Inverse or U shaped educational gradient in fertility differentials?

Evidence from census-linked data for Lithuania

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Introduction

Education is recognized as one of the key determinants of childbearing behaviour, affecting both the timing and quantum of fertility (Axinn and Barber 2001, Rindfuss et al. 1980, Westoff 1953). The existing empirical evidence points to several mechanisms linking education to fertility. Educational enrolment has a postponing effect on the first partnership formation and correspondingly on the start of reproductive life (Blossfeld and Huinink 1991; Ni Bhrolchaín and Beaujouan 2012). Being a student and having a family are two competing activities that are difficult to combine. On the other hand, the acquisition of higher education is highly demanded nowadays. On the attainment of higher education depends the success of women's future career and income, which is important for providing future children. The normative environment of schooling itself has also a constraining effect on childbearing – becoming a mother or having an additional child while enrolled in higher education is not perceived as a normal part of the educational track (Morgan and Rackin 2010). Therefore, women seeking higher education tend to put off childbearing, which in the end may lead to having smaller completed family size and increases the likelihood of remaining childless (Skirbekk and Samir 2012, Rendall and Smallwood 2003). Highly educated women not necessarily have lower fertility intensions, quite the opposite: women with higher educational attainment are found to show higher fertility intentions (Testa 2014, Mills et al. 2008). However, better educated women are more likely than less educated women to postpone having children and, as a consequence, are

more prone to underachieve their fertility intentions (Berrington and Pattaro 2014, Morgan and Rackin 2010, Quesnel-Vallee and Morgan 2003). They tend also more frequently than their less educated counterparts to adjust their fertility intentions downwards, especially as they are approaching the end of their fertile life span (Liefbroer 2009). The existing evidence on educational differences in period fertility provides contradictory results suggesting about both U-shape and inverse gradients. It has been suggested that the contradictory results can be attributable to limitations of data on education indicated in birth records and distortions of period measures due to tempo effects (Sobotka et al., 2015).

Most of the existing analysis on the underlying fertility determinants has been performed on the basis of survey data, such as the FFS and the GGS. Alongside numerous advantages of survey-based evidence, with a large number of explanatory variables being among the most important ones, there are several important disadvantages, including low response rates, low representativeness, and exclusion of some specific population groups. In addition, due to limitations of sample size, survey data often provide very limited possibilities to study fertility of socio-demographic groups. In some cases, information about education of females can be obtained from birth records, but these data often also suffer from various problems, and a very high share of females with unknown education is one of them. Furthermore, in many countries (including Lithuania from 2007 onwards) information about educational attainment is not available in birth records. In such cases, period fertility measures by education can be calculated only in two ways: either using census-linked data (or linked census sample data) or retrospective surveys.

Our study demonstrates potentials of census-linked fertility data for estimating robust and nationally representative parity-specific period and cohort fertility measures by education. Using a unique dataset (one of the first of this type in the Central and Eastern European region) it provides new evidence and demographic insights into the scarce existing literature on educational differentials in fertility in Lithuania. Understanding the scale and determinants of lower fertility of specific educational groups is important because population groups with lower

fertility eventually depress the overall fertility level of the country. It is also important for policy makers in developing policies supporting families.

Data and methods

The dataset (compiled and provided by Statistics Lithuania) is based on the follow-up of all females recorded on the date of the 2011 census (Figure 1). All birth records (including multiple parities) occurring during the period of observation (between 01.03.2011 and 31.12.2012) were linked to the corresponding female records at the census. Linkages between individual census and parity-specific birth records were implemented using personal identification numbers as unique identifiers for the same individuals. Deaths and emigration records were also linked to the census records in order to estimate person-years of exposure. All socio-demographic and socio-economic characteristics come from the 2011 census, whereas age was constructed as a time-varying variable. The final dataset includes 55 thou. births and 1.4 mill. person years of exposure (Table 1).

Results

In the 1990s, the TFR in Lithuania, which for about twenty years had stood close to the replacement level, started decreasing rapidly (Fig. 2). Fertility level hit the bottom in 2002 when the TFR fell to as low as 1.23. However, the trend reversed soon after. According to the latest official statistics, the TFR was 1.59 in 2013. The mean age at first birth was continuously increasing since the mid-1990s: from 23.04 in 1994 it went up to 26.74 in 2013 (HFD 2015). Among the birth cohorts 1944 through 1957, the level of completed cohort fertility (CCF) was relatively stable and close to 2. There was a temporary downward trend observed in completed fertility of cohorts born in 1958-1962, after which another leveling off (slightly above 1.7) of the CCF followed.

