Revisiting the Relationship between Higher Education and Second Births across Europe and the US

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SHORT ABSTRACT

Previous studies, based on event-history methods, reported that highly educated women in Northern, Western and Southern Europe are now more likely to have the second child than the low educated. Event-history models do not allow, however, for concluding whether they had the second birth earlier or were indeed more likely to have it. We address this oversight by estimating cure models, which allow to assess the effects of education on the timing of the event and the probability of its occurrence. We use Harmonized Histories and cover 16 European countries and the US. We find that highly educated women display higher probability to have the second child only in Belgium. In many other Western European countries and the US no educational gradient in second births persist, while in Eastern Europe it is negative. Finally, we find no evidence for a reversal in the educational gradient in second births over time.

EXTENDED ABSTRACT

This study contributes to the discussion on the educational gradient in second births among women who have not yet completed their reproductive careers across 16 European countries and the US.

Background

Expansion of higher education among women is one of the important factors that contributed to a decline in fertility in the developed world (NiBhrolchain 1986, Blossfeld and Huinink 1991, Basten et al. 2014). Highly educated women have less time to realise their fertility intentions as they spend more time in education (Ní Bhrolcháin and Beaujouan 2012) and right after finishing education postpone childbearing to establish their position in the labour market (Gustafsson 2001, Nicoletti and Tanturri 2008). Furthermore, women with university degree face high opportunity costs of parenting (Mincer and Ofek 1982, Ermisch 1990). Recently, it has been argued, however, that highly educated women might be starting to have larger families than the low educated (e.g. Esping-Andersen and Billari 2015, Goldscheider et al. 2015). This reversal in the educational gradient in fertility might be taking place as the increasing welfare support for work and family reconciliation and a gradual increase in men's involvement in childcare and housework make it easier for highly educated women to reconcile paid work and family life. Furthermore, women's economic resources increasingly improve conditions for family formation by offering couples more financial security (e.g. Oppenheimer 1997).

Studies on women *who completed their reproductive careers* do not provide support for the change in the educational gradient in fertility. Sobotka et al. (2015) and Sobotka et al. (2016) showed that completed fertility among highly educated women is persistently lower than among the low educated, apart from some Nordic countries where hardly any educational differences in completed fertility are observed (see also Kravdal and Rindfuss 2008, Andersson et al. 2009). Wood et al. (2014) provided detailed evidence on the topic, by looking at parity progression of women born 1940-1961. They showed that highly educated women from these birth cohorts are more likely to be childless and are usually less likely to progress to the third child. The authors found less clear evidence on the educational gradient in parity progression ratios to the second child, which turned out to be weak in many countries apart from Southern and Eastern Europe where they turned out to be clearly negative (German-speaking countries were not analysed). Finally, Brzozowska et al. (2016) analyzed trends in the proportion of women born 1916-1970 with two children by education. They found that the proportion of highly educated mothers with two children in Northern and Western Europe (except for German-speaking countries) was quite stable and did not fall below the proportion of two child mothers among the low educated. In Southern Europe and German-speaking countries, in contrast, the educational differences in the share of mothers with two children started to increase for cohorts born in the late 1940s. Since then highly educated women are less likely to have two children than the low educated. Overall, these studies show that highly educated women born before 1970, who have already completed their reproductive careers, were either less likely to have two children than the low educated (e.g. Southern Europe or German-speaking countries) or as likely as the low educated (Nordic and remaining Western Europe).

Recent studies conducted for cohorts which have *not yet completed their reproductive careers*, provide some evidence for a change in the educational gradient in fertility, however. While highly educated women are more likely to postpone their transition to motherhood, they are also increasingly found to be more likely to progress to the second child than the low educated. Such findings were obtained for Nordic countries (Olah 2003, Vikat 2004, Kravdal 2007), France (Köppen 2006), United Kingdom (Mathews and Sear 2013) or Italy (Impicciatore and Zuanna 2016). At times, these micro-level findings are interpreted as a sign of the changes in the educational gradient in fertility.

