y	0.338***	(0.070)			
	age 3-7y	0.744	(0.139)			
	age >7y	0.948	(0.212)			
	pregnant	0.000***	(0.000)			
three births, one in current union	age 0-3y	0.542**	(0.102)			
	age 3-7y	0.531**	(0.109)			
	age >7y	0.720	(0.149)			
three births, two in current union	age 0-3y	0.442**	(0.113)			
	age 3-7y	0.627*	(0.146)			
	age >7y	0.693	(0.182)			
three births in current union	age 0-3y	0.382*	(0.162)			
	age 3-7y	0.282*	(0.139)			
	age >7y	0.074*	(0.075)			
Sample size		111006				
Degrees of freedom		41				
Log-Likelihood		-7643				
BIC		15762				

Legend: * p<0.05, ** p<0.01, *** p<0.001.

Figure 1: Expected number of births for childless women by union duration in years.

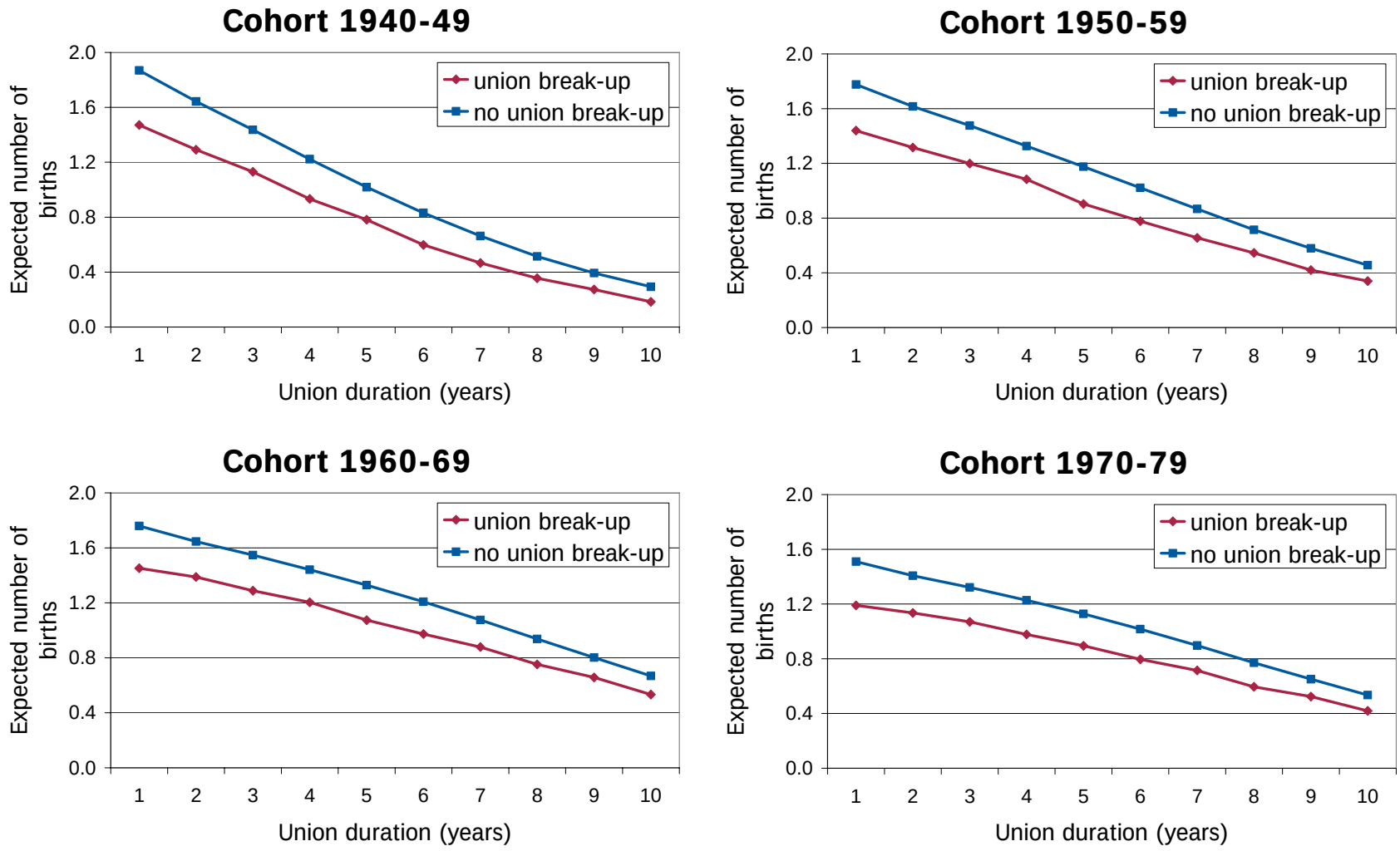

Figure 2: Expected number of further births for women at parity 1 by years since conception of first child.

