Int J Public Health (2013) 58:43–55
DOI 10.1007/s00038-012-0390-9

ORIGINAL ARTICLE

Economic recession and first births in Europe: recession-induced postponement and recuperation of fertility in 14 European countries between 1970 and 2005

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Received: 14 November 2011 / Accepted: 25 June 2012 / Published online: 26 July 2012

Abstract
Objectives The economic crisis that emerged after 2008 caused speculation about further postponement of fertility and a recession-induced baby-bust in countries affected by the economic downturn. This paper aims to disentangle short-term and long-term effects of economic context on entry into parenthood and explores variation of postponement and recuperation by age, gender, educational level and welfare state context.
Methods Random-effects complementary log–log models including macro-level indicators are used to analyse longitudinal microdata on 12,121 first births to 20,736 individuals observed between 1970 and 2005.
Results Adverse economic conditions and high unemployment significantly reduce first birth hazards among men and women below age 30, particularly among the higher educated. After age 30 economic context continues to affect first birth hazards of men, but not for women. Recuperation of fertility is further associated with access to labour markets and entry into cohabiting unions.
Conclusions The continuing postponement of first births has clear medical consequences and implications for health policies. Preventive policies should take access to labour markets for younger generations into account as an important factor driving postponement.

This article is part of the special issue "Life course influences on health and health inequalities: moving towards a Public Health perspective".

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Keywords First births · Recession · Late fertility · Unemployment · Education · Union formation

Introduction

Postponement of first births since the early 1970s has led to mean ages at first birth increasing to 28–30 years in most European countries and an increasing number of men and women delaying their first birth after age 35 (Council of Europe 2005). The medical consequences of delayed parenthood are well documented. Pregnancy at older ages is related to a higher incidence of chromosomal abnormalities (e.g., trisomia 21) and increased foetal death (including ectopic pregnancy and miscarriage). Similarly, women after age 35 run a higher risk of gestational diabetes and pregnancy induced hypertension. These are associated with macrosomia and in more severe cases with foetal growth reduction, preeclampsia and placenta abruption, all of which may necessitate preterm delivery (Heffner 2004; van Katwijk and Peeters 1998). A higher prevalence of multiple births raises the risk for placenta praevia, preterm birth and low birth weight. Labour complications (e.g. birth asphyxia and protracted labour) are also more common with older women (ESHRE Capri Workshop Group 2005; Gilbert et al. 1999; Schmidt et al. 2012; van Katwijk and Peeters 1998). Finally, women experience a decline in the number and quality of oocytes after age 30, the main cause of fecundity declining with age (Broekmans et al. 2006; Schmidt et al. 2012). The increased incidence of age-related fecundity problems entails more frequent use of assisted reproductive treatments (ART), which have been shown to be less effective among older women (Broekmans et al. 2006; ESHRE Capri Workshop Group 2005; Feinberg et al. 2005; Gustafsson 2001; Nelson 2004; Schmidt et al. 2012).

The postponement of fertility in Europe coincides with expanding tertiary education and unemployment levels rising rapidly with successive economic recessions in the early 1970s, the mid-1980s and the mid-1990s (OECD 2011). The economic crisis emerging in 2008 caused speculation about further postponement of fertility and a recession-induced baby-bust in countries affected by the economic downturn. The pathways through which economic context delays family formation include rising unemployment, falling employment stability, rising uncertainty about the future, changing housing markets, but also prolonged enrolment in education and delayed union formation (Sobotka et al. 2011). Although the empirical literature provides evidence of economic context affecting individuals at different stages in the life-course, research distinguishing short-term and long-term effects of economic context on fertility is currently lacking. This study aims to explore (1) how economic context has affected entry into parenthood between 1970 and 2005; (2) how recession-induced postponement of fertility varies by age, gender, educational level and welfare state context; (3) whether fertility forgone at younger ages is recuperated later in the life-course; and (4) how this recuperation varies by education, work status, union status and welfare state context.

Education, opportunity costs and fertility

Education has short- and long-term effects on fertility (Lappegard and Ronsen 2005). In the short-term, enrolment in education significantly reduces the rate of entering a union, getting married or entering parenthood compared to non-students (Hoem 1986). In the long run, education has consequences on career and income trajectories that affect fertility. In this respect, economic theories distinguish income and price effects. The income effect implies that the earning potential of higher educated makes them better equipped to deal with the direct costs of childbearing (Becker 1981). However, as the cost of time spent on non-market activities increases, the opportunity cost of children increases as well, leading to a reduced demand for children (Becker 1981). The balance between income effects and opportunity costs depends critically on the compatibility of labour force participation and family formation, and is likely to vary considerably by age, gender and societal context.

Income effects, opportunity costs and gender

The relationship between income, opportunity costs and fertility varies by gender, due to the gendered division of labour in households. As family formation is more likely to reduce the time spent on paid labour by women than men, the income effect is assumed to prevail for men, whereas opportunity costs are assumed to outweigh income effects for women. Hence, the effect of human capital on fertility is assumed to be negative for women, but positive for men.

Economic recession is likely to entail a gendered response to unemployment and employment instability. Recession adversely affects the income position of men in their role of breadwinners, thus negatively affecting family formation and giving rise to a procyclical relation between economic context and fertility. For women reduced employment opportunities may lower opportunity costs and increase fertility, giving rise to a weaker procyclical or even counter-cyclical relationship. Despite some evidence of high unemployment benefits enhancing birth hazards in Finland (Vikat 2004) and unemployment enhancing second and third birth hazards in Norway (Kravdal 2002), empirical evidence grants little support for a counter-cyclical relationship between economic trends and fertility (Sobotka et al. 2011). The loss of earnings due to childbearing may be lower during recession (i.e. lower opportunity costs), but this effect is unlikely to prevail if having children early hampers long-term income and career development.