In this study, we demonstrate that the evidence provided by the micro-level studies does not imply a change in the educational gradient in fertility. Event history models, commonly applied in micro-level research on women's education and birth transitions, are designed for studying the effects of covariates on the timing of events that will eventually occur. Second births are not such events. Ignoring this fact leads to a bias in the effect of the estimated coefficients on the timing of the event (e.g. Arranz and Muñoz-Bullón 2016). Consequently, not only do event-history models provide us with no information on whether highly educated women are more likely to experience the birth, but they also give biased information on the effect of the education on the timing of the second birth.

Data and Method

This study utilizes mixture cure models in order to investigate the effects of women's education on (1) the probability of giving birth to the second child and (2) the timing of this event. These models were proposed as an extension of the conventional survival analysis for studying events that may not occur to all individuals (McDonald and Rosina 2001). They allow for assessing the effect of explanatory covariates on the timing of the event and the probability of its occurrence. They are well established in the medical literature and allow to study the effect of covariates on the probability of being cured from a disease and the timing of death otherwise. They have been, however, rarely applied in family demography, although there has been some exceptions (Gray et al 2011, Bremhorst et al 2016, Beaujouan and Solaz 2013, Locatelli et al. 2007, Rosina 2006 or Pinnelli et al. 2002), including the very recent study by Bremhorst et al (2016) looking at the effects of women's education on birth risks.

We rely on parametric mixture cure models for which the survival function takes the following form:

$$S(t)=\pi+(1-\pi)\cdot S_u(t)$$

where:

π – the proportion cured (the proportion who are not susceptible to experiencing the event, i.e. the second birth),

$S_u(t)$ - survival function for the uncured individuals.

We model the probability of giving birth to the second child with the logit model and the time-to-the-second birth with the log-normal hazard model.

For a comparison, we also estimate piecewise constant hazard models for the transition to the second child, which is a common way to analyse the effects of covariates on birth risks. This allows us to better understand whether mixture cure models indeed provide additional information about the process of interest.

We focus on cohorts born 1940-1979 and adopt a comparative approach. We study several countries which are representative for different fertility regimes, welfare states and cultural settings and thus constitute a very informative framework for a comparison. To this end, we use data from Harmonised Histories. Harmonised Histories is a compilation of retrospective databases for 17 European countries and the US that provide full fertility and partnership histories as well as information on the year of obtaining highest education (Perelli-Harris et al 2010). Most of the data come from the first wave of the Generations and Gender Programme conducted in the previous decade (Austria, Belgium, Bulgaria, Czech Republic, Estonia, France, Germany, Hungary, Lithuania, Norway, Poland, Romania, Russia and Sweden), although the database harmonises also data from panel and retrospective surveys from Spain, United Kingdom and the US.

Preliminary Findings

Below we discuss our preliminary findings. First, we demonstrate what the mixture cure models tell us about the relationship between education and second birth risks and what the piecewise constant hazard models cannot tell us. In the next step, we address the question whether there was a change in the educational gradient in second birth probabilities over time.

Findings from standard piecewise constant models versus mixture cure models

Tables 1 and 2 show findings from piecewise constant hazard models and mixture cure models respectively. Piecewise hazard models suggest that highly educated women in Belgium, Norway and Sweden are more likely to have the second child. No significant difference between the low and high educated women in second birth risks is observed in Northern and Western Europe (Austria, Germany, UK, France) or in Spain. In Eastern Europe and the US, second birth risks for highly educated women are clearly lower than for the low educated. It is not clear, however, whether these findings imply educational differences in the tempo or the probability of having the second child (or both). In other words, we cannot know whether Belgian, Norwegian or Swedish highly educated mothers are indeed more likely than the low educated to end up having at least two children or they simply have the second child sooner. Likewise, it is not clear whether highly educated women in Eastern Europe and the US display higher probabilities of stopping at parity one or they wait longer to have the second child after they enter motherhood than the low educated mothers.

