Mutual Impacts between Motherhood and Educational Enrollment in Eastern Europe.

by Cornelia Mureșan, Babeș-Bolyai University, Cluj –Napoca (Romania)

1. Introduction

The massive educational expansion of recent decades is one of the most fundamental social changes in Europe in modern times. Not only has the number of students grown steadily, but the years that a student has spent in higher education, have also increased considerably (OECD 2013). As women with a higher education enter motherhood later in life than other women, the extended education is usually seen as an important factor behind the postponement of the start of childbearing. Investigations of how motherhood can (or cannot) be combined with continued investment in human capital have become increasingly plentiful, as have studies of how the socioeconomic context plays a role in the education/family balance. The present paper makes a contribution to this growing literature.

How important the mutual influence of educational enrolment and first birth can be, the importance of common factors, and the role of welfare regimes, have all been assessed for eleven Western European countries by Billari and Philipov (2004a) based on the 1990s Family and Fertility Survey data, and by Brand and Davis (2011) with data from the U.S. National Longitudinal Survey of Youth 1979. Our purpose is to extend such investigations to Eastern Europe, as far as possible using individual-level dynamics of the processes involved, as reflected in the latest data sets that cover all countries selected, namely the recent Generation and Gender Surveys. The general tenor is that too early motherhood usually has negative consequences for a woman's later life, particularly when she gets her first child while she is still enrolled in education. For a young woman, a birth increases the risk of terminating education because of her need to care for child and family. This basic observation is well documented in the literature, and already in an early study by Lillard et al. (1994). These authors simultaneously studied several events of family formation and educational career and found that "women who became pregnant in their 'current' schooling decision window were much less likely to go on the next grade level" (p.42). They made the same finding at the college level.

Macro-level circumstances can attenuate or even reverse these negative consequences. Notably, the flexibility of the educational system (e.g. Hoem et al. 2006), cultural factors of family solidarity (e.g. Dalla Zuanna 2001; Billari 2004; Billari and Philipov 2004a), and social policies designed to facilitate the combination of student and parental roles (e.g. Rindfuss 1991; Hoem 1993; Esping-Andersen 1999; McDonald 2000; Gauthier 2002; Thalberg 2013) may change the impact of pregnancy and motherhood on educational enrolment. Our broad choice of countries for investigation has the purpose of catching a range of such possibilities, in particular in Eastern Europe, but for contrast we also include a few countries from Western Europe.The literature has shown that in most populations, a first birth usually triggers the end of education and, conversely, that the arrival of a first birth is triggered by the completion of education. An investigation of the causal effect of one of these two processes on the other generally needs a study of both processes simultaneously because of their mutual endogeneity. Therefore several authors have modeled together educational enrolment and childbearing in various guises. For example, Gerster et al. (2013), recently used Danish register data to show that the relationship between education and completed fertility is the result of a dynamic interplay between the two processes. Similarly, Tesching (2012) dealt with the interrelationship between women's educational level, educational field, and first and higher order births, and Thalberg (2013) handled students' enrolment and childbearing. Both of the latter studies used Swedish longitudinal register data and took into consideration the impact of common (unobserved) factors on educational trajectories and fertility decisions. Martin-Garcia and Baizan (2006) studied the impact of educational

enrolment and the type of education on first births with Spanish Family and Fertility Survey data by jointly considering the end of education and the entry into parenthood, again controlling for common unmeasured heterogeneity.

Because of the scarcity of studies on Eastern Europe, in the present study we want to investigate whether it was easier to combine studies with childbearing in some countries in this region than in others, how similar the former communist countries have been to each other, and how they differ from other European countries. We also want to explore whether the combination of educational enrolment with childbearing became easier over our periods, since one of the aim of social policies in many European countries is to help people attain their life goals related to various domains of their life course.

We formulate two research hypotheses, as follows:

H1. In all countries, conception and birth during a woman's studies increase her risk of terminating education. The impact is stronger at times when and in societies where welfare regimes provide less support to a role combination or to a postponement of the end of education.

H2. In more familistic welfare regimes (e.g. in Romania) and in societies with a more pronounced de-standardization of the life course (e.g. in Norway), the correlation is lower between unobserved factors that affect both the length of education and time to motherhood.

2. Data

For any empirical study of the interaction between educational attainment and fertility, the two factors need to be made more precise than in the general reasoning above, and they need to be related to the data in hand. As we have noted already, Gerster et al. (2013) represented fertility by the number of children <u>ultimately</u> born by a respondent in their register data, and they defined educational attainment in terms of five educational levels for which the individual had a record of completing the needed examination or degree. Most other authors have used some continuous representation of the individual childbearing histories instead and have applied a simpler version of time-varying educational histories. For each of our own country-specific analyses we have selected information from a recent first-round national Generations and Gender survey (GGS) and have used a simultaneous-hazard two-equation analysis, controlling for unobserved heterogeneity. Because of our particular interest in Eastern Europe, we have used GGS data from seven former-communist countries in that region (Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Poland, Romania, ,), and for comparison we have also selected GGS data for two countries in Western Europe (France, and Norway). To our knowledge, the GGS data for the East European countries have never been studied systematically in this manner before.