Opportunity costs, career paths and the timing of fertility

Higher educated people are more likely to enter long-term career tracks where earnings increase gradually with age and experience (Liefbroer and Corijn 1999). Highly educated women are thus assumed to postpone childbearing until they are sufficiently established in their career track, so that a temporary break from the labour market is considered less damaging for future career development (Kreyenfeld 2000; Liefbroer and Corijn 1999). As job opportunities are determined by economic conditions, particularly for younger people entering the labour market, we expect higher educated women to further delay childbearing under adverse economic conditions (De Wachter and Neels 2011; Neels 2010; Sobotka et al. 2011).

Opportunity costs and societal context

With female educational attainment and labour force participation rising in recent decades, high fertility is increasingly associated with gender equity and social policies that reduce the incompatibility between women's roles in the family and the labour market (Andersson et al. 2009; Esping-Andersen 1999; McDonald 2000). Although social democratic welfare regimes are considered to ease the worker–mother conflict—thus stimulating recuperation of fertility at older ages—Neyer and Andersson (2008) show that the income-centred parental leave system in Sweden has put additional emphasis on establishing a secure labour market position prior to family formation,

thus (unintentionally) reinforcing the procyclical character of Swedish fertility in the 1990s (Neyer and Andersson 2008). Similarly, Lappegard and Ronsen (2005) state that for women in Norway—who usually return to work when their youngest child is quite young—it has become increasingly important to get established in the labour market before motherhood. In sum, family policies reducing the incompatibility between work and family are considered important to support recuperation of fertility, but do not necessarily reduce the delaying effect of unemployment on parenthood.

Methods

Data and response rate

The analysis uses data from the European Social Survey (ESS): a general purpose, repeated cross-sectional survey organized in 30 European countries. The third round of the ESS (2006) provides detailed demographic information on the life-course and the timing of key life-events (Matsuo et al. 2009). The analysis uses data on 10,615 women and 10,121 men in 14 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom (Table 1). Between entering the risk set for parenthood at age 15 and censoring at age 49, these individuals have been observed for 260,219 person-years between 1970 and 2005 during which 12,121 first births occurred.

Individual-level covariates

The multivariate analysis includes following individual-level covariates: (1) age, (2) gender, (3) educational level, (4) duration since entry into the labour market and (5) duration since entry into first cohabitation.

The *educational variable* is based on the number of years of full-time education completed. Since educational classifications are difficult to compare across countries, the number of years in full-time education was collapsed into four categories representing the quartiles of the educational distribution in each of the countries considered. The first quartile serves as the reference category throughout the analysis.

The time-varying covariate on *union status* measures the duration in period difference since the first cohabitation with a partner or spouse for a period of 3 months or more. Since first births are more frequent during the first years of cohabitation—resulting in a skewed distribution of first birth hazards—duration since first cohabitation is collapsed into five categories: (1) never cohabited or first year of cohabitation (reference category), and subsequently (2) 1–5 years, (3) 6–10 years, (4) 11–15 years and (5) 16 years or more since first cohabitation.

Table 1 Country-specific descriptives: response rate, number of cases included in the analysis, number of person-years and number of first births by gender

Country	Response rate	Number of individuals		Number of person-years		Number of first births	
		Women	Men	Women	Men	Women	Men
Austria	64.0	983	854	10,929	10,936	575	419
Belgium	61.0	675	633	7,411	7,937	447	360
Switzerland	51.5	724	635	10,144	9,791	430	330
Germany	54.5	1,051	1,090	12,184	14,617	641	574
Denmark	50.8	534	566	6,330	7,787	357	350
Spain	65.9	689	699	8,266	9,079	378	335
Finland	64.4	676	716	8,010	9,278	394	412
France	46.0	779	739	9,111	9,762	521	462
United Kingdom	54.6	900	842	10,984	11,467	571	453
Ireland	56.8	670	569	7,872	8,132	408	277
Netherlands	59.8	774	685	10,407	10,517	470	343
Norway	65.5	653	738	7,321	9,235	417	437
Portugal	72.8	796	574	8,190	6,836	533	338
Sweden	65.9	711	781	7,807	9,849	452	437
Total	–	10,615	10,121	124,996	135,223	6,594	5,527

Source: European Social Survey, ESS3 2006 (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom, 1970–2005)

The time-varying covariate on *employment status* measures the number of years in period difference since the first entry in paid employment or paid apprenticeship of 20 h or more per week for a period of at least 3 months. Given the nonlinear relationship between birth hazards and duration since first employment, the latter is collapsed into six categories: (1) never had paid employment or employed for less than 3 years (reference category) and subsequently (2) 5–9 years, (3) 10–14 years, (4) 15–19 years, (5) 20–24 years and (6) 25 years or more since first employment.

Macro-level variables

The literature on economic determinants of fertility has identified the aggregate-level unemployment rate as a relevant indicator for the impact of economic context on birth hazards (Adsera 2005; Adsera and Menendez 2009; Van Giersbergen and De Beer 1997). At the macro-level, measures of unemployment and consumer confidence reflect the impact of recession on fertility more closely than general indicators as GDP (Sobotka et al. 2011). Micro-level studies combining measures of unemployment at the individual-level and aggregate-level find that the effects of the latter persist after controlling for unemployment spells at the individual-level, indicating that the perception of economic uncertainty (employment instability, downward income mobility,…) plays an important role in establishing the relationship between economic conditions and fertility outcomes at the individual-level (Adsera 2005; Hoem 2000; Kravdal 2002). This study combines longitudinal microdata from the ESS with time-series of unemployment rates (calculated as a percentage of the civilian labour force) between 1956 and 2005 (OECD 2011). The overall unemployment rate is used as a covariate as time-series broken down by gender and age are not available over the entire period considered.