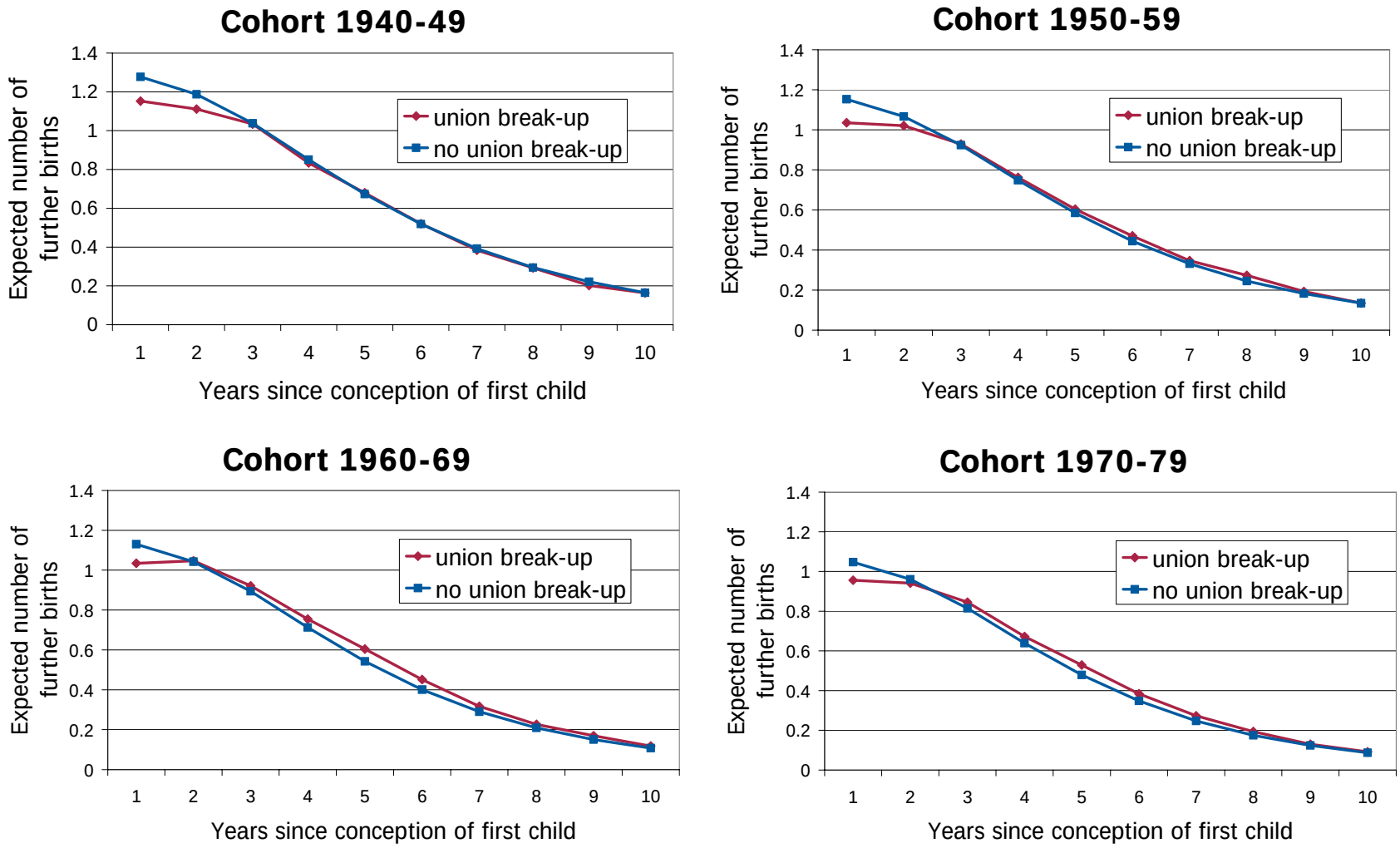

Figure 3: Expected number of further births for women at parity 2 by years since conception of second child.