The mixture cure models provide us with more information. They contain two sets of parameters: parameters from the log-normal hazard model (the lower panel of Table 2), which indicate the effects of education on second birth risks, and parameters from the logit model (the upper panel), which measure the effects of education on the probability of not giving birth to the second child, π. The parameters in the upper panel of the table inform us that among the three countries, where highly educated women seemed to be more likely to have the second child (i.e. Belgium, Norway and Sweden), only in Belgium and Norway the probabilities of not having the second child are significantly lower for highly educated women. In Sweden and, in fact, many other Western European countries (Austria, Germany, France, UK) and the US education does not differentiate the probabilities of having the second child. In Eastern Europe, in turn, highly educated women display clearly lower probabilities of second child than the low educated.

The mixture cure model informs us also about the relationship between women's higher education and the timing of second births. The negative parameter in the lower panel of Table 2 suggests that the location parameter of the log-normal distribution gets closer to zero, which implies a faster transition. Our findings show that highly educated women in Belgium, Sweden and Norway have their second children sooner than the low educated (counting the time elapsed since the first birth). Highly educated women in Eastern Europe and the US, in turn, are more inclined to postpone the second birth.

Tables 1. Findings from piecewise constant hazard models, second birth risks

	AUSTRIA	BELGIUM	FRANCE	GERMANY	NORWAY	SPAIN	SWEDEN	UK	US	BULGARIA	CZECH REP	ESTONIA	HUNGARY	LITHUANIA	POLAND	ROMANIA	RUSSIA
Age of the first child																	
0-1	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
1-2	0.816***	0.531***	0.579***	0.612***	0.895***	0.367***	1.146***	0.680***	0.448***	0.523***	0.398***	0.172**	0.554***	0.255***	0,0581	0,0977	0.290***
	(9.13)	(7.43)	(9.1)	(8.76)	(17.4)	(6.39)	(18.11)	(13.83)	(6.88)	(8.28)	(5.53)	(2.47)	(9.56)	(3.26)	(1.42)	(1.59)	(3.7)
2-3	0.532***	0.415***	0.651***	0.522***	0.998***	0.400***	1.198***	0.559***	0.313***	0.527***	0.345***	-0,107	0.646***	0.253***	-0,0523	-0,0443	0.313***
	(5.21)	(5.19)	(9.73)	(6.94)	(18.37)	(6.59)	(17.75)	(10.03)	(4.31)	(7.96)	(4.48)	(-1.35)	(10.75)	(3.09)	(-1.16)	(-0.65)	(3.89)
3-4	0.308***	-0,0333	0.382***	0.167*	0.742***	0.350***	0.761***	0.210***	0.225***	0.483***	0.167*	-0,0225	0.443***	0,129	-0.180***	-0.251***	0.388***
	(2.63)	(-0.33)	(4.94)	(1.9)	(11.77)	(5.31)	(9.32)	(3.07)	(2.8)	(6.82)	(1.95)	(-0.28)	(6.64)	(1.46)	(-3.56)	(-3.27)	(4.76)
4-5	0,165	-0.278**	0.214**	0,0589	0.396***	0.371***	0.503***	-0,138	-0,0634	0.396***	0,00883	-0,132	0.217***	-0.182*	-0.243***	-0.424***	0.234***
	(1.25)	(-2.38)	(2.42)	(0.61)	(5.19)	(5.28)	(5.25)	(-1.62)	(-0.65)	(5.17)	(0.09)	(-1.48)	(2.86)	(-1.78)	(-4.41)	(-4.93)	(2.66)
