Unskilled Mayors and Graduate Farmers— Educational Fertility Differential by Occupational Status and Industry in Four European Countries

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Extended Abstract

Introduction

The present research will contribute to a better understanding of the relationship between socio-economic status and fertility. Specifically, we seek to answer the question of whether education is associated with fertility independently of occupation. This is achieved by examining educational fertility differentials within occupation groups and industries and making cross-country comparisons for four central and southern European countries: Austria, Greece, Hungary and Romania. The analysis employs the individual-level census micro-samples recently made available as part of the Integrated Public Use Micro-Sample Census Data (IPUMS) scheme. A key advantage of this data source is that the census samples are sufficiently large to contain sizeable numbers of rare combinations, such as university graduates in low-status jobs or primary school drop-outs in the 'Legislators, Senior Officials and Managers' category. Since occupation can be assumed to be more directly correlated with social status and income than education per se, this allows for an indication of whether education has a direct relationship with fertility, net of these confounding factors.

Theoretical Framework

Women's level of education has long been widely recognized as one of the most important determinants of fertility, both at the macro and individual level (Becker 1981; Caldwell 1980; Cochrane 1979; 1983; Kasarda 1979; Kasarda, Billy, and West 1986). However, the theoretical model is still surprisingly lacking; for example, there is no consensus on whether the effect of education is mainly economic, behavioural, or attitudinal. Disentangling these issues is made difficult by the fact that education is highly correlated with other relevant factors such as occupational status or income. While it is known that education may reduce fertility because it exposes women to knowledge about the biological circumstances of reproduction and contraceptive practices (Jejeebhoy 1995), education also exposes women to lifestyles and opportunities beyond motherhood (Lesthaeghe 1995). However, a womans attitudes and beliefs towards fertility may themselves be reflected in her ultimate education and occupational status (c.f., Lesthaeghe and Moors 1995; Janssen and Kalmijn 2002). In other words, social status goals, when realized, may be endogenous to underlying values and preferences concerning family and fertility. Moreover, a woman with aspirations for occupational upward mobility may forgo having children (or at least delay them) because of the opportunity costs involved in reaching such goals (Kravdal 1994).
While fertility preferences may be obtained via the education process itself, even before entering an occupation, it may also be that women who aspire to have children self-select into industries that are family-friendly in terms of time management, such as education, health and social work, and which offer flexibility regarding when during the day and week the work needs to be done, and flexibility in working hours (Kravdal 2007; Janssen and Kalmijn 2002; Lappegard and Ronsen 2005). Such industries, while in some contexts are relatively lower-paying (due to their traditional dominance by women), tend to require a higher degree of formal education. Another important consideration is an occupations wage structure, but especially the steepness of the earnings profile or opportunities for promotion. A steep curve in earnings has been shown to positively correlate with the onset of motherhood, since childbearing would be more costly later in ones career (Lappegard and Ronsen 2005).
The relationship between education or occupational status and fertility is also determined by context. The characteristics of a countrys labor market are arguably related to fertility, since the ease with which one enters the labor market after education completion (or high unemployment) could impact childbearing (Pfeiffer and Nowak 2001; Scherer 2005). A countrys formal education structure may also be an important determinant of

fertility patterns. For instance, Greeces educational system is ill-suited to simultaneous enrollment and occupation, and further, it is characterized by an inability to complete a tertiary educational level after early departure (Bagavos 2010). In Austria, however, programs placing students into paid apprenticeships simultaneous with educational completion are common (Rindfuss and Brauner-Otto 2008). Furthermore, two of the countries whose data are included in this study present the opportunity to observe whether fertility relates to education in the same manner observed in Western countries. Prior to the 1990s in Hungary and Romania former Soviet Communist block members the economic returns to education via occupational status were potentially lower and less varied, and employment prospects were less uncertain; thus, one might expect less impact on fertility due to opportunity costs or fewer differences in partnership formation and fertility timing due to education (Billari and Philipov 2004). The fertility behavior of the cohorts examined may address whether these relationships have changed since the Soviet collapse. In a study of Hungary (Speder 2006), it was found that postponement among higher educated women increased sharply after the regime change. This may also be true in Romania, especially since in addition to recent widespread structural changes in the job market, anti-abortion/contraception policies stopped being enforced after 1989 (Pop-Eleches 2010).