For each national data set we have followed enrolled and childless female respondents from age 17 to 35 between 1st January 1980 and the date of interview. Details about national sample sizes, interview dates, and numbers and shares of events are shown in Table 1.

As is well known, major political changes took place in Eastern Europe in the years after around 1990, with important consequences for their welfare regimes. In our analyses we have therefore distinguished three calendar periods: the 1980s (the last years of the communist authoritarian regimes), the first eight years of transition (1990-1997), and the last seven to fourteen available years (1998-2004/11, varying between countries), representing the consolidated capitalist regime.

For the (Western) countries with a stable sociopolitical regime, the comparative analyses by period reveal the dynamics of the mutual relationship between the transition to motherhood and the end of studies, and they highlight differences with Eastern Europe, a region which so far has received less attention than it deserves.

Table 1. Interview dates, sample sizes, numbers of events, and share of first conceptions/births before the end of education. Women at ages 17-35 at least for a month between 1st January 1980 and the date of interview.

3. Method

Following an approach outlined by Lillard (1993), we have used a simultaneous-hazard two-equation model to assess the reciprocal impact of first conception (leading to birth) and end of educational enrolment, controlling for potentially common determinants through unobserved heterogeneity. This heterogeneity incorporates the effect of individual characteristics, values and norms that remain largely unchanged until first birth or the end of education, whichever comes the later. (Like most survey data, the GGSs do not contain continuous information about values and norms at the time when a woman is exposed to the risks of pregnancy or completion of education, so we must use an indirect methodology. Since value orientations usually actually change some during a woman's life, we do not want to use the information that the GGS data do contain concerning values at the time of a survey alone.) Initially we also included two easily available common control variables to represent a woman's <u>observed</u> characteristics, namely her number of siblings and her type of region of residence at age 15, but we ended up dropping these variables when they turned out not to give much further insight.

To spell this out, we have proceeded as follows: We have modeled the intensity $h_E(t)$ of the transition to the successful end of education and the intensity $h_B(t)$ of the transition to motherhood (actually 7 months before time of first birth), using a system of two hazard equations. For both intensities, we have let process time start at age 17, which is when enrolled people usually are close to completing high school and to deciding whether to continue or not with a tertiary education. We have preferred not to start at younger ages (say at age 15 as is usual for assessing risks of first birth, or at age 10 as is usual for assessing the end of education) in order to avoid as much as possible the mismatch between completing or dropping out of education and a more deliberate decision of young women to choose between family formation and continuing studies. The two situations may be influenced very differently by the factors under study. We censor all life histories at age 35. The calendar months of the two defining events were recorded in the GGS data. (In the Norwegian data, educational attainment was collected from register data.)

We have used the following model.

Model 1:

$$\ln h_E(t) = y_E(t) + C(a(0)-1980+t) + \alpha_1 M(t) + \alpha_2 U(t) + \tau_1,$$

$$\ln h_B(t) = y_B(t) + C(a(0)-1980+t) + \beta_1 E(t) + \beta_2 U(t) + \tau_2.$$

As an alternative, we have sometimes used the following model instead.

Model 2:

$$\ln h_E(t) = y_E(t) + \alpha_1 M(t)*P(t) + \alpha_2 U(t) + \tau_1,$$

$$\ln h_B(t) = y_B(t) + \beta_1 E(t)*P(t) + \beta_4 U(t) + \tau_2.$$

The functions included in the models are as follows:

$y_E(t)$ and $y_B(t)$ denote the baseline effects of age t from 17 to 35, represented by the logarithm of a linear duration spline with knots every two years for the intensity for end of education, and at ages 20, 25, and 30 for the intensity of first birth. These apply when the other functions have the value 0.

$C(a(0)-1980+t)$ is a second duration spline which catches the effect of calendar time. It is expressed relative to the year 1980. The argument $a(0)$ is the calendar year when individual i starts to be exposed to risk, i.e. the year when the person reaches age 17. It is a duration spline with two knots, located at the 1st of January 1990 and the 1st of January 1998. This term appears only in Model 1.

$P(t)$ is a time-varying variable denoting the calendar period, specified as (i) the 1980s, (ii) 1990-1997, and (iii) the period from 1998 to the date of interview, as already noted. It is used in Model 2 where it is interacted with other terms.

$M(t)$ is a time-varying variable denoting current maternal status , with three possibilities: "childless so far (i.e., at age t)", "childless and pregnant", and "mother".

$U(t)$ is a dichotomous time-varying variable indicating first-union formation (counting either marriage or non-marital cohabitation).

$E(t)$ is also a time-varying variable denoting educational attainment, with three statuses: "in education", "out of education, middle level of education or less attained" and " out of education, high level of education attained".

 In Model 2 we have included interactions between our maternal status variable and period, and between educational attainment and period, in order to shed light on the way the reciprocal impact of motherhood and education changes between periods.