To test whether the effect of the macro-level unemployment rate varies by welfare state context, four clusters of countries are considered based on Thévenon's typology of family policies in Europe: (1) Northern European countries characterized by substantial support for working parents with children (Denmark, Finland, Norway and Sweden); (2) Southern European countries characterized by 'deficit' policies, regardless of the indicators considered (Spain and Portugal); (3) Anglo-Saxon countries with support targeted on pre-school children and poor households, but lower support for reconciling work and family (UK, Ireland, Switzerland and the Netherlands); and (4) a cluster of central European countries holding an intermediate position (Austria, Germany, France and Belgium) (Thévenon 2008).

Model specifications

As the timing of the first birth is measured in years, the analysis uses random-effects discrete-time hazard models of first births to men and women aged 15–49 in the 14 countries considered (Allison 1982; Singer and Willett 2003). Using a complementary log–log link function, the antilog of the parameter estimates, e(b), allows for an interpretation in terms of hazard ratios. All models include a piecewise linear spline transformation of age as a fixed effect, with nodes at the end of the years when a person turns 20, 25, 30, 35, 40 and 45, respectively (Kravdal and Rindfuss 2008; Suits et al. 1978).

Between 1970 and 2005, fertility schedules by age show considerable variation (Frejka and Sardon 2006). Postponement of parenthood has resulted in a substantial decline of fertility rates at younger ages, later followed by an increase of fertility in older age-groups. The onset of fertility postponement itself is subject to substantial variation among countries in Europe (Council of Europe 2005; Sobotka 2004). The trend of fertility postponement started in the Nordic countries and subsequently spread to Western Europe, Southern Europe, and more recently Eastern Europe (Council of Europe 2005). To allow sufficient flexibility to accommodate such trends, all models include a random APC effect that allows deviations from the fixed-effects hazard function by combinations of (1) five-year age-group (A); (2) five-year time-period between 1970 and 2005 (P); and (3) country (C).

Two sets of models are estimated. The first set estimates the effects of individual-level and contextual variables on first birth hazards between ages 15 and 29. Only short-term effects of economic context with a lag of 1 year are considered in this age-group. The second set of analyses focuses on first birth hazards between ages 30 and 49 and also considers the effect of economic context with lags from 2 to 10 years. All models are stratified by gender.

Results

Age-specific first birth rates by gender

The age-pattern of fertility varies significantly by gender (Table 2). The mean age at first birth for women is 29.0 years, whereas men are 31.4 years on average. A null model only including a fixed age-effect (results not shown) indicates that 8.1 % of the variation in first birth hazards among women is due to between-country differences and age-specific trends in birth hazards within countries ($-2LL = 36{,}348.90$, rho $= 0.0806$), with the remainder of the variance being situated at the individual level. Similarly

Table 2 Age-specific first birth hazards by gender and 5-year age-groups, EU-14

Age	Number of person-years		Number of events (first births)		Age-specific first birth rates	
	Women	Men	Women	Men	Women	Men
15–19	40,432	37,077	554	94	0.0137	0.0025
20–24	34,918	35,756	2,168	1,152	0.0621	0.0322
25–29	22,215	27,024	2,392	2,210	0.1077	0.0818
30–34	11,240	15,597	1,116	1,408	0.0993	0.0903
35–39	6,726	8,965	304	510	0.0452	0.0569
40–44	5,085	6,192	52	121	0.0112	0.0195
45–49	4,350	4,612	3	32	0.0007	0.0069
Total	124,966	135,223	6,594	5,527	0.0528	0.0409

Source: European Social Survey, ESS3 2006 (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom, 1970–2005)

among men, 8.6 % of the variance is situated at the APC level ($-2LL = 26{,}084.42$, rho = 0.0864).

Multivariate models age-group 15–29

A significant procyclical relationship emerges between economic context and first birth hazards at ages 15–29, both for men and women (Table 3, model 1).[1] A percentage point increase in the unemployment rate reduces first birth hazards by 4.6 % among women ($(1 - 0.945) \times 100$) and 5.7 % among men. A 10 percentage point increase in unemployment rate—routinely witnessed in European countries between the mid-1970s and mid-1980s—reduces first birth hazards in this age-group by 37.5 % among women and 44.4 % among men. Increasing education is also associated with significantly lower first birth hazards between ages 15 and 29, particularly among women. First birth hazards decrease by 18.3–66.4 % among women with higher levels of education. Controlling for these factors, the proportion of the variance in first births accounted for by deviations from the fixed effects by age group, time-period and country decreases to 4.1 %, indicating that a substantial part of the variation in birth hazards at this level during the period considered is associated with increasing education and variations in economic context.

Allowing variation of the unemployment effect by age-groups (model 2) significantly improves model fit for women ($p < 0.001$ for $\Delta -2LL = 21.34$ and $\Delta df = 2$), but not for men ($p > 0.050$ for $\Delta -2LL = 0.34$ and $\Delta df = 2$). Among women aged 15–19, a percentage point increase in the unemployment rate reduces first birth hazards by 2.9 %. The effect is significantly more articulated among women aged 20–24 ($e(b) = 0.971 \times 0.963 = 0.935$), but not among women aged 25–29. The effect is significantly more articulated among higher educated men and women (model 3), but no significant variation is found in terms of welfare state context (model 4).

Duration since first entry into the labour market has a significant impact on first birth hazards. Compared to individuals who never had a job or entered their first job less than 5 years ago, first birth hazards are significantly higher among men and women who entered the labour market more than 5 years earlier (model 5). Similarly, compared to individuals who have never entered a cohabiting union, first birth hazards are significantly higher among men and women who entered their first cohabiting union 1–5 years earlier and individuals who entered their first union more than 6 years earlier. The effect of the macro-level unemployment rate on first birth hazards remains significant after controlling for individual time-varying covariates on employment and union status.

Multivariate models, age-group 30–49

The effect of educational attainment reverses after age 30 (Table 4, model 7). Compared to the lowest educational quartile, female first birth hazards increase by 19.4–23.1 % among groups with higher educational attainment. The educational gradient is more pronounced among men with birth hazards being 44.2 % higher in the highest educational group.