5-10	-0.516***	-1.254***	-0.601***	-0.712***	-0.173***	-0.356***	-0.222***	-0.992***	-0.433***	-0.292***	-0.659***	-0.598***	-0.304***	-0.677***	-0.819***	-1.135***	-0,0719
	(-4.54)	(-12.14)	(-7.65)	(-8.63)	(-2.71)	(-5.69)	(-2.68)	(-13.45)	(-5.64)	(-4.37)	(-8.31)	(-8.50)	(-4.88)	(-8.39)	(-18.51)	(-16.33)	(-1.01)
10+	-1.586***	-3.484***	-2.878***	-2.856***	-2.200***	-2.236***	-1.939***	-2.880***	-1.605***	-2.647***	-2.781***	-2.245***	-2.583***	-2.822***	-2.925***	-3.281***	-1.824***
	(-8.50)	(-16.44)	(-18.04)	(-18.37)	(-18.43)	(-20.08)	(-14.37)	(-20.15)	(-11.20)	(-19.36)	(-19.22)	(-21.04)	(-23.00)	(-19.69)	(-36.57)	(-25.95)	(-18.50)
Education level																	
low	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
medium	-0.222***	0,0799	-0.173***	-0.175**	0,0199	-0.133***	0,0894	-0,0811	-0.338***	-0.592***	-0.187***	-0.208***	-0.244***	-0,104	-0.329***	-0.408***	-0.200**
	(-2.69)	(1.13)	(-3.38)	(-2.46)	(0.41)	(-2.93)	(1.14)	(-1.60)	(-5.14)	(-12.61)	(-3.02)	(-2.97)	(-5.57)	(-1.20)	(-9.00)	(-8.75)	(-2.33)
high	-0,0879	0.381***	-0,0417	-0,0422	0.235***	0,029	0.271***	-0,00587	-0.259***	-0.970***	-0.165*	-0.324***	-0,0518	-0.305***	-0.720***	-0.790***	-0.418***
	(-0.77)	(5.6)	(-0.70)	(-0.51)	(4.49)	(0.5)	(3.31)	(-0.12)	(-4.30)	(-14.80)	(-1.69)	(-4.21)	(-0.84)	(-2.96)	(-11.97)	(-7.35)	(-4.84)
in education	-0.524***	0,0169	-0,0567	-0,129	-0.0912*	-0.218*	0,0953	-0.170*	-0.279***	-0.796***	-0.414***	-0.239***	-0.343***	-0,113	-0.604***	-0.689***	-0.337***
	(-3.76)	(0.15)	(-0.70)	(-1.26)	(-1.80)	(-1.83)	-1,23	(-1.81)	(-3.31)	(-11.91)	(-4.29)	(-2.89)	(-5.67)	(-1.10)	(-11.73)	(-7.01)	(-3.60)
Cohort																	
1940-1949		ref	ref	ref	ref	ref	ref	ref		ref	ref	ref	ref	ref	ref	ref	ref
1950-1959		-0,0776	-0,0838	-0,108	-0.221***	-0.340***	0,0196	-0,0589		0.196***	0,0644	0,0781	0.141***	0,0716	0.0684*	0.112**	0.106*
		(-0.97)	(-1.44)	(-1.58)	(-4.77)	(-6.78)	-0,34	(-1.18)		(3.2)	(0.99)	(1.3)	(3.02)	(1.01)	(1.89)	(2.02)	(1.86)
160-1969	ref	0,0369	0,0351	0.138**	-0.0824*	-0.447***	0.249***	-0.0977**	ref	0.188***	0,09	0.114*	0.307***	0.149**	0,0441	-0,0174	0,0518
		(0.48)	(0.59)	(2.16)	(-1.81)	(-9.04)	(4.49)	(-2.00)		(3.46)	(1.4)	(1.83)	(6.14)	(2.19)	(1.05)	(-0.28)	(0.85)
1970-1979	0,045	0,0042	0,112	0,0469	-0.130**	-0.543***	0.250***	-0.209***	0.0829*	-0.221***	-0,0879	-0.144**	0,0301	-0,112	-0.0698*	-0.167**	-0.373***
	(0.73)	(0.05)	(1.6)	(0.59)	(-2.51)	(-8.60)	(4.18)	(-3.51)	(1.8)	(-3.68)	(-1.24)	(-2.03)	(0.51)	(-1.44)	(-1.65)	(-2.43)	(-5.06)
_cons	-4.301***	-4.366***	-4.361***	-4.522***	-4.447***	-4.083***	-4.854***	-4.019***	-4.115***	-4.289***	-4.317***	-4.201***	-4.576***	-4.536***	-3.738***	-4.017***	-4.763***
	(-42.30)	(-50.78)	(-66.01)	(-48.04)	(-71.45)	(-79.01)	(-54.69)	(-71.46)	(-56.46)	(-65.72)	(-52.82)	(-52.76)	(-77.71)	(-47.18)	(-88.81)	(-72.00)	(-48.58)
N	6149	8367	12709	13582	17969	17373	11650	14305	12010	19882	12318	14421	19949	13849	29381	16197	23024