The items τ_1 and τ_2 are normally distributed unobserved characteristics of the individual with variance equal to 1 and a correlation of ρ between the unobserved characteristics. The parameter ρ is estimated in each national data set. We have fixed the variances of the unobserved heterogeneity items τ_1 and τ_2 to 1, forced by the fact that for some countries, the iterative estimation process with unknown variances did not converge in our data. Other authors, like Tesching (2012), Baizan et al. (2003), and Martin-Garcia and Baizan (2006), have allowed the heterogeneity factors to have general variances which they have estimated, but they found that it does not much matter for their results (in their Swedish and Spanish data, respectively) whether the variances were set to 1 or were estimated. The effects of observed covariates were essentially the same in both cases. Other authors, like Billari and Philipov (2004b), argue that variances must be fixed to 1 when events are not repeatable, as in our case, where we study first births only. Their standpoint surely is colored by the need to have identifiable heterogeneity items.

For the estimation of the hazard models we have used the aML software, Version 2.09 (Lillard and Panis 2003).

For each specification of our model elements, we fit a pair of hazards to the data for nine countries, which means that we operate with eighteen regressions each time we fit the models. To limit the amount of work, we focus on first births alone. We keep the multiplicity of possibilities in check by "only" operating with first unions in the specification of the union covariate $U(t)$ and by "only" using the specification of the motherhood covariate $M(t)$ where we censor educational histories at age 35. As we shall see when we present our results below, our restrictions do not prevent us from providing extensive new knowledge about (first) childbearing in Eastern Europe.

Note that in all our various specifications, the two processes (educational attainment and first childbearing) appear in an asymmetric manner in our analysis. While the intensity $h_B(t)$ of first birth operates on each female respondent only as long as the first birth has not occurred, her intensity $h_E(t)$ of successful termination of educational enrollment continues to act after the first birth and until censoring.

4. Results

4.1. Trends of the completion of education and of first births, by calendar period

Before we assess the impact of the transition to motherhood on the completion of education and conversely the effect of an exit from the educational system on childbearing, let us look at the development over time of the two phenomena separately (Figures 1 and 2).

Figure 1. Trends in country-specific hazards of first birth (relative to 1980). Childless, enrolled women at least one month during their ages 17 to 35. Duration splines by calendar year.

Figure 2. Trends in hazards of completion of education (relative to 1980). Childless, enrolled women at least one month during their ages 17 to 35. Duration splines by calendar year.

After an increase between 1980 and 1990 in most countries, first-births "risks" decreased in all countries, reaching a value 20-80% lower at the interview dates than at the beginning of 1980 (Figure 1). The decrease was more or less steep and started after 1990 in most countries. In Romania, childbearing postponement started ten years earlier (see also Mureșan et al. 2008; Mureșan and Hoem 2010), i.e. in the 1980s, and conversely it started ten years <u>later</u> in France than in the rest of our countries. We cannot see any pattern that separated the Eastern European countries consistently from our selected Western countries.

As regard the transition to the end of education, the general trend (Figure 2) is decreasing intensities (and thus longer study durations) during the 1990s, and essentially much smaller changes after 1998. The real exception is Norway, where one can see a persistently increasing intensity of completion of education. The exceptional case of Norway was also noted by Cohen, Kravdal, and Keilman (2011) in a sophisticated analysis showing that the direction of causation between educational attainment and <u>final family size</u> is from fertility to education. This statement cannot be generalized, in the opinion of Ni Bhrolchain and Beaujouan (2012), who argue that fertility postponement is largely due to rising educational enrolment, at least in France and Britain. This would mean that the causation goes from education to fertility. We will see below that this also what we find concerning the direction of causation between <u>first birth</u> and completion of education, especially in more recent times.

4.2. Overall mutual impacts

Table 2. Results of country-specific simultaneous-hazard models of transition to the end of education and of transition to first birth (relative risks from Model 1). Significant values are given in boldface.

Table 2 contains the results of fitting Model 1. It shows that that a pregnancy (ending in a live birth) significantly increased the risk of terminating education in only two countries (Estonia and Poland). After the arrival of a first birth the risk of terminating education is reduced significantly in all countries, as is natural if these women return to the educational system after the end of their parental leave. A stronger impact is found in three former communist countries (Bulgaria, Czech Republic, and Hungary), but also in France and Norway.

Entering a first union significantly increases the risk of terminating education in most of our countries. The increase is about one quarter in Estonia, Romania, and Norway; and it is about 40-80% in Bulgaria, Lithuania, Poland, and France. (For Hungary and Estonia the results are not statistically significant.)

In all countries, the role of first union formation in the transition to motherhood is much stronger, first birth risk being higher by 8 to 34 times (from Czech Republic to Bulgaria) than for those not yet in any union (see the bottom half of Table 2).

Beside the evidence of the role of union formation, our estimates in the model of transition to first birth show another almost universal impact, namely a significantly lower childbearing risk of enrolled women, especially as compared with women with a completed middle level of education or less. Only in Bulgaria seems that the educational attainment has no significant impact on first birth risk, but here the influence of entering a first union is the biggest and potentially overwhelms the effect of education. As many authors have signaled (Billari and Philipov 2004a; Blossfeld and Huinink 1991; Kravdal 1994; Hoem 1986; Hoem and Hoem 1989, Rindfuss et al. 1980), the <u>level</u> of education does not play a major role in childbearing when we control for enrolment. Exceptions are women in Estonia, Romania[1], Poland, and France[2]. In these four countries, a tertiary education sensibly leads to a lower risk of first birth than a middle level of education; and in Romania and France the risks are as low as those of women who are still enrolled.