The effect of economic context on birth hazards varies significantly by gender. After age 30, female first birth hazards are no longer significantly affected by economic context in the previous year. Long-term effects of economic context on first birth hazards were tested using lags

[1] The model including education and the macro-level unemployment rate constitutes a highly significant improvement over the null model, both for men ($\Delta -2LL = 26{,}084.42 - 25{,}790.86 = 293.56$ with $\Delta df = 22 - 18 = 4$, $p < 0.001$) and women ($\Delta -2LL = 36{,}348.90 - 35{,}579.40 = 769.5$ with $\Delta df = 22 - 18 = 4$, $p < 0.001$).

for the unemployment rate ranging from 2 up to 10 years (results not shown). No significant relationship was found between first birth hazards after age 30 and unemployment rates 2–5 years earlier, whereas significant positive associations emerged with the aggregate-level unemployment rate 6–10 years earlier. Specifying a 10-year lag, first birth hazards after age 30 increase by 4.3 % per unit increase in the unemployment rate experienced at younger

Table 3 Exponentiated coefficients (hazard ratios) from random-effects complementary log–log model of first birth hazard, women/men aged 15–29, 1970–2005

	Model 1				Model 2				Model 3			
	Women		Men		Women		Men		Women		Men	
	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig
Individual-level covariates												
Age splines												
Spline1	1.851	***	2.211	***	1.967	***	2.265	***	1.852	***	2.212	***
Spline2	1.163	***	1.391	***	1.148	***	1.396	***	1.163	***	1.391	***
Spline3	1.053	***	1.095	***	1.038	***	1.095	***	1.053	***	1.095	***
Education (lowest quartile is reference)												
Medium low	0.817	***	0.908	**	0.817	***	0.882	**	0.805	***	0.820	**
Medium high	0.561	***	0.714	***	0.561	***	0.714	***	0.614	***	0.927	
High	0.336	***	0.481	***	0.336	***	0.481	***	0.405	***	0.566	***
Country (Austria is reference)												
Belgium	1.466	***	1.380	**	1.474	***	1.379	**	1.469	***	1.389	**
Switzerland	0.597	***	0.540	***	0.598	***	0.540	***	0.597	***	0.544	***
Germany	1.131		1.150		1.132		1.150		1.131		1.163	
Denmark	1.140		0.986		1.148		0.986		1.139		0.997	
Spain	1.287	*	1.303	*	1.290	**	1.301	*	1.285	*	1.307	*
Finland	1.086		1.122		1.090		1.121		1.090		1.142	
France	1.241	*	1.245		1.242	**	1.244		1.245	*	1.267	*
United Kingdom	1.146		1.110		1.142		1.109		1.142		1.122	
Ireland	1.454	***	1.100		1.455	***	1.099		1.453	***	1.114	
Netherlands	0.724	***	0.633	***	0.728	***	0.633	***	0.722	***	0.637	***
Norway	1.059		1.067		1.060		1.067		1.052		1.066	
Portugal	1.472	***	1.307	**	1.472	***	1.306	**	1.469	***	1.323	**
Sweden	1.130		0.826		1.130		0.825		1.124		0.832	
Macro-level covariates												
Unemployment (lagged 1 year)												
Main/refgroup	0.954	***	0.943	***	0.971	***	0.954	*	0.960	***	0.953	***
Unemploy × age (age-group 15–19 is reference)												
Urlag1 × age2024					0.963	***	0.985					
Urlag1 × age2529					0.991		0.988					
Unemploy × edu (lowest quartile of education is reference)												
Urlag1 × eduQ2									1.002		1.015	
Urlag1 × eduQ3									0.985		0.955	***
Urlag1 × eduQ4									0.971	***	0.972	**
Model parameters												
Rho	0.0413	***	0.0446	***	0.0366	***	0.0445	***	0.0417	***	0.0446	***
N person-periods	97,565		99,857		97,565		99,857		97,565		99,857	
df	22		22		24		24		25		25	
Deviance (−2LL)	35,579.40		25,790.86		35,558.06		25,790.52		35,569.02		25,758.60	
AIC	35,623.40		25,834.85		35,606.06		25,838.52		35,619.02		25,808.59	
BIC	35,832.14		26,044.10		35,833.78		26,066.79		35,856.23		26,046.38	