Table 2. Findings from mixture cure model, second birth risks

	AUSTRIA	BELGIUM	FRANCE	GERMANY	NORWAY	SPAIN	SWEDEN	UK	US	BULGARIA	CZECH REP	ESTONIA	HUNGARY	LITHUANIA	POLAND	ROMANIA	RUSSIA
Probability of not giving birth to the second child (pi)																	
Education level																	
low	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
medium	0.702***	-0,142	0.351***	0.364**	-0,0187	0.369***	-0,0907	0,18	0.0574**	1.105***	0.258*	0,282	0.359***	0,0357	0.595***	0.622***	0.325*
	(2.69)	(-1.03)	(2.89)	(2.41)	(-0.14)	(2.95)	(-0.46)	(1.33)	(2.24)	(9.07)	(1.85)	(1.63)	(3.65)	(0.23)	(5.67)	(6.99)	(1.91)
high	0,219	-0.563***	0,147	0,0646	-0.369**	0,0375	-0,312	0,113	0,0228	1.651***	0,224	0.480***	0,18	0.372**	1.310***	1.220***	0.633***
	(0.58)	(-3.90)	(0.96)	(0.37)	(-2.35)	(0.22)	(-1.44)	(0.84)	(0.94)	(12.05)	(1.09)	(2.66)	(1.3)	(2.09)	(9.6)	(7.63)	(3.76)
in education	1.369***	0,22	-0,017	0,118	0,173	0,479	-0,111	0.813***	0.0824**	1.324***	0.445*	0.474**	0,253	0,112	0.956***	1.016***	0.595***
	(3.88)	(0.99)	(-0.07)	(0.44)	(1.2)	(1.41)	(-0.56)	(2.97)	(2.09)	(8.01)	(1.95)	(2.15)	(1.56)	(0.54)	(6.66)	(5.86)	(3.03)
Cohort																	
1940-1949		ref	ref	ref	ref	ref	ref	ref		ref	ref	ref	ref	ref	ref	ref	ref
1950-1959		0,0849	-0,094	0,112	0.209*	0.492***	-0,085	0,0332		-0,0779	0,124	-0,123	-0.164*	-0,0522	-0,106	-0,132	-0.189*
		(0.56)	(-0.77)	(0.94)	(1.76)	(3.83)	(-0.59)	(0.26)		(-0.61)	(0.97)	(-0.96)	(-1.72)	(-0.42)	(-1.23)	(-1.25)	(-1.78)
160-1969	ref	-0,247	-0.569***	-0.382***	-0.271**	0,111	-0.429***	-0,00251	ref	0,0166	-0,125	-0,184	-0.610***	-0,141	0,0407	0,103	0,114
		(-1.58)	(-3.90)	(-3.12)	(-2.01)	(0.73)	(-2.83)	(-0.02)		(0.15)	(-0.92)	(-1.32)	(-5.19)	(-1.15)	(0.43)	(0.93)	(1.04)
1970-1979	-0,232	-0.451**	-1.530***	-0.626***	-0,313	0,0258	-1.078***	-0,078	-0.0940***	0.391***	-0.440*	-0,158	-0.306*	-0,0235	-0.533***	0,0666	0,215
	(-1.36)	(-2.20)	(-3.71)	(-2.71)	(-1.62)	(0.09)	(-4.58)	(-0.43)	(-4.65)	(3)	(-1.96)	(-0.71)	(-1.83)	(-0.14)	(-3.81)	(0.46)	(1.22)
_cons	-1.984***	-0.761***	-1.249***	-0.950***	-1.775***	-1.917***	-1.441***	-1.798***	0.152***	-2.026***	-1.275***	-1.398***	-1.246***	-0.726***	-1.945***	-1.166***	-1.127***
	(-7.94)	(-5.91)	(-11.81)	(-6.02)	(-13.61)	(-18.59)	(-8.29)	(-14.91)	(6.87)	(-15.52)	(-8.96)	(-8.62)	(-13.67)	(-5.04)	(-19.34)	(-13.68)	(-7.11)