Data & Methods

We use the most recent rounds of individual-level IPUMS census data from 1990 and 2000 for Austria, Greece, Hungary and Romania. Although complete birth, educational or occupational histories are not available, two measures at census time are used as fertility indicators: the number of children ever born and the percentage without children. The initial analysis (year 2000) focuses on women aged 40 years or higher, whose birth histories can be assumed to be essentially complete. A secondary analysis also uses the same measures for women aged 35-44 and 25-34 (year 1990) to allow for a pseudo-cohort analysis.
Occupation and industry measures have been harmonized, meaning the national categories have been mapped to common categories to achieve comparability.
The recoded Industry Categories (and corresponding abbreviations) are: Education/Health and Social Work (E&HSW); Public Administration and Defense (PA&D); Financial Services/Insurance/Real Estate/Business Services (Service); Hotel/Restaurant (H&R); Wholesale and Retail Trade (W&RT); Utilities/Transportation and Communications (UTC); Construction/Mining (CM); Manufacturing (Manuf); and Agriculture/Fishing and Forestry (AF&F).
The recoded Occupation Categories (and their corresponding abbreviations) are: Plant and Machine Operators/Assemblers/Elementary occupations (PMOAE); Crafts/Related Trade Workers (C&RTW); Skilled Agricultural/Fishery Workers (SA&FW); Clerks/Service Workers/Shop & Market Sales (CSWSMS); Technicians/Associate professionals (T&AP); Professionals (Prof); Legislators/Senior Officials/Managers (LSO&M).
The four harmonized Education Levels (and their corresponding abbreviations) are Less than primary completed (¡P); Primary (P); Secondary (S); and College Completed (T).[1]
Given the cross-sectional nature of the IPUMS samples, the results, though rich, are primarily descriptive. Children Ever Born (CEB)[2] by education and occupational status are presented, and disaggregated by country. However, the full paper will exploit the fact that almost all combinations of occupation, industry and educational attainment level are present in each country to perform a Bayesian Analysis of Variance (ANOVA) as proposed by Gelman (2007). This serves a similar analytic purpose as classical ANOVA (to shed light on the relative importance of different sources of variation), but among other advantages easily deals with unbalanced cell sizes, which in our case differ by several orders of magnitude. Underlying this analysis is a Poisson model[3] for the count of CEB in each group, with random effects for country, education, occupation and industry, as well as all their interactions. The estimation is performed using the Integrated Nested Laplace Approximation algorithm.

Preliminary Findings

Univariate Findings: With regard to education, the expected pattern of a negative association of education with fertility was on the whole confirmed, with some important caveats: First, there were large differences in the size of the education differential between countries. The lowest amount of variation by educational level was observed for Greece, where the differential was less than 1 child, whereas in Romania the variation was highest, with a difference of almost 2 children between the lowest and highest educational category.
Examining fertility by industry and occupational categories, we found that there was relatively little variation in fertility between groups, even between what might be considered extremes, such as Education/Health and Social

[1] The harmonized variable was unavailable for Austria. The Austrian unharmonized categories were mapped to the four levels above, taking into account country knowledge and IPUMS documentation on how the mapping was performed for the other three countries in this study. Another difference is that in Austria, Less than Primary Completed is virtually non-existent in the data.

[2] The full paper also examines the percentage childless.

[3] There is evidence of underdispersion at moderate levels of fertility and overdispersion at high levels. The full paper therefore further investigates the application of a generalized Poisson model.