Our study indicates that period fertility, as reflected by education-specific total fertility rates show a "U-shaped" education-fertility relationship with the lowest fertility among women with secondary education and the highest fertility among women with the lowest education (Table 2). We also found that highly educated women most frequently have one or two children and are less likely than their less educated counterparts to have children of higher birth order. The results show that high TFR among women with higher education is a result of high TFR1 and TFR2. Women with lower than secondary education demonstrate higher fertility at higher parities and this account for the high TFR for all birth orders. The observed pattern in the total fertility rates is clearly affected by differences in timing of births (Fig. 3). Lower educated women enter the motherhood very young, and their childbearing careers stretch over a longer life span. Highly educated women, quite the opposite, tend to postpone childbearing to later ages and to have children much more closely spaced. The findings on completed cohort fertility show different results. We observe a persisting strong inverse educational gradient in fertility, especially among older cohorts of women. Completed fertility of women with higher educational level is systematically the lowest and least changing across the three cohorts.

Concluding remarks and next steps

Census-linked fertility datasets provide a reliable population-level evidence about fertility behavior of distinct population groups. The main advantages of such an approach include nationally representative data and a large sample size ensuring possibility to produce statistically robust estimates. A disadvantage of such an approach is related to a small number of explanatory variables available in the census. In this study census-linked dataset was employed to produce and to analyse reliable estimates of education-specific fertility in Lithuania.

The U-shaped pattern of educational differences found in period fertility are attributable to disparities in both fertility schedules and tempo effects (which are unequal across educational groups). These findings contradict the evidence based on cohort fertility showing a strong inverse relationship between education and fertility. We will further explore this divergence as

far as educational gradient in period and cohort fertility is concerned. One of potential causes for a U-shaped education-fertility relationship found in period fertility measures could originate from the specifics of classification of females by education. For example, women, who were enrolled in higher education at the census and thus who eventually would acquire higher level of education in the close future, are classified as having completed secondary educational level. This methodological issue and other reasons of possible distortions of education-specific period fertility measures will be examined in the forthcoming analyses.

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Figure 1. The follow-up design of census-linked fertility dataset.

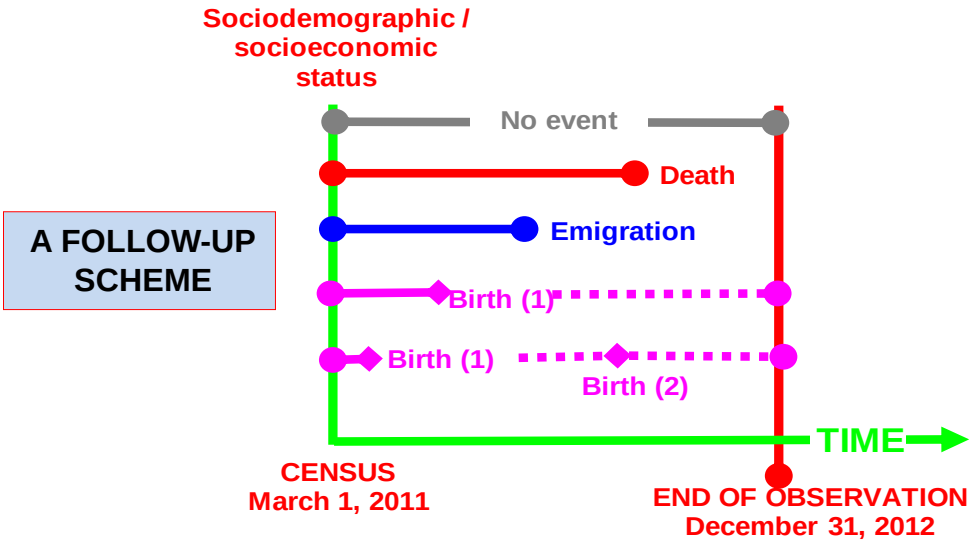
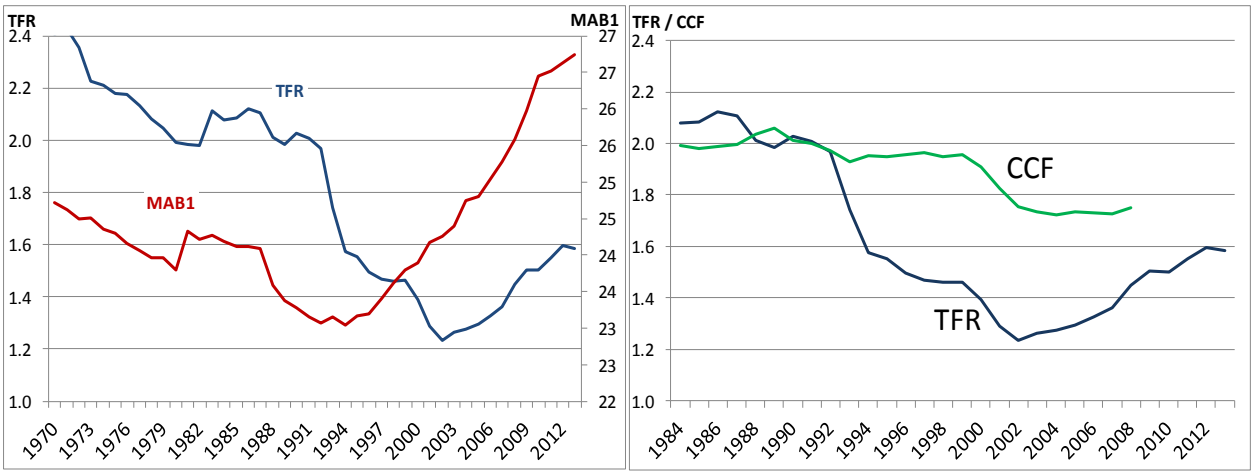