Tables 2. Findings from mixture cure model, second birth risks (continues…)

	AUSTRIA	BELGIUM	FRANCE	GERMANY	NORWAY	SPAIN	SWEDEN	UK	US	BULGARIA	CZECH REP	ESTONIA	HUNGARY	LITHUANIA	POLAND	ROMANIA	RUSSIA
Timing of birth (mu)																	
Education level																	
low	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
medium	0,0656	0,00706	0.0954**	0,0183	0,00359	-0,00508	-0,0783	0.0785*	0.289***	0.268***	0.225***	0.219***	0.208***	0.262***	0.270***	0.235***	0,155
	(0.84)	(0.11)	(1.99)	(0.26)	(0.09)	(-0.11)	(-1.27)	(1.73)	(3.73)	(6.19)	(3.55)	(2.68)	(5.07)	(2.77)	(6.64)	(4.71)	(1.57)
high	0,112	-0.203***	0,0219	0,0436	-0.132***	-0,0782	-0.223***	0,013	0.304***	0.426***	0.211**	0.289***	-0,00604	0.313***	0.487***	0.259**	0.261***
	(1.03)	(-3.37)	(0.39)	(0.53)	(-3.12)	(-1.32)	(-3.47)	(0.29)	(4.32)	(6.81)	(2.09)	(3.18)	(-0.10)	(2.75)	(7.07)	(2.18)	(2.61)
in education	0,0926	-0.181*	0,0363	0,0376	0,0455	0,0624	-0,092	-0,139	0,141	0.395***	0.407***	0,155	0.377***	0,183	0.457***	0.279***	0,15
	(0.69)	(-1.79)	(0.48)	(0.36)	(1.09)	(0.49)	(-1.52)	(-1.54)	(1.46)	(6.1)	(4.1)	(1.55)	(6.33)	(1.63)	(7.84)	(2.6)	(1.39)
Cohort																	
1940-1949		ref	ref	ref	ref	ref	ref	ref		ref	ref	ref	ref	ref	ref	ref	ref
1950-1959		0.181**	0.397***	0.171***	0.282***	0.274***	0,0543	0.115**		-0.291***	-0.276***	-0,0516	-0.133***	-0.138*	-0.0764*	-0.130**	-0,0437
		(2.56)	(7.33)	(2.6)	(7.59)	(5.39)	(1.21)	(2.56)		(-5.15)	(-4.19)	(-0.73)	(-3.06)	(-1.81)	(-1.89)	(-2.22)	(-0.70)
160-1969	ref	0.284***	0.482***	0.203***	0.312***	0.697***	-0.0752*	0.189***	ref	-0.313***	-0,0577	-0,0621	-0.0816*	-0.218***	-0.140***	-0,047	-0.258***
		(4.1)	(8.54)	(3.27)	-8,48	(13.11)	(-1.73)	(4.26)		(-6.23)	(-0.86)	(-0.83)	(-1.73)	(-2.94)	(-2.96)	(-0.71)	(-3.83)
1970-1979	0,0717	0.397***	0.559***	0.386***	0.346***	0.752***	0,0613	0.332***	0.181***	0,0585	0.335***	0.316***	0.157***	0.175*	0.389***	0.255***	0.324***
	(1.2)	(5.09)	(8.16)	(4.64)	(8.02)	(10.62)	(1.3)	(5.97)	(3.36)	(0.99)	(4.22)	(3.37)	(2.62)	(1.91)	(7.7)	(3.22)	(3.47)
_cons	3.259***	2.994***	2.937***	3.176***	3.106***	3.068***	3.391***	2.969***	3.124***	3.414***	3.231***	3.305***	3.339***	3.314***	3.008***	3.165***	3.655***
	(44.1)	(49.73)	(65.41)	(41.59)	(80.71)	(83.72)	(60.91)	(73.34)	(46.75)	(73.92)	(49.72)	(42.08)	(85.23)	(38.38)	(77.66)	(69.92)	(39.99)
ln_sigma																	
_cons	-0.0956***	-0.141***	-0.0950***	-0.0734***	-0.232***	-0,0126	-0.265***	-0.125***	0.0586***	-0.111***	-0,0206	0.101***	-0.0894***	0,0169	0.0695***	0,022	0,00625
	(-3.63)	(-6.84)	(-5.42)	(-3.69)	(-17.87)	(-0.80)	(-17.33)	(-8.69)	(2.73)	(-6.79)	(-1.03)	-4,83	(-6.01)	(0.77)	(5.9)	(1.24)	(0.31)
N	6149	8367	12709	13582	17969	17373	11650	14305	12010	19882	12318	14421	19949	13849	29381	16197	23024