Table 3 continued

	Model 4				Model 5				Model 6			
	Women		Men		Women		Men		Women		Men	
	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig
Individual-level covariates												
Age splines												
Spline1	1.850	***	2.210	***	1.823	***	2.151	***	1.551	***	1.921	***
Spline2	1.164	***	1.392	***	1.125	***	1.329	***	0.981		1.120	***
Spline3	1.053	***	1.095	***	1.054	***	1.067	***	1.041	***	1.039	**
Education (lowest quartile is reference)												
Medium low	0.819	***	0.906	**	0.813	***	0.925	*	0.816	***	0.858	***
Medium high	0.562	***	0.714	***	0.577	***	0.773	***	0.606	***	0.699	***
High	0.337	***	0.481	***	0.359	***	0.562	***	0.405	***	0.534	***
Country (Austria is reference)												
Belgium	1.646	***	1.462	**	1.534	***	1.470	***	1.521	***	1.516	***
Switzerland	0.553	***	0.529	***	0.591	***	0.516	***	0.585	***	0.573	***
Germany	1.191		1.180		1.132		1.121		1.127		1.310	**
Denmark	1.042		0.997		1.146		0.961		0.855		0.855	
Spain	1.112		0.997		1.335	**	1.293	*	2.122	***	2.199	***
Finland	0.990		1.136		1.090		1.096		0.988		1.112	
France	1.353	**	1.230	*	1.280	**	1.295	*	1.219		1.308	*
United Kingdom	1.022		1.134		1.159		1.099		1.120		1.166	
Ireland	1.265		1.154		1.501	***	1.161		2.308	***	1.859	***
Netherlands	0.651	***	0.644	**	0.735	***	0.659	***	0.728	**	0.726	**
Norway	0.979		1.056		1.087		1.117		1.013		1.092	
Portugal	1.331	**	1.139		1.529	***	1.294	**	1.842	***	1.623	***
Sweden	1.039		0.823		1.142		0.836		0.914		0.773	*
Duration since first job (never or <5 years is reference)												
5–9 years					1.378	***	1.456	***	1.100	**	1.134	***
≥10 years					1.230	***	1.631	***	1.003		1.227	***
Duration since first cohabitation (never cohabited or <1 year is reference)												
1–5 years									8.195	***	9.272	***
≥6 years									6.344	***	6.554	***
Macro-level covariates												
Unemployment (lagged 1 year)												
Main/refgroup	0.958	***	0.937	***	0.954	***	0.945	***	0.945	***	0.938	***
Unemploy (lagged 1 year) × country (cluster of northern countries is reference)												
Urlag1 × liberal	1.003		0.999									
Urlag1 × central	0.974		0.996									
Urlag1 × south	1.002		1.027									
Model parameters												
Rho	0.0397	***	0.0436	***	0.0395	***	0.0428	***	0.0570	***	0.0529	***
N person-periods	97,565		99,857		35,497.80		99,857		97,565		99,857	
df	25		25		24		24		26		26	
Deviance (−2LL)	35,575.52		25,787.48		35,497.80		25,705.96		32,008.48		22,917.96	
AIC	35,625.52		25,837.48		35,545.79		25,753.96		32,060.47		22,969.97	
BIC	35,862.72		26,075.27		35,773.51		25,982.24		32,307.17		23,217.27	

Source: European Social Survey, ESS3 2006 (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom, 1970–2005)

Significance levels: $p < 0.100$ (*), $p < 0.050$ (**), $p < 0.010$ (***)

Table 4 Exponentiated coefficients (hazard ratios) of random-effects complementary log–log model of first birth, women/men aged 30–49, EU-14, 1970–2005

	Model 7				Model 8				Model 9			
	Women		Men		Women		Men		Women		Men	
	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig
Individual-level covariates												
Age splines												
Spline 1	0.870	***	0.968	**	0.861	***	0.956	***	0.870	***	0.968	**
Spline 2	0.825	***	0.809	***	0.825	***	0.792	***	0.825	***	0.809	***
Spline 3	0.599	***	0.819	***	0.658	***	0.814	***	0.600	***	0.819	***
Spline 4	0.713		0.763	**	0.948		0.768	**	0.713		0.763	**
Education (lowest quartile is reference)												
Medium low	1.194	**	1.165	**	1.189	**	1.166	**	1.045	**	1.221	**
Medium high	1.272	***	1.365	***	1.281	***	1.366	***	1.257	***	1.402	***
High	1.231	***	1.442	***	1.248	***	1.444	***	1.130	***	1.493	***
Country (Austria is reference)												
Belgium	1.148		1.627	***	1.144		1.624	***	1.147		1.633	***
Switzerland	1.031		1.065		1.028		1.065		1.042		1.060	
Germany	0.874		1.009		0.875		1.006		0.875		1.010	
Denmark	0.982		1.668	***	0.984		1.661	***	0.986		1.672	***
Spain	0.771		1.732	***	0.766		1.731	***	0.765		1.753	***
Finland	1.045		1.582	***	1.045		1.575	***	1.024		1.588	***
France	1.055		1.619	***	1.057		1.614	***	1.058		1.622	***
United Kingdom	0.972		1.287	**	0.970		1.283	**	0.972		1.289	**
Ireland	0.837		1.238		0.835		1.230		0.836		1.237	
Netherlands	1.009		1.204		1.009		1.202		1.009		1.206	
Norway	1.272		1.541	***	1.273		1.537	***	1.273		1.544	***
Portugal	1.216		1.713	***	1.215		1.711	***	1.216		1.715	***
Sweden	1.404	**	1.736	***	1.402		1.730	***	1.411		1.740	***
Macro-level covariates												
Unemployment (lagged 1 year)												
Main/refgroup	0.995		0.981	**	0.995		0.982	**	0.995		0.981	**
Unemployment (lagged 10 years)												
Main/refgroup	1.043	***	0.996		1.041	***	0.989		1.032	*	1.001	
Unemployment (lagged 10 years) × age (age-group 30–34 is reference)												
Urlag1 × age3539					1.012		1.017	**				
Urlag1 × age4044					0.985		1.030	*				
Urlag1 × age4549					0.733		1.029					
Unemployment (lagged 10 years) × education (lowest quartile is reference)												
Urlag1 × eduQ2									1.023		0.991	
Urlag1 × eduQ3									1.004		0.995	
Urlag1 × eduQ4									1.015		0.993	
Model parameters												
Rho	0.0178	***	0.0005		0.0168	***	0.0001		0.0174	*	0.0006	
N person-periods	27,401		35,366		27,401		35,366		27,401		35,366	
Df	24		24		27		27		27		27	
Deviance (−2LL)	10,274.10		14,758.45		11,067.99		14,752.71		10,271.41		14,758.05	
AIC	10,322.10		14,806.45		10,321.99		14,806.71		10,325.41		14,812.05	
BIC	10,519.34		15,009.81		10,543.89		15,035.49		10,547.31		15,040.84	