Table 1. Total number of births and female exposures by education. Lithuania, 2011-2012.

	Total	Higher education	Secondary education	Lower than secondary education
Births (all parities)	**54614**	26057	19861	8696
Births (parity 1)	**25281**	12699	8516	4067
Births (parity 2)	**20902**	10578	7828	2496
Births (parity 3)	**5932**	2401	2414	1117
Births (parity 4+)	**2499**	379	1103	1017
Person years of exposure	**1414592**	406648	635074	372870

Figure 2. Trends in period total fertility rate (TFR), period mean age at first birth (MAB1), and completed cohort fertility (CCF).



Note: CFF are lagged by 40 years.

Table 2. Period total fertility rate (TFR) by parity and education. Lithuania, 2011-2012.

	TFR (All parities)	TFR (Parity 1)	TFR (Parity 2)	TFR (Parity 3)	TFR (Parity 4+)
Higher	1.57	0.73	0.66	0.16	0.03
Secondary	1.33	0.53	0.57	0.16	0.07
Lower than secondary	1.73	0.64	0.59	0.26	0.25
TOTAL	1.54	0.70	0.60	0.17	0.07

Figure 3. Age-specific fertility rates by education level. Lithuania, 2011-2012.

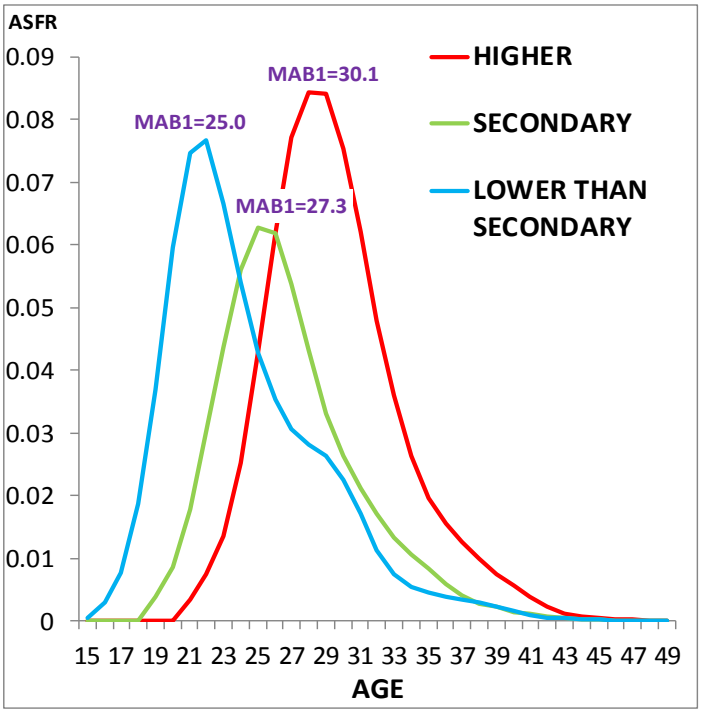


Figure 4. Completed cohort fertility by education, 2011-2012.