Estimated correlation coefficients[3] of unobserved heterogeneity are positive and statistically significant in Bulgaria, Hungary, and Poland, three of the former communist countries, as well as in France which has a conservative welfare regime. In Czech Republic the coefficient is also positive, but not statistically significant. In each case this indicates the prevalence of unobserved common factors that affect both processes in the same direction, i.e. an unobserved orientation towards a career that both prolongs the length of education and delays transition to motherhood. The fact that the correlation coefficients is close to zero in rest of the countries may indicate that personal characteristics and value orientations matter less for the combination of human capital investments with family life and motherhood in

---

[1] More details about the Romanian negative educational gradient in parity-specific fertility are reported by Mureșan and Hoem (2010).

[2] Ní Bhrolcháin and Beaujouan (2012) find that in France, first birth postponement is mainly "attributable to the rise in educational participation, but the additional lengthening of the time to first birth not explained by rising educational enrolment is related to educational level, with the best educated women postponing their births for longer following the end of education than other groups".

[3] We have also fitted similar models for the two transitions without terms for unobserved heterogeneity. The results (not shown in Table 2) indicate in general higher mutual effects in countries with significant positive correlations between the two unobserved factors, and lower effects for the other countries.

countries with a familistic regime, like Romania and countries from the former Soviet-bloc, or in a country like Norway, where the social-democratic welfare regime induces at de-standardization of the life-course. Note that a consideration of the national correlation coefficients does not really bring the Eastern European countries into a distinct region.

4.3. Mutual impact trends over periods

Results of applying Model 2 (Figures 3) show how the impact of pregnancy and motherhood on educational enrolment changes over time.

For the 1980s, we find significantly <u>higher</u> risks of terminating education among pregnant women only in Estonia, while the risk among women who already were mothers is significantly <u>lower</u> in Bulgaria, Hungary, Poland, France, and Norway. The last two West European countries distinguish in this period by the fact that pregnancy, like motherhood, significantly decreases the risk of terminating studies. This is the first systematic difference between the behavior in Eastern and Western Europe.

In the early years of the 1990s, pregnancy had no effect on the duration of education, but motherhood definitely increased the duration of studies in all countries investigated. It seems that everywhere, the combination of education and family formation was simpler in the period 1990-1997 than otherwise.

The opposite may be observed in Eastern Europe for the years around 2000. Motherhood does not induce prolonged studies anymore, while in this period a pregnancy strongly triggered the end of education almost everywhere (except in Bulgaria). In our two Western European benchmark countries, France and Norway, the positive influence of motherhood on duration of education persists overtime, but the former positive effect of pregnancy loses its significance and even becomes negative. This is a second systematic difference between the behavior in Eastern and Western Europe.

As regards the change over time in the impact of educational attainment on the transition to motherhood, our results from the analysis using Model 2 (Figure 4) show that a first birth is triggered uniformly by the end of education. The effect is in general stronger when the level of education attained is less than tertiary. Very few exceptions are some countries, in specific periods, where there are no significant differences between first birth risks of students and of women with a completed education, in particular Bulgaria and France in the 1980s, Bulgaria, France, and Hungary in the 1990s.

In the years around 2000 everywhere, the higher risks of transition to motherhood after the end of education as compared to the risks of enrolled women, accentuated increasing by 2-4 times. Thus, the main pattern in more recent times is that everywhere, both in Eastern and Western Europe, the reduction in birth intensities is due mainly to increased educational enrolment. The level of education introduces further differences in half of the countries: some Eastern European (Estonia, Lithuania, Poland, and Romania) and some Western ones (France).

5. **Conclusions**

Related to the question of where it is easier to combine studies with childbearing in Eastern Europe, we have seen that <u>in general</u> a pregnancy can be combined with enrollment, with only two exceptions: Estonia and Poland, where a pregnancy strongly triggers the end of education. Moreover, once a birth has occurred before the completion of studies, a woman can easily continue her studies. However the situation changed around the year 2000 and, unlike in Western Europe, in East European countries combining motherhood and education became much more difficult.

As regard if former-communist countries differ from other countries, we have noticed that, <u>as overall,</u> Eastern Europe does not have a pattern distinct from Western Europe: pregnancy has no effect on duration of studies, motherhood

before end of education prolongs the studies, and enrolment strongly reduces the risk of transition to motherhood. Everywhere, in the East and in the West, the impact of the attained level of education is smaller (when controlling for enrolment), except in Estonia, Poland, Romania, and France, where women with a high level of education sensibly have lower first birth risks.