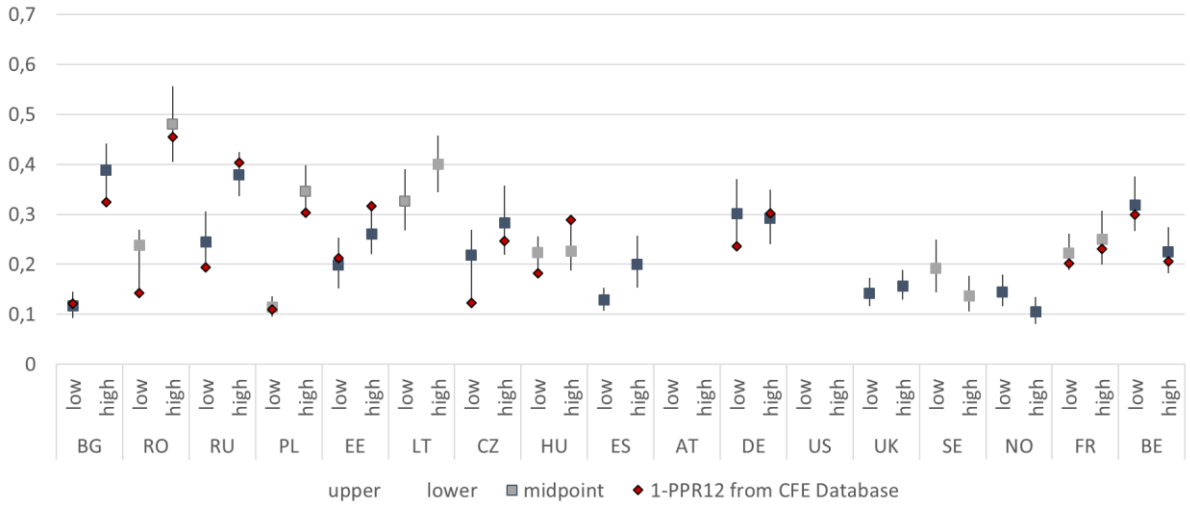
Has there been a reversal in the educational gradient in second birth probabilities?

In order to see whether there has been a reversal in the educational gradient in second birth probabilities over time, we predicted the probabilities of not giving birth to the second child by education for women born 1940-59, who have already completed their reproductive careers, and separately for women born 1960-79, who have not. To this end, we used the mixture cure model. In addition, we validated our predictions for older cohorts by comparing them with the inverse of parity progression ratios extracted from the Cohort Fertility and Education Database (CFE)[1]. This database contains information on completed cohort fertility and parity distribution by education for cohorts who largely completed their reproductive careers. The data is mainly derived from censuses and large sample surveys.

