INVERSE OR U-SHAPED EDUCATIONAL GRADIENT IN FERTILITY DIFFERENTIALS? EVIDENCE FROM CENSUS-LINKED DATA FOR LITHUANIA

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INTRODUCTION

Most of the existing analysis on the underlying fertility determinants in Lithuania and elsewhere has been performed on the basis of survey data, such as the FFS and the GGS. Alongside numerous advantages of survey-based evidence such as a large number of explanatory variables, there are several disadvantages, including sensitivity of results as regards the level of response rates or representativeness issues as related to coverage 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.

The study demonstrates potentials of census-linked fertility dataset for estimating **robust and nationally representative parity-specific period and cohort fertility measures by education**. This unique dataset is one of the first of this type in the Eastern and Central European countries and allows producing and analysing reliable estimates of group-specific fertility in a post-transitional society.

The key advantages of the census-linked data:

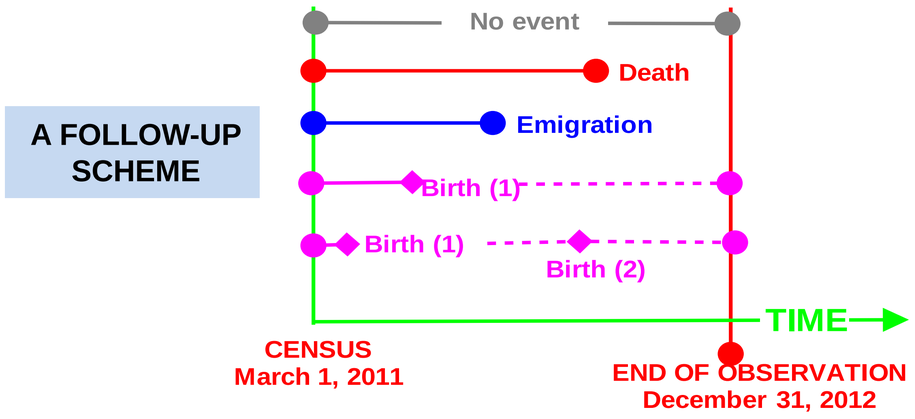
=> Representativeness: the dataset covers the entire population. This is a considerable advantage against surveys excluding vulnerable parts of population.

=> Sample size: the dataset covering the whole population provides substantial numbers of parity-specific births and person-years of exposure for statistically robust estimations of parity-specific fertility rates for distinct socio-demographic groups.

DESIGN OF CENSUS-LINKED FERTILITY DATASET

Steps of creating the census-linked fertility dataset:

1. Implementation of linkages between individual census and vital (parity-specific births, deaths, and emigration) records using personal identification numbers as unique identifiers for the same individuals (conducted at Statistics Lithuania). Deaths and emigration records are needed to estimate person-years of exposure.



2. Transformation of individual-level data into the aggregated multidimensional frequency format that provides aggregated parity-specific births and female exposures (based on person-years lived during the period of observation) for every possible combination of available variables. This data structure is suitable for calculation of *period* demographic measures (it is also possible to derive cohort fertility indicators).

TRANSFORMATION FROM INDIVIDUAL TO FREQUENCY FORMAT:

A) Individual data format (an example based on 8 cases)

Individual Nr.	Year of birth of mother	Month of birth of mother	Year of death	Month of death	Year of emigration	Month of emigration	Education	Year of birth (parity 1)	Month of birth (parity 1)	Year of birth (parity 2)	Month of birth (parity 2)
1	1990	6	.	.	.	.	Higher				
2	1990	6				.	Higher	2011	5		
3	1990	6				.	Higher			2011	12
4	1990	6		.	.	.	Higher				
5	1990	6	.	.	2011	5	Higher				
6	1990	6	2011	5	.	.	Higher				
7	1990	6	.	.	.	.	Secondary				
8	1990	6	.	.	.	.	Secondary	2011	5		

Censoring events

B) Dataset of frequencies

Nr. of combination of categories	Age (changes during the follow-up!)	Education	Births (parity 1)	Births (parity 2)	Person-years of exposure
1	20	Higher	1	0	1.58
2	21	Higher	0	1	4.00
3	22	Higher	0	0	2.17
4	20	Secondary	1	0	0.58
5	21	Secondary	0	0	2.00
6	22	Secondary	0	0	1.08