However, when we wonder if the combination of enrolment with childbearing became easier or not over time, our results show that the period when it was the easiest to combine childbearing with studies was during the 1990s, actually even easier than during the 1980s. At around the 2000s, the situation does not become more favorable, quite on the contrary. In the former communist countries, pregnancy during studies starts to trigger the end of education (except in Bulgaria) and a child conceived before the last successful completion of education occurrs rather after then. The Western European countries instead keep their privileged situation more friendlily with combining motherhood and studies, even if a pregnancy does not lead anymore to prolonged studies as it did before. Note however that everywhere, in all countries (former-communist or not), enrolment remains hardly compatible with motherhood, and most first births occur after completion of education. It seems that the 2000s are more demanding as regard combining human investments, professional career, and family life, and this is especially true in Eastern European countries. Despite educational policies designated to ease return to studies - i.e. distance learning tertiary education programs introduced at the end of 1990s in most Eastern European countries – pregnant women decide to end their studies and mothers fail to restart education. Another explanation could be that women learned to plan better their time of transition to motherhood and linked it to time of end of education: they plan births very close to the moment when they will end studies or they plan conceptions soon after completion of studies. Thus, it seems that the recent fertility postponement in our nine European countries is due mainly to rising educational enrolment, but in Eastern Europe it is also due to the lack of efficient family and educational policies to facilitate combining motherhood and education.

Our first hypothesis, which claims that conception and birth during studies increase the risk of terminating education, is not entirely confirmed for all countries and all periods. It is true for pregnancy in Estonia, but for the other Eastern European countries it is true only in more recent times. Unlike in Eastern Europe, in our two Western European countries pregnancy does not have any influence on terminating studies. Motherhood before completing education, instead, does not increases the risk of terminating studies nowhere, quite in the contrary.

Instead, our second research hypothesis is completely confirmed. Unobserved personal characteristics and value orientations play more of a role in three of the Eastern European countries (in that there is a higher correlation between the two unobserved factors) – Bulgaria, Hungary, and Poland –, and in one of the Western European countries – France. In the other former-communist countries (Estonia, Lithuania, and Romania; perhaps also in Czech Republic), the correlation between unobserved factors that affect both the length of education and time to motherhood is less important, maybe because in these countries the family solidarity is stronger, and permits young mothers to continue their studies while grand-parents usually take care of their grandchildren. On the other hand, a personal value orientation toward family and education does not show any correlation in Norway either, perhaps because the social-democratic welfare regime improves the compatibility between motherhood and education, and thus permits a de-standardization of the life-course.

Figure 3. Relative risks of end of education by maternal status and period (vs. no children so far). Model 2.

Figure 4. Relative risks of first birth by educational status and period (vs. still in education). Model 2.

References

Baizan, P., Aassve, A., & Billari, F. C. (2003). Cohabitation, marriage, and first birth: The interrelationship of family formation events in Spain. *European Journal of Population*, 19, 147–169.

Billari, F.C. (2004). Becoming an adult in Europe: A Macro(/Micro)-Demographic Perspective. *Demographic Research SC* 3, 2.

Billari, F. C. & Philipov, D. (2004a). Education and the transition to motherhood: A comparative analysis of Western Europe. *European Demographic Research Papers* 3.

Billari, F.C., & Philipov, D. (2004b). Women's education and entry into first union. A simultaneous-hazard comparative analysis of Central and Eastern Europe. *Vienna Yearbook of Population Research*, pp. 91-110.

Blossfeld, H. P. & Huinink, J. (1991). Human capital investments or norms of role transition? How women's schooling and career affect the pro-cess of family formation. *American Journal of Sociology*, 143-168.

Brand, J.E., & Davis, D. (2011). The Impact of College Education on Fertility: Evidence for Heterogeneous Effects. *Demography*, 48:863‑887.

Cohen, J.E., Kravdal, O. & Keilman, N. (2011). Childbearing impeded education more than education impeded childbearing among Norwegian women, *Proceedings of the National Academy of Sciences of the United States of America,* 108(29): 11830_11835.

Dalla Zuanna, G., 2001. The banquet of Aeolus: A familistic interpretation of Italy's lowest low fertility. *Demographic Research* 4 (5): 133-162.

Esping-Andersen, G. (1999). *Social Foundations of Post-Industrial Economies.* New York: Oxford University Press.

Gauthier, A.H. (2002). Family Policies in Industrialized Countries: Is there Convergence? *Population, English Edition*, No 3.

Gerster, M., Ejrnæs, M., & Keiding N. 2013. The Causal Effect of Educational Attainment on Completed Fertility for a Cohort of Danish Women — Does Feedback Play a Role? *Statistics in Biosciences*. 5(1)1-22, DOI 10.1007/s12561-013-9102-0.

Hoem, J. (1986). The Impact of Education on Modern Family-Union Initiation. *European Journal of Population*, 2: 113–133.

Hoem, J. (1993). Public policy as the fuel of fertility: effects of a policy re-form on the pace of childbearing in Sweden in the 1980s. *Acta Sociologica*, 36,19-31.

Hoem, B. and Hoem, J. (1989). The Impact of Women's Employment on Second and Third Births in Modern Sweden. *Population Studies*, 43: 47–67.

Hoem, J., Neyer, G. & Andersson, G. (2006). Education and childlessness: The relationship between educational field, educational level, and childlessness among Swedish women born in 1955-59. *Demographic Research*, 14(15), 331-380.

