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The Education Gradient in Childbearing: Changes in the Education Distribution

Background and Motivation

In most Western countries, age at first birth has dramatically increased in recent decades, fertility rates declined, and the share of women who never had a child is at the highest point since the Second World War (Gustafsson et al. 2002). The concurrent rise in educational enrolment is often cited as a possible explanation (Ní Bhrolcháin and Beaujouan 2012). There are different channels through which education can lead to a postponement or reduction of childbearing. First, education and childbearing are generally considered to be incompatible and therefore the mere fact of spending more time in education pushes women to start families at a later age. The fixed biological window for childbearing in turn means that women with more education have less time to have children and might have fewer of them over their reproductive years (Kravdal and Rindfuss 2008). Second, women with additional schooling further postpone childbearing in order to start a career with an upward trajectory that needs time to establish (Gustafsson 2001). Third, having a university degree and career perspectives increases the opportunity cost for child-related career interruptions for highly educated women (Lappegård and Rønsen 2005). Since all these concerns apply to a lower extend to women with less education, the expectation is that the educational gradient of fertility would be negative; the result is a potential increase in educational stratification in family formation.

Negative educational gradients in fertility, i.e. the fact that highly educated women have fewer children and higher rates of childlessness than women with lower education, have been documented in a number of countries, but its presence is far from uniform (Wood et al. 2014). There is significant cross-country variation in these effects (Garriga et al. 2015), some of which is attributable to the differential mediation of welfare regimes (Mertz and Liefbroer 2017). However, recent studies argue that highly educated women might be returning to larger families (Esping-Andersen and Billari 2015; Goldscheider et al. 2015). Recent studies focusing on cohorts that have not year completed their reproductive careers support this claim by reporting that highly educated women display higher transition rates to the second child (Kravdal 2007). This could lead to a gradual convergence in fertility rates across women with different educational levels and a consequent flattening of the educational gradient (Adserà 2017). Faster transitions to second births could be a result of the smaller time window faced by highly educated women rather than an actual increase in fertility quantum, so the results for completed fertility are still uncertain (Matysiak and Vignoli 2019).

Expansions in education enrollment and achievement not only contributed to the emergence of differential fertility rates across education groups, it also affected the education distribution itself. At the beginning of the educational transition, women who achieved bachelor degrees and above were fewer and highly selected. Now, there is more (negative) selection at the bottom of the educational distribution as women who do not finish high school are more disadvantaged than in the past (Adserà 2017). Therefore, while measures of absolute education in years of schooling or highest degree did not change much during the educational expansion, the meaning attached did. This disconnect is particularly problematic in cross-country comparisons since increases in enrollment of women in upper secondary and tertiary education did not happen simultaneously across countries. In other words, there is variation within countries by cohort and variation within cohort by country because the starting point and the speed of increasing educational levels are context-specific.

Research Question and Contribution

The present study re-examines the educational gradient in fertility in light of changes in educational composition and selectivity. It accounts for the difference in the educational distribution by constructing a relative measure of education by country and cohort. To give a sense of the sizeable differences between absolute and relative measures of education across cohorts and countries, here is an example of the same level of completed education (high school) and two countries. A woman who obtained a high school degree in the United States in 1950 was in the 56th percentile in the education ranking of women in her birth cohort, but the same degree obtained in 1990 would place her in the 25th percentile of her cohort. Meanwhile, a Greek woman with a high school degree in 1990 would be roughly in the 56th percentile for her reference group. The identification of the appropriate education reference group is important for studying childbearing in at least two ways. First, fertility behavior modelling is more likely to happen for women who share characteristics such as socio-economic status and aspirations (Hensvik and Nilsson 2010). Second, labor market conditions at the time of graduation shape fertility patterns and depend critically on the level of education and on the country of residence.

Feliciano and Lanunza (2017) recognize the relevance of accounting for the actual educational reference group beyond measures of absolute education in their analysis of the immigrant paradox in education. In their work, as well as in Ichou (2014), contextual educational attainment for the immigrant parents explains why children of immigrants perform better than expected based on their socio-economic status in the receiving countries. Similarly, alternative measures of relative education help to reconcile current voter turnout rates with the fact that they should have gone up with time as more education positively correlates with turnout (Helliwell and Putnam 2007; Nie et al. 1996; Tenn 2005). In this work, I use a country and cohort specific measure of relative education to explain findings of changing education gradients in fertility quantum with childlessness rates and total number of children as well as fertility timing through transition speeds to first and second births.