Table 4 continued

	Model 10				Model 11				Model 12			
	Women		Men		Women		Men		Women		Men	
	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig
Individual-level covariates												
Age splines												
Spline 1	0.869	***	0.968	**	0.882	***	0.961	***	0.916	***	1.008	
Spline 2	0.825	***	0.808	***	0.852	***	0.813	***	0.891	***	0.865	***
Spline 3	0.599	***	0.819	***	0.604	***	0.820	***	0.623	***	0.837	***
Spline 4	0.712		0.763	**	0.714		0.769	**	0.721		0.775	**
Education (lowest quartile is reference)												
Medium low	1.191	**	1.164	**	1.142	**	1.159	**	1.092		1.040	
Medium high	1.270	***	1.361	***	1.191	***	1.369	***	1.066		1.119	*
High	1.228	***	1.437	***	1.153	***	1.474	***	1.064		1.140	*
Country (Austria is reference)												
Belgium	1.119		1.547	***	1.108		1.627	***	1.164		1.697	***
Switzerland	1.027		1.101		1.018		1.050		0.926		1.023	
Germany	0.865		0.994		0.871		1.000		0.837		1.042	
Denmark	0.937		1.609	***	0.878		1.655	***	0.888		1.588	***
Spain	1.133		2.032	***	0.785		1.732	***	0.958		1.943	***
Finland	1.002		1.540	***	1.026		1.555	***	1.006		1.567	***
France	1.035		1.564	***	1.035		1.624	***	1.097		1.581	***
United Kingdom	0.866		1.375	**	0.976		1.278	**	0.946		1.290	**
Ireland	0.684		1.354		0.857		1.293	*	1.194		1.631	***
Netherlands	0.901		1.286	*	0.997		1.211		1.056		1.381	***
Norway	1.253		1.536	***	1.259		1.555	***	1.164		1.563	***
Portugal	1.392	*	1.854	***	1.281		1.736	***	1.429	**	1.891	***
Sweden	1.378	*	1.727	***	1.373	**	1.716	***	1.304		1.589	***
Duration since first job (never or <5 years)												
5–9 years					1.348	***	1.184		1.173		0.843	
10–14 years					1.477	***	1.222	**	1.302	***	0.868	
15–19 years					1.217	*	1.292	**	1.098		0.913	
≥20 years					0.988		1.220	*	0.958		0.813	*
Duration since first cohabitation (never cohabited or <1 year is reference)												
1–5 years									10.271	***	13.41	***
6–10 years									6.893	***	8.314	***
11–15 years									5.241	***	5.563	***
≥16 years									3.278	***	4.272	***
Macro-level covariates												
Unemployment (lagged 1 year)												
Main/refgroup	0.996		0.984	**	0.995		0.982	**	0.992		0.991	
Unemployment (lagged 10 years)												
Main/refgroup	1.051	***	1.007		1.042	***	0.995		1.032	*	0.987	**
Unemployment (lagged 10 years) × country (cluster of northern countries is reference)												
Urlag1 × liberal	1.010		0.984									
Urlag1 × central	0.996		1.000									
Urlag1 × south	0.967		0.980									

Table 4 continued

	Model 10				Model 11				Model 12			
	Women		Men		Women		Men		Women		Men	
	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig	e(*b*)	Sig
Model parameters												
Rho	0.0187	*	0.0001		0.0168	*	0.0008		0.0221	**	0.0006	
N person-periods	27,401		35,366		27,401		35,366		27,401		35,366	
df	27		27		28		28		32		32	
Deviance (−2LL)	10,269.69		14,756.22		10,250.70		14,750.53		9,554.51		13,460.60	
AIC	10,323.69		14,810.22		10,306.70		14,806.53		9,618.51		13,524.60	
BIC	10,545.58		15,039.01		10,536.82		15,043.79		9,881.50		13,795.75	

Source: European Social Survey, ESS3 2006 (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom, 1970–2005)

Significance levels: $p < 0.100$ (*), $p < 0.050$ (**), $p < 0.010$ (***)

ages (model 7). Hence, the decline of female birth hazards at younger ages is partially compensated by an increase of first birth hazards after age 30. Variation of the unemployment effect by age—although not significant (model 8)—suggests that recuperation of first births among women is concentrated between ages 30 and 39. No significant variation of the unemployment effect is found in terms of educational level (model 9) or welfare state context (model 10).

Among men, the current economic context continues to exert a significant effect on first birth hazards after age 30, although the effect is less articulated than among younger men (model 7). After age 30, a percentage point increase in the unemployment rate reduces first births hazards by 1.8 %. No significant correlation is found between male birth hazards after age 30 and the unemployment rate experienced 6–10 years earlier. This conclusion remains unaltered when testing variation of this effect in terms of age (model 8), educational level (model 9) or welfare state context (model 10). Controlling for education and unemployment rate, male first birth hazards after age 30 are subject to significant regional variation, with hazards generally being somewhat lower in the more liberal welfare states (Ireland, Switzerland, Netherlands and United Kingdom), and particularly Austria and Germany.

The individual-level time-varying covariates shed additional light on recuperation of first births after age 30. Among men, first birth hazards are lowest among men who never or recently (<5 years) entered the labour market (model 11). Compared to this group, first birth hazards are 22–29 % higher among men who have been employed for at least 10 years. Women who never held a job or were only recently employed also have the lowest birth hazards, but recuperation is more concentrated among women who have been working between 5 and 14 years. Finally, delayed union formation is strongly associated with postponement of parenthood (model 12): birth hazards are low for men and women who have never been in a cohabiting union, whereas men and women who entered their first union 1–5 years earlier have the highest first birth hazards, suggesting that first births after age 30 take place at shorter union durations. Among women, delayed entry in unions of higher educated women accounts for the positive educational gradient on first birth hazards after age 30.

Discussion

This study aimed to explore: (1) how economic context has affected entry into parenthood between 1970 and 2005; (2) how recession-induced postponement of fertility varies by age, gender, educational level and welfare state context; (3) whether fertility is recuperated later in the life-course; and (4) whether this recuperation varies by education, work status, union status and welfare state context.