Kravdal, Ø. (1994). The importance of economic activity, economic potential and economic resources for the timing of first births in Norway. *Population studies*, 2 , 249-267.

Lillard, L.A. (1993). Simultaneous equations for hazards: Marriage duration and fertility timing. *Journal of Econometrics*, 56, 189–217.

Lillard, L.A., Panis, C. & Upchurch, D. (1994). Interdependencies Over the LIfe Course: Women's Fertility, Marital, and Educational Experiences. Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/drafts/DRU763.

Lillard, L.A. & Panis C. (2003). aML Multilevel Multiprocess Statistical Software, Version 2.0. EconWare, Los Angeles, California.

Martín-García, T., & Baizán, P. 2006. The Impact of the Type of Education and of Educational Enrolment on First Births. *European Sociological Review*, 22(3): 259–275.

McDonald, P. (2000). Gender Equity, Social Institutions and the Future of Fertility. *Journal of Population Research,* 17(1)1-16.

Mureşan, C. & Hoem, J.M. (2010). The negative educational gradients in Romanian fertility. *Demographic-Research*, 22(4): 95-114.

Mureşan, C., Hărăguş, P.-T., Hărăguş, M., & Schröder, C. (2008). Overview Chapter 6: Romania: Childbearing metamorphosis within a changing context. Demographic Research 19(23): 855-906.

Ní Bhrolcháin, M. & Beaujouan, E. (2012) Fertility postponement is largely due to rising educational enrolment, *Population Studies: A Journal of Demography*, 66:3, 311-327.

OECD (2013). *Education at a Glance 2013. OECD Indicators*. OECD Publishing. Retrieved from http://dx.doi.org/10.1787/eag-2013-en

Rindfuss, R. (1991). The young adult years: Diversity, structural change, and fertility. *Demography*, 28(4), 493-512.

Rindfuss, R. R., Bumpass, L. & St.John, C. (1980). Education and Fertility: Implications for the Roles Women Occupy. *American Sociological Review*, 45: 431–447.

Tesching K., 2012. *Education and Fertility. Dynamic Interrelations between Women's Educational Level, Educational Field and Fertility in Sweden*, Acta Universitatis Stockholmiensis, Stockholm University Demography Unit - Dissertation Series 6.

Thalberg, S. 2013. Students and Family Formation. Studies on educational enrolment and childbearing in Sweden, *Acta Universitatis Stockholmiensis*, Stockholm University Demography Unit - Dissertation Series 9.

Table 1. Interview dates, sample sizes, numbers of events, and share of first conceptions/births before the end of education. Women at ages 17-35 at least for a month between 1ˢᵗ January 1980 and the date of interview.

	Interview date	Sample size	End of education	Conceptions before end of education	Birth before end of education	Total first birth	Conception before end of education, %	Birth before end of education, %
Former communist countries								
Bulgaria	Oct-Dec 2004	3426	2760	718	602	2223	21	18
Chech R.	Feb2004 - Nov2005	2228	1667	254	188	1196	11	8
Estonia	Sep 2004 - Dec 2005	2011	1622	526	420	1418	26	21
Hungary	Nov 2004 - May 2005	2558	2569	330	275	1467	13	11
Lithuania	Apr-Dec 2006	2082	1439	511	436	1269	25	21
Romania	Nov-Dec 2005	1761	1449	259	225	1194	15	13
Poland	Ian2010-Dec2011	5081	3852	1103	923	3369	22	18
Democratic countries								
France	Sep 2004 - Dec 2005	2356	1812	218	194	1210	9	8
Norway	Jan 2007 - Oct 2008	3863	2843	919	855	1210	24	22