Data and Methods

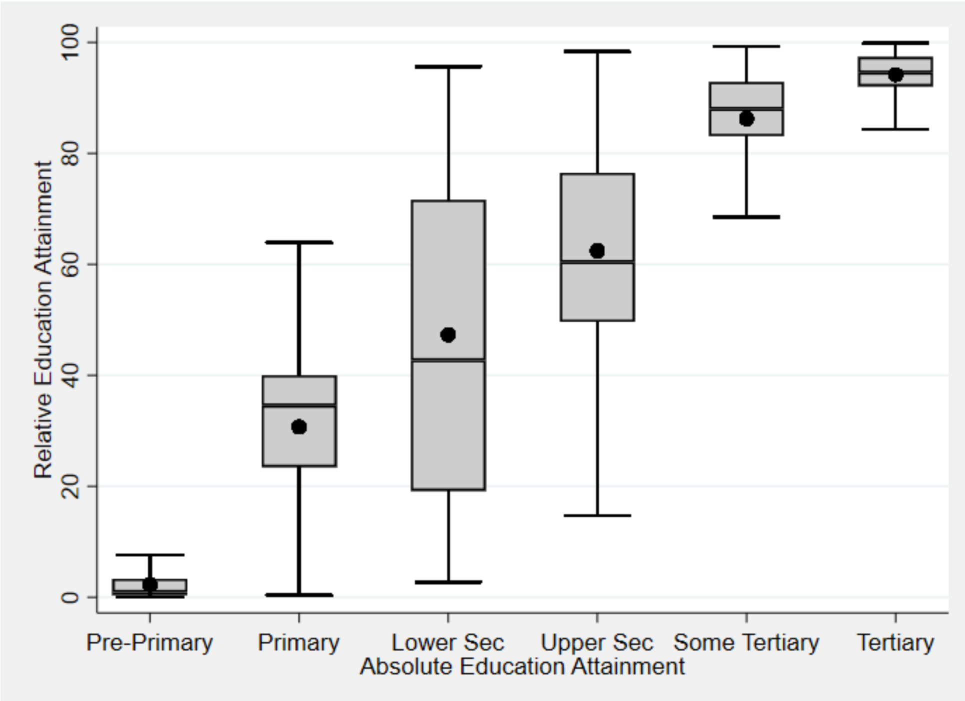
I use the first wave of the Gender and Generation Survey (GGS) and Harmonized Histories from the Gender and Generation Programme. They contain highly comparable survey responses from a number of European countries and the United States, including information on fertility and union status histories. Furthermore, these datasets contain the cohorts who were of childbearing age at the time of educational expansion. Indeed, those who have completed fertility at time of survey (conducted between 2002 and 2013) are the ones chiefly affected by the changes in the educational distribution. The GGS measures education in terms of highest education level using the ISCED97 scale from which standard absolute measures of education (ISCED 0 – 2: low, ISCED 3-4: medium, ISCED 5-6: high) are routinely used.

I match each respondent's highest level of education with a relative measure of education constructed based on data reported in the Barro-Lee Educational Attainment Data (Barro and Lee 2013). It provides educational attainment data for 146 countries disaggregated by sex in 5-year intervals from 1950 to 2010 based on 621 census and survey observations. Women who are from the same country and were in the same 25-29 age group when they completed their education constitute the reference education group. Based on Ichou (2014), the relative education measure is the percentage of women in the reference group who have a lower level of educational attainment, plus half the percentage of women with the same level of education. Figure 1 compares the absolute and relative measure of education for the overall sample. Since the sample only includes developed countries, the education expansion happened mainly in secondary and tertiary education. Therefore, those categories cover a larger span in the relative education measure, signifying variations across countries and cohorts.

Stratification by education in childbearing decisions can manifest differently for tempo and quantum effects in fertility. Therefore, I first run logistic regressions on being childless and Poisson regressions on the number of children by age 25, 35 and at completed fertility. Second, I use discrete-time hazard models for first birth from age 15 and from year of completed education (Gustafsson et al. 2002;

Lappegård and Rønsen 2005). In addition to relevant covariates like relationship status, predictors include absolute and relative measures of education, country, cohort, and their interactions.

Figure 1 – Comparison of Absolute and Relative Measures of Education



Preliminary and Expected Findings

Table 1 shows descriptive statistics for the relative education measure by country and cohort. As expected, the mean decreases across cohorts within the same country as absolute education increases with each subsequent cohort. The speed of the decline differs across countries with sustained drops across cohorts in the Czech Republic, while mean relative education does not drop in Estonia and Poland until the cohorts born in the 1970s and 1980s. This measure also shows that changes occur differently at the ends of the distribution. At the upper end, most changes within countries happen in the top 25% rather than in the top 10% (not shown), and they are particularly pronounced in Italy, Czech Republic, and Romania. At the lower end, there are dramatic decreases in the bottom 10%, especially in Germany, France, and the Netherlands. The bottom decile starts with similar values for cohorts born before the 1940s and then it grows diverse until it aligns again at a lower level for cohorts born in the 1980s.

Preliminary results from regression analyses on childlessness and number of children confirm that the relative education matters even when in combination with absolute education, thus supporting the claim that relative positon in the education ranking convey useful information to explain childbearing behavior. I expect to find that those at the very top (p90) and very bottom (p10) display different fertility behaviors than those traditionally labelled as low (ISCED 0-2) and high (ISCED 5 -6), and in particular they display lower fertility and more childlessness at each age. Indeed, women with relative medium-high education are expected to have faster transitions to second births than those at the very top of the distribution. I also expect timing to differ, with longer gaps across educational level for models starting at age 15, but less disparities in models that start the ‘childbearing clock’ for the first child at year of graduation for the top quartile.