Considering the first aim, we find that deterioration of the economic context has negatively affected first birth hazards between 1970 and 2005 in the countries considered. Considering the second aim of the study, the effect of economic context varies significantly by age, gender and educational level. The effect is more articulated among individuals under age 30, particularly in age-groups 20–24 and 25–29. This finding—in tandem with the negative educational gradient under age 30—indicates that the prolonged enrolment in education and the difficult entry of younger generations into the labour market after 1970 have contributed significantly to the postponement of parenthood. Moreover, recession-induced postponement is significantly more articulated among the higher educated. As highly educated men and women are more oriented

towards long-term career tracks, parenthood is postponed until a temporary break from the labour market is considered less damaging for future career prospects. This implies additional postponement in a context of limited employment opportunities. In contrast to theories suggesting a counter-cyclical fertility pattern (Butz and Ward 1979), we find a procyclical effect of economic context on first births hazards. The effect is more pronounced among men, suggesting that male employment status continues to have a larger impact on family formation. Finally, the effect of economic context on first birth hazards did not vary significantly between clusters of countries having similar family policies. This is consistent with earlier findings stating that family policies—while supporting the combination of work and family formation—have put additional emphasis on securing a stable labour market position before entering parenthood (Neyer and Andersson 2008).

Considering the third and fourth aims of the study, a positive educational gradient is found on birth hazards after age 30, both for men and women. Current economic conditions no longer affect births hazards of women after age 30 and a significant positive correlation is found with unemployment rates experienced 6–10 years earlier. Adverse economic conditions experienced earlier in the life-course are thus compensated by elevated birth hazards between ages 30 and 39. No significant variation of this recuperation effect was found by education or welfare state context. In contrast, current economic conditions continue to affect male birth hazards after age 30 and no significant correlation is found with unemployment rates experienced 6–10 years earlier. Significant regional variation is found with birth hazards being lower in the Anglo-saxon cluster, Austria and Germany. Individual-level time-varying covariates indicate that women are most likely to recuperate first births 5–14 years after their first entry into employment, whereas recuperation among men is most pronounced 10–19 years after first employment. Postponement of union formation equally has a negative effect on first birth hazards, with recuperation of fertility after age 30 taking place at shorter union durations.

Limitations

The individual-level time-varying covariates do not reflect full histories of employment status and union status. Hence, the analysis only partially controls for intermediate variables that link economic context to individual-level fertility outcomes. Full histories should be incorporated in future research, together with information on qualitative aspects of relationships and type of employment (e.g. type and duration of contract, private versus public sector, wage, benefits,…). Second, the macro-level unemployment rates included in the models do not differentiate by age, gender or educational level. This is likely to entail an underestimation of the effect of economic context on fertility. Finally, the study has only considered first births and entry into parenthood. Additional research is required to assess the impact of economic context on progression to second and higher-order births.

Implications

The continuing postponement of first births has clear medical consequences and implications for health policies as investments are needed for ART and prenatal screening on a larger scale. Moreover, health promotion and prep-regnancy counselling are essential to make informed choices on the timing of parenthood. Informing the public is important, as treatments cannot fully compensate for age-related fecundity decline (ESHRE Capri Workshop Group 2005; Feinberg et al. 2005; Ozalp et al. 2003). As shown in this study, reducing unemployment and making the labour markets open and flexible to young age-groups may present important pathways for policy to reduce the effect of economic context on fertility postponement (Sobotka et al. 2011).

Conflict of interest The authors do not have any conflict of interest.

Appendix

See Table 5 as appendix table.

Table 5 Distribution of person-years by individual-level time-constant and time-varying covariates, women and men aged 15–49, 1970–2005

Covariates	Age-group 15–29		Age-group 30–49	
	Women	Men	Women	Men
Age (years)				
15–19	0.4144	0.3713	–	–
20–24	0.3579	0.3581	–	–
25–29	0.2277	0.2706	–	–
30–34	–	–	0.4102	0.4410
35–39	–	–	0.2455	0.2535
40–44	–	–	0.1856	0.1751
45–49	–	–	0.1588	0.1304
Education				
Lowest quartile	0.2115	0.2315	0.3100	0.3300
Lower medium quartile	0.2700	0.2769	0.2320	0.2402

Table 5 continued

Covariates	Age-group 15–29		Age-group 30–49	
	Women	Men	Women	Men
Higher medium quartile	0.2848	0.2585	0.2277	0.2049
Highest quartile	0.2338	0.2331	0.2303	0.2249
Duration since first employment (years)				
Never or <5	0.7242	0.6442	0.1185	0.0846
5–9	0.2075	0.2470	0.0856	0.0775
≥10	0.0683	0.1089	–	–
10–14	–	–	0.2085	0.2079
15–19	–	–	0.2313	0.2684
≥20	–	–	0.3562	0.3616
Duration since first cohabitation (years)				
Never cohabited or <1	0.7356	0.7849	0.3243	0.3642
1–5	0.2108	0.1754	0.1193	0.1523
≥6	0.0536	0.0397	–	–
6–10	–	–	0.1755	0.1796
11–15	–	–	0.1693	0.1443
≥16	–	–	0.2116	0.1597
N person-years	97,565	99,857	27,401	35,366

Source: European Social Survey, ESS3 2006 (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom, 1970–2005)

References

Adsera A (2005) Vanishing children: from high unemployment to low fertility in developed countries. Am Econ Rev 95:189–193. doi:10.1257/000282805774669763

Adsera A, Menendez A (2009) Fertility changes in Latin America in the context of economic uncertainty. Institute for the Study of Labour, Bonn. doi:10.1080/00324728.2010.530291

Allison PD (1982) Discrete-time methods for the analysis of event histories. In: Leinhardt S (ed) Sociological methodology. Jossey-Bass, San Francisco, pp 61–98

Andersson G, Kreyenfeld M, Tatjana M (2009) Welfare state context, female earnings and childbearing. In: XXVI population conference. IUSSP, Marrakech, Morocco

Becker G (1981) A treatise on the family. Harvard University Press, Cambridge, MA