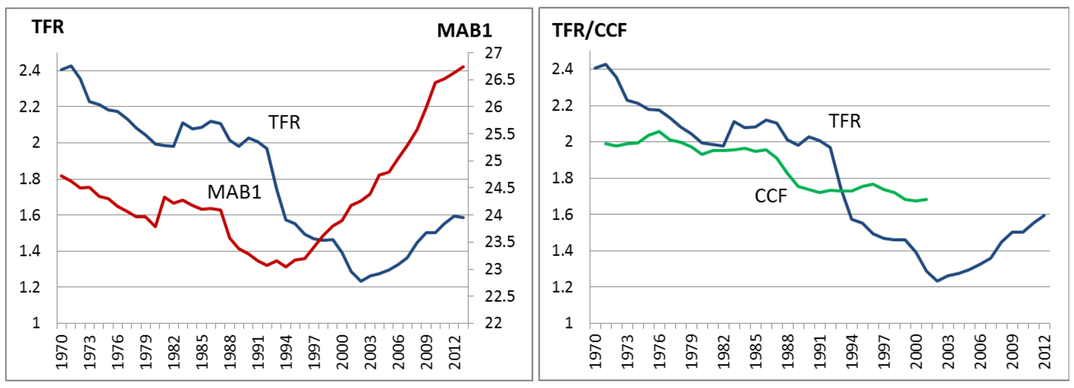
Table 1. Total number of births and female exposures by education. Lithuania, 2011-2012

	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

FERTILITY CHANGES IN LITHUANIA

TFR: rapid decline starting in the early 1990s and upward turn since the early 2000s.
Mean age at first birth (MAB1): reversal in the mid-1990s and continuous increase thereafter.
Completed cohort fertility: relatively stable and close to 2 for cohorts 1944-59, then a temporary downward trend (cohorts 1960-63) followed by leveling off at around 1.7.

Figure 1. Trends in period total fertility (TFR), mean age at first birth (MAB1), and completed cohort fertility (CCF)



Data source: Human Fertility Database, 2016. Note: cohorts are lagged by 27 years.

EDUCATIONAL GRADIENT IN PERIOD AND COHORT FERTILITY

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

➔ **U-shaped education-fertility relationship** with the lowest fertility among women with secondary education and the highest fertility among women with higher and lower than secondary education.

➔ **Highly educated** women most frequently have one or two children and are less likely than the secondary and least educated women to have children of higher birth order: => 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 => this account for high TFR for all birth orders combined.

Figure 2. Completed cohort fertility by education

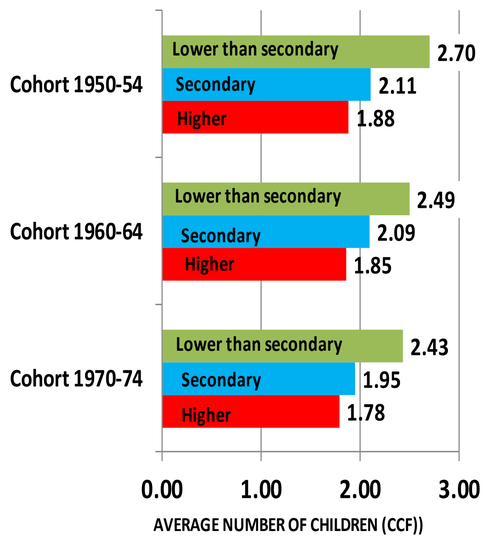
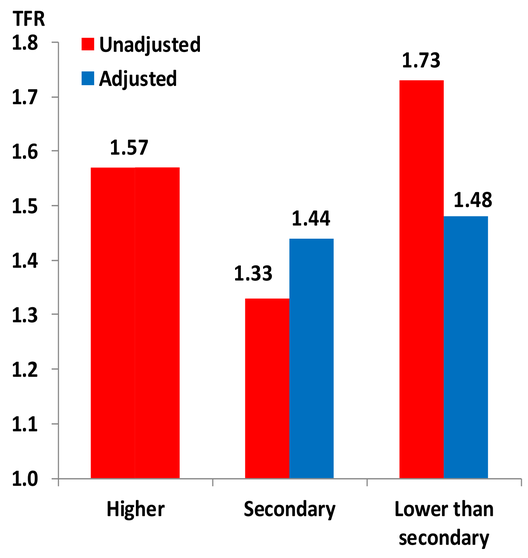


Figure 3. Comparison of unadjusted and adjusted period TFR by education



➔Persisting strong **inverse** educational gradient in fertility, especially among older cohorts of women.

➔Completed fertility of **women with higher educational** level is the lowest and **least changing** across the three cohorts.

➔**A hypothetical scenario**: reclassifying women enrolled in lower than secondary education at the census into the category of secondary education leads to almost disappearance of the U-shaped education-fertility pattern.

CONCLUSIONS

➔Census-linked fertility datasets provide a reliable population-level evidence about fertility behavior of population groups. The main **advantages** of this approach include nationally representative data and large sample size ensuring possibility to produce statistically robust estimates. A **disadvantage** of this approach is related to a small number of explanatory variables available in the census.

➔The observed U-shape pattern of **educational differences in period fertility are attributable to disparities in both fertility schedules and tempo effects** (which are unequal across educational groups). The evidence based on cohort fertility, showing a strong inverse relationship between education and fertility, contrasts this observation.

➔As our analysis shows, the U-shape pattern may also be caused by **specifics of classification of women by education**.

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