Work on the one hand and Construction/Mining on the other. The sole exception was for Agriculture/Fishing and Forestry, where the number of CEB was far higher than in other industries, but this is likely attributable to a natural rural bias of these industries.
Interaction Findings: There was a fairly consistent pattern in that in all countries within the vast majority of occupation groups, there is an educational fertility differential in the expected direction, suggesting that education has a depressing effect on the number of children independently of social status, income, and other factors normally associated with occupational status (see Figure 1) For many country-occupation combinations, every step up the education scale is associated with fewer children. In quite a few cases however, the difference between completed secondary and completed tertiary is marginal, non-existent or negative, especially in Austria. Nevertheless, even in these cases fertility is higher for the lowest than the highest education category in virtually all country-occupation combinations. Interestingly, the Professional category exhibits the least consistent education differentials in all the measures above. This may indicate that it is the hallmarks of professional status, such as increased autonomy and independence that have a dampening effect on fertility, which for other groups are mostly attained through higher education.
Compared to occupation, the industry of ones career appears to have relative little effect on education differentials. (See Figure 2) In particular, education differentials universally persist even in industries intuitively associated with a selection bias towards family-minded women, namely Education/Health and Social Work.
Timing: In order to examine possible tempo effects, the above analyses were repeated for the age groups with incomplete birth histories. It is instructive to compare the 25-34 group in 1990, and the 35-44 group in 2000. Though the samples were drawn independently, they can be viewed as a 'pseudo-cohort.' While in Greece the higher education group to some extent catches up with the lower education groups between the ages of 25-34 and 35-44 in terms of CEB, in Romania any catching up has already taken place: the educational differential remains almost constant as a similar number of births is added at all levels. Austria and Hungary both exhibit a mixed picture. In Austria there is significant late fertility at all education levels, but more so for the highest education group, which thereby manages to close the gap to some extent. In Hungary, ignoring the group with less than primary education, the pattern is somewhere between those of Austria and Greece. However, between the highest and the lowest education group, there is no closing of the gap.
In line with the focus of the study on the education-occupation interaction, we conducted the same pseudo-cohort analysis, but disaggregated by both education and occupation. The timing pattern by occupation essentially mirrors the aggregate education pattern, with no clear trends for the impact of individual occupation groups. For industry too, we found no consistent or strong effects of particular industries on first birth timing. This may be seen as a counter-intuitive result: Despite the notion that careers in some occupations and/or industries are easier to combine with childbearing than others, our results show no convincing evidence of substantially different fertility timing or catch-up behavior.
The results of the more sophisticated Bayesian ANOVA analysis essentially confirm these results (c.f. Figure 3). The agricultural industry and occupation groups were excluded here as outliers. The results confirm education as the single largest source of variation. Interestingly, there is virtually no separate effect of the country. Broadly, the results suggest that fertility may be reasonably modeled by assuming independent education, occupation and industry effects that are mediated by the country setting, but do not interact strongly with each other. Confirming the descriptive patterns, the variational effect of education is almost entirely independent of occupation level and industry.
In the absence of data on proximate determinants of fertility it remains unclear whether this education effect works through behavioral changes or attitudinal/agency changes. Nevertheless, the results suggest that at least part of the effect of education may be a direct effect on fertility behavior net of education's correlation with income and social status.

References

[1] G. Becker. *A Treatise on the Family.* Cambridge, MA: Harvard University Press, 1981.

[2] F.C. Billari and D. Philipov. "Education and the transition to motherhood: a comparative analysis of Western Europe". In: *Vienna: Vienna Institute of Demography of the Austrian Academy of Sciences.(European Demographic Research Papers, 2004-3)* (2004).

[3] John C. Caldwell. "Mass Education as a Determinant of the Timing of Fertility Decline". In: *Population and Development Review* 6.2 (June 1980), pp. 225–255.

[4] Minnesota Population Center. *Integrated Public Use Microdata Series, International: Version 6.1.* University of Minnesota. Minneapolis, 2011.

[5] S.H. Cochrane. "Effects of education and urbanization on fertility". In: *Determinants of fertility in developing countries* 2 (1983), pp. 587–626.

[6] S.H. Cochrane. *Fertility and education: What do we really know?* Baltimore, MD: Johns Hopkins University Press, 1979.

[7] A. Gelman and J. Hill. *Data analysis using regression and multilevel/hierarchical models*. Cambridge University Press Cambridge, 2007.

[8] M Janssen and M Kalmijn. "Investments in Family Life: The Impact of Value Orientations and Patterns of Consumption, Production and Reproduction in Married and Cohabiting Couples." In: *Meaning and Choice: Value Orientations and Life Course Decisions*. Ed. by R. Lesthaeghe. The Hague: NIDI/CBGS, 2002, pp. 129–59.

[9] S. J. Jejeebhoy. *Women's education, autonomy, and reproductive behaviour: experience from developing countries*. Clarendon Press, 1995.

[10] J.D. Kasarda. "How female education reduces fertility: Models and needed research". In: *Mid-American Review of Sociology* 4.1 (1979), pp. 1–22.

[11] J.D. Kasarda, J.O.G. Billy and K. West. "Status Enhancement and Fertility: Reproductive Responses to Social Mobility and Educational Opportunity". In: *Studies in Population*. Orlando, FL: Academic Press, 1986. URL: http://www.popline.org/docs/0025/042803.html.

[12] Ø. Kravdal. "Effects of current education on second-and third-birth rates among Norwegian women and men born in 1964: Substantive interpretations and methodological issues". In: *Demographic Research* 17.9 (2007), pp. 211–246. URL: http://ideas.repec.org/a/dem/demres/v17y2007i9.html.

[13] Trude Lappegård and Marit Rønsen. "The Multifaceted Impact of Education on Entry into Motherhood". In: *European Journal of Population* 21.1 (2005), p. 31. ISSN: 01