Figure 1. Trends in country-specific hazards of first birth (relative to 1980). Childless, enrolled women at least one month during their ages 17 to 35. Duration splines by calendar year.
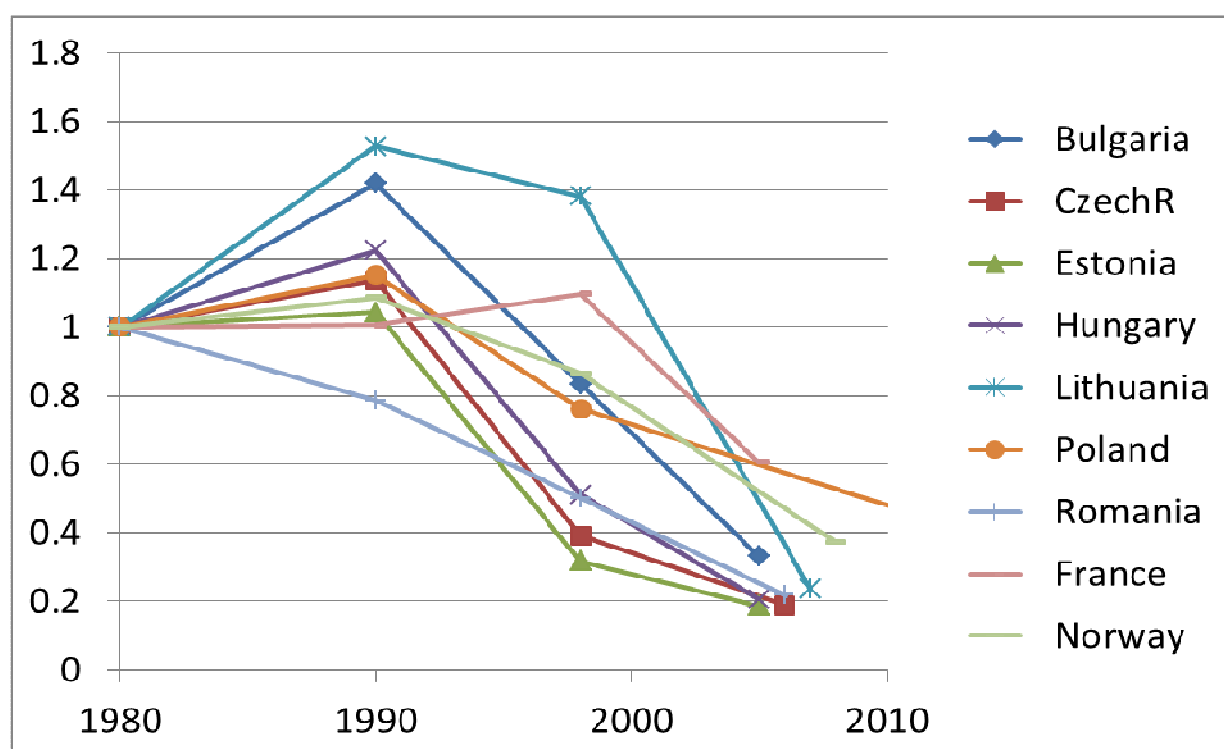
Figure 2. Trends in hazards of completion of education (relative to 1980). Childless, enrolled women at least one month during their ages 17 to 35, censored seven months before second birth. Duration splines by calendar year.
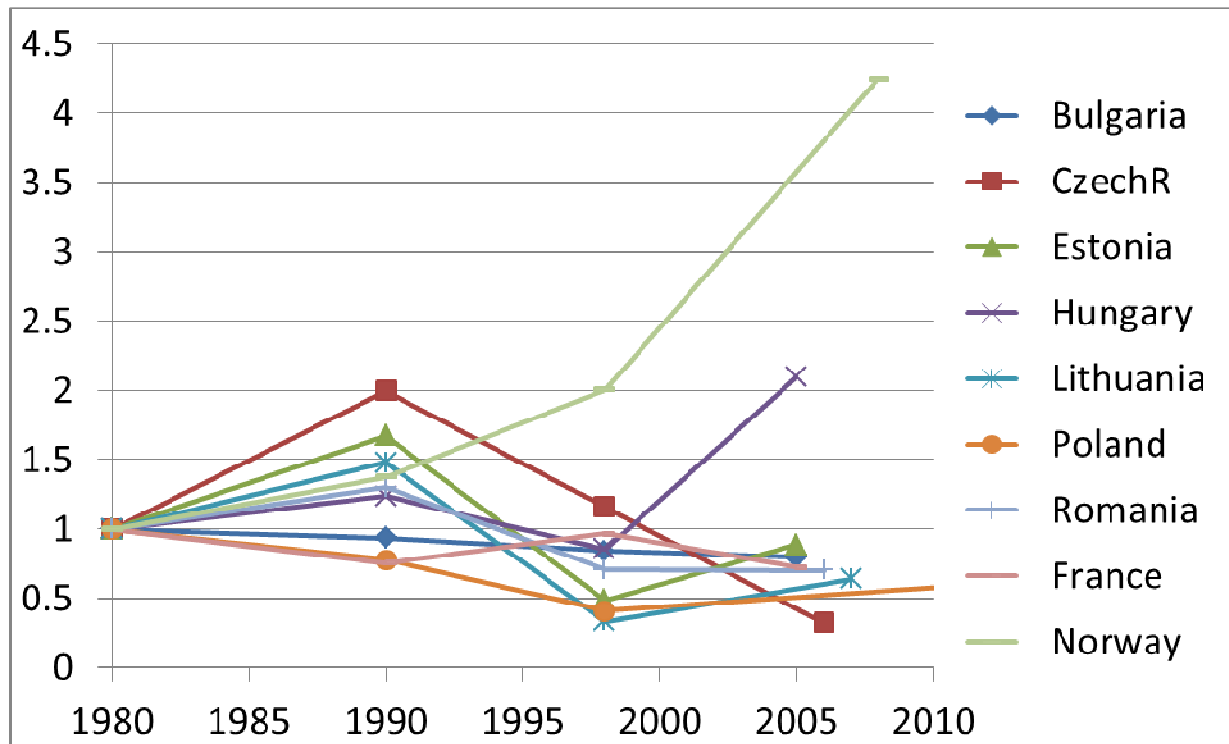

Table 2. Results of country-specific simultaneous-hazard models of transition to the end of education and of transition to first birth (relative risks from Model 1). Censoring seven months before any second birth or at age 35.
Significant values are given in boldface.