Figure 1 displays the predicted probabilities of not giving birth to the second child with their 95% CIs among women who completed their reproductive careers (born 1940-59). In addition, the red points represent the inverse of the parity progression ratios to second births extracted from the CFE database. The inverse of the parity progression ratios to second births largely fall into the confidence intervals which provides confidence into the reliability our findings. These findings show that many of the Eastern European countries (Bulgaria, Romania, Russia, Poland) and Spain display higher probabilities of having no second child among the high rather than the low educated women (negative gradient in second birth probabilities). In many other countries no significant differences between the low and highly educated women are observed. Finally, a positive educational gradient in second birth probabilities is visible in Belgium.

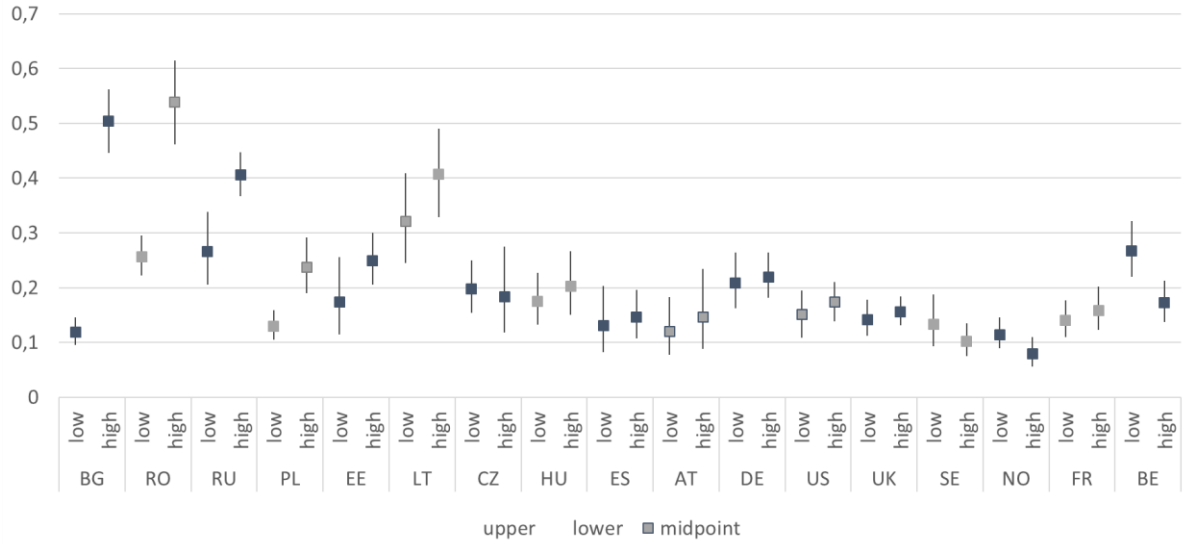
Figure 2 shows the predicted probabilities of not giving birth to the second child with their 95% CIs among women who have not yet completed their reproductive careers (born 1960-79). The findings are largely similar to those observed in Figure 2: negative educational gradient in second birth probabilities in Eastern Europe, no gradient in Austria, Germany, France, US, UK and Nordic countries and a positive gradient in Belgium.

Figure 1 Predicted proportion not having the second child, cohorts 1940-1959, 95% CI



[1] http://www.cfe-database.org/

Figure 2 Predicted proportion not having the second child, cohorts 1960-1979, 95% CI



Abridged conclusions

Overall, our findings do provide rationale for distinguishing between timing and quantum effects in modelling effects of women's education on second birth risks. Highly educated women who progressed to the first child are more likely to have the second child than the low educated only in Norway and Belgium. They also have it faster. In all other Western and Northern European countries, the two groups are equally likely to have the second child. In Eastern Europe and the US, in turn, an opposite pattern is observed: highly educated women are less likely to have the second child than the low educated. They are also more likely to postpone this transition.

Furthermore, we find no evidence for a change in the educational gradient in second births over time.

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