Table 1 – Descriptive Statistics for Relative Education by Country and Cohort

		Countries														
		Bulgaria	Russia	Germany	France	Hungary	Italy	Nether-lands	Romania	Austria	Estonia	Belgium	Lithuania	Poland	Czech Republic	Sweden
<1940s	Mean	71.5	77.54	90.25	60.55	84.66	57.68	74.38	65		76.51	64.54	68.61	65.04	84.82	70.75
	SD	26.86	24.39	7.95	27.95	19.34	28.3	26.43	27.52		21.29	30.57	26.26	27.82	10.07	24.96
	p25	54.43	68.44	85.52	40.53	88.57	38.62	51.6	40.01		69.61	28.43	40.73	37.46	80.03	64.41
	Median	78.75	89.54	90.59	43.28	91.84	38.62	89.75	63.75		82.92	70.59	70.88	76.03	86.09	71.25
	p75	87.74	97.93	94.01	93.33	96.97	86.9	97.9	92.82		95.69	90.24	90.54	90.4	93.2	96.62
	n	1711	2504	1674	1834	2823	1529	1563	2378		1950	924	1730	3556	1700	1197
1950s	Mean	67.74	79.81	84.88	65.9	77.55	70.31	63.28	57.12		75.09	61.42	72.71	66.7	68.5	68.75
	SD	22.76	22.85	10.47	31.09	18.24	24.15	29.91	26.6		22.73	28.44	24.86	26.73	17.96	23.17
	p25	62.63	60.53	78.12	27.83	57.61	65.33	35.72	34.35		56.63	36.5	50	64.05	69.32	49.7
	Median	73.76	88.44	84.81	89.05	89.08	65.9	65.36	73		84.97	65.07	84.79	64.05	69.32	60.45
	p75	93.93	96.15	97.34	96.9	90.55	87.28	95.93	73.64		94.39	92.1	94.39	81.9	72.05	92.18
	n	837	1492	1023	1088	1478	1082	927	1213		942	701	810	2523	877	823
1960s	Mean	60	71.64	77.27	70.46	75.69	62.33	57.82	54.01	71.42	72.43	60.83	69.75	72.25	61.65	66.33
	SD	24.27	26.64	17.1	31.78	19.16	24.38	30.01	27.15	20.55	24.94	27.62	25.17	24.82	21.36	25.75
	p25	54.7	41.3	66.9	37.7	67.45	38.2	19.24	17.04	67.32	47.38	49.26	42.36	57.21	55.54	45.86
	Median	56.24	90.28	75.07	86.66	85.39	72.85	55.63	59.95	67.32	83.45	57.52	83.13	82.61	62.71	49.5
	p75	92.69	94.58	97.12	96.22	86.95	76.49	93.24	60.66	92.37	93.61	88.55	93.58	92.08	62.71	92.41
	n	1743	1263	1285	1094	1176	1332	1208	1050	915	891	801	937	1552	890	955
1970s	Mean	61.43	61.46	62.49	69.96	71.64	57.51	59.7	51.54	68.7	60.82	59.94	68.74	61.86	54.6	71.16
	SD	26.51	31.06	22.57	31.71	25.49	24.32	28.61	29.5	21.93	29.85	29.68	27.81	26.73	24.86	25.8
	p25	50.48	22.3	56.01	43.42	52.05	26.03	44.33	12.65	51.74	37.48	34.82	46.48	41.1	47.08	48.32
	Median	57.25	87.85	56.5	83.47	83.49	59.35	48.85	57.46	67.42	71.5	85.25	85.3	50.53	51.8	90.16
	p75	90.31	89.45	86.71	95.32	92.2	65.19	91.06	57.46	93.15	88.92	86.72	94.29	91.78	51.8	94.15
	n	1761	1136	867	967	1491	831	837	956	1106	903	675	805	1879	1002	825
1980s	Mean	41.68	52.46	42.95	48.75	71.23	44.36	35.77	49.25	56.75	54.73	49.63	36.85	47.71	30.91	47.58
	SD	21.71	33.04	26.31	37.52	21.55	18.95	21.36	24.3	25.05	26.57	28.93	28.11	31.32	24.18	29.29
	p25	22.68	21.21	12.51	8.72	79.98	15.25	13.75	18.11	48.61	43.21	33.41	21.73	26.48	3.66	35.07
	Median	52.53	54.83	49.67	67.27	79.98	54.42	41.58	59.49	49.25	43.21	33.98	21.73	39.3	37.88	35.41
	p75	52.53	87.42	49.67	91.23	79.98	54.42	41.58	59.49	82.57	76.96	84.42	61.57	82.96	43.86	85.97
	n	955	643	526	725	549	341	206	412	980	348	627	755	2068	740	1191

Note: Author's calculation based on the Gender and Generation Survey and Barro-Lee dataset.

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