Broekmans JF, Knauff EAH, te Velde ER, Macklon NS, Fauser BC (2006) Female reproductive ageing: current knowledge and future trends. Trends Endocrinol Metab 18:58–65. doi:10.1016/j.tem.2007.01.2004

Butz WP, Ward MP (1979) The emergence of countercyclical US fertility. Am Econ Rev 69:318–328

Council of Europe (2005) Recent demographic developments in Europe, 2004. Council of Europe Publishing, Council of Europe Publishing

De Wachter D, Neels K (2011) Educational differentials in fertility intentions and outcomes: family formation in Flanders in the early 1990s. Vienna Yearbook of Population Research 9:237–269. doi:10.1553/populationyearbook2011s227

ESHRE Capri Workshop Group (2005) Fertility and ageing. Hum Reprod Update 11:261–276

Esping-Andersen G (1999) Social foundations of postindustrial economies. Oxford University Press, Oxford. doi:10.1093/0198742002.001.0001

Feinberg EC, Bromer JG, Catherino WH (2005) The evolution of in vitro fertilization: integration of pharmacology, technology, and clinical care. J Pharmacol Exp Ther 313:935–942. doi:10.1124/jpet.104.080051

Frejka T, Sardon J-P (2006) First birth trends in developed countries: persisting parenthood postponement. Demogr Res 15:147–180. doi:10.4054/DemRes.2006.15.6

Gilbert WM, Nesbitt TS, Danielsen B (1999) Childbearing beyond age 40: pregnancy outcome in 24,032 cases. Obstet Gynecol 93:9–14. doi:10.1016/S0029-7844(98)00382-2

Gustafsson S (2001) Optimal age at motherhood. Theoretical and empirical considerations on postponement of maternity in Europe. J Popul Econ 14:225–247. doi:10.1007/s001480000051

Heffner LJ (2004) Advanced maternal age—how old is too old? New Engl J Med 351:1927–1929

Hoem JM (1986) The impact of education on modern family-union initiation. Eur J Popul 2:113–133. doi:10.4054/DemRes.2000.2.4

Hoem B (2000) Entry into motherhood in Sweden: the influence of economic factors on the rise and fall in fertility, 1986-1997. Demogr Res 2(4). doi:10.4054/DemRes.2000.2.4

Kravdal O (2002) The impact of individual and aggregate unemployment on fertility in Norway. Demogr Res 6:263–294. doi:10.4054/DemRes.2002.6.10

Kravdal O, Rindfuss RR (2008) Changing relationships between education and fertility: a study of women and men born in 1940 to 1964. Am Sociol Rev 73(5) doi:10.1177/000312240807300508

Kreyenfeld M (2000) Educational attainment and first births: East Germany before and after unification

Lappegard T, Ronsen M (2005) The multifaceted impact of education on entry inti motherhood. Eur J Popul 21:31–49. doi:10.1007/s10680-004-6756-9

Liefbroer AC, Corijn M (1999) Who, what, where, and when? Specifying the impact of educational attainment and labour force participation on family formation. Eur J Popul 15:45–75. doi:10.1023/A:1006137104191

Matsuo H, Symons K, Buellens K, Billiet J (2009) Response based quality assessment in the ESS—Round 3: an update for 23 countries. University of Leuven, Working Paper CeSO/SM, 2009(9), pp 1–64

McDonald P (2000) Gender equity in theories of fertility transition. Popul Dev Rev 26:427–439. doi:10.1111/j.1728-4457.2000.00427.x

Neels K (2010) Temporal variation in unemployment rates and their association with tempo and quantum of fertility: some evidence for Belgium, France and the Netherlands. Population Association of America Annual Meeting, Dallas, Texas, p 38

Nelson R (2004) Premature births on the rise. Am J Nurs 104:23–25

Neyer G, Andersson G (2008) Consequences of family policies on childbearing behavior: effects of artifacts? Popul Dev Rev 34:699–724. doi:10.1111/j.1728-4457.2008.00246.x

OECD (2011) Statistical compendium (accessed March 2011)

Ozalp S, Tanir HM, Sener T, Yazan S, Keskin AE (2003) Health risks for early (≤19) and late (≥35) childbearing. Arch Gynecol Obstet 268:172–174. doi:10.1007/s00404-002-0359-7

Schmidt L, Sobotka T, Bentzen JG, Andersen AN (2012) Demographic and medical consequences of the postponement of

parenthood. Hum Reprod Update 18:29–43. doi:10.1093/humupd/dmr040

Singer J, Willett J (2003) Applied longitudinal data analysis. Modeling change and event occurrence. Oxford University Press, Oxford

Sobotka T (2004) Is lowest-low fertility in Europe explained by the postponement of childbearing? Popul Dev Rev 30:195–220. doi:10.1111/j.1728-4457.2004.010_1.x

Sobotka T, Skirbekk V, Philipov D (2011) Economic recession and fertility in the developed world. Popul Dev Rev 37:267–306. doi:10.1111/j.1728-4457.2011.00411.x

Suits DB, Mason A, Chan L (1978) Spline functions fitted by standard regression methods. Rev Econ Stat 60:132–139. doi:10.2307/1924341

Thévenon O (2008) Family policies in Europe: available databases and initial comparisons. In: Gauthier AH, Philipov D (eds) Vienna yearbook of population research. Austrian Academy of Sciences, Vienna. doi:10.1553/populationyearbook2008s165

Van Giersbergen NPA, De Beer J (1997) Geboorteontwikkeling en consumentenvertrouwen: een econometrische analyse. Maandstatistiek van de bevolking 11:23–27

van Katwijk C, Peeters LLH (1998) Clinical aspects of pregnancy after the age of 35 years: a review of the literature. Hum Reprod Update 4:185–194. doi:10.1093/humupd/4.2.185

Vikat A (2004) Women's labor force attachment and childbearing in Finland. Demogr Res 10:177–212. doi:10.4054/DemRes.2004.S3.8