		BU	CZ	ES	HU	LI	RO	PL	FR	NO
Transition to end of education										
Maternal status (no children so far =1)										
pregnant		1.03	0.93	**1.74**	1.07	1.15	1.29	**1.36**	0.73	0.86
mother		**0.46**	**0.49**	**0.67**	**0.46**	**0.63**	**0.65**	**0.58**	**0.41**	**0.43**
First union (no =1)										
yes		**1.82**	1.17	**1.17**	1.14	**1.36**	**1.25**	**1.40**	**1.43**	**1.25**
Transition to first birth										
Educational status (in education =1)										
lo/mid level, out of ed		1.15	**2.43**	**2.15**	**1.54**	**1.84**	**1.83**	**1.95**	1.43	**2.12**
hi level, out of ed		1.16	**2.13**	**1.57**	**1.46**	**1.57**	1.03	**1.41**	1.06	**1.92**
First union (no =1)										
yes		**33.90**	**7.59**	**19.72**	**11.74**	**21.71**	**25.15**	**14.85**	**17.29**	**10.60**
ρ		**0.40**	0.18	0.04	**0.42**	-0.02	-0.02	**0.25**	**0.53**	0.01

Figure 3. Relative risks of end of education by maternal status and period (vs. no children so far). Model 2.
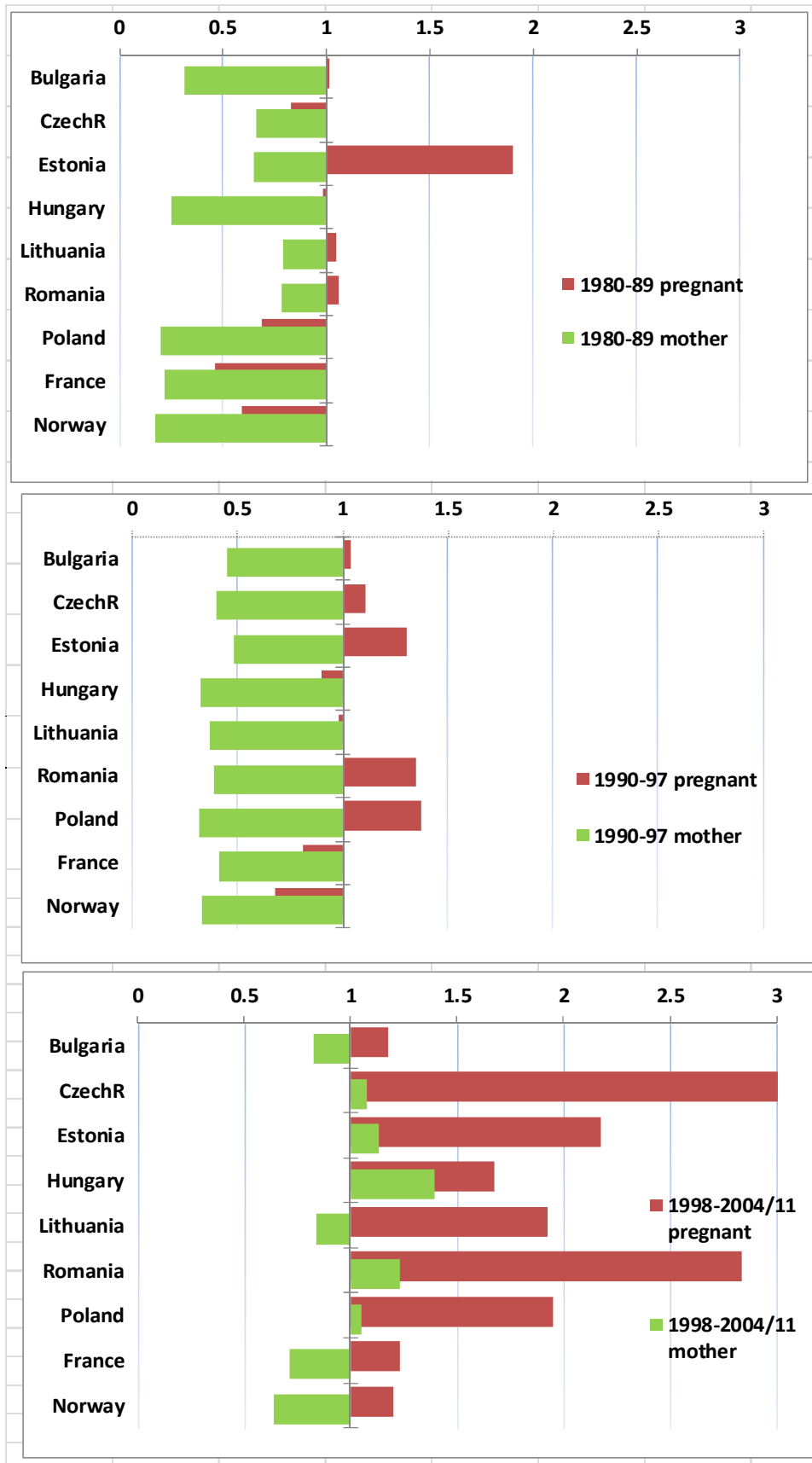
Figure 4. Relative risks of first birth by educational attainment and period (vs. still in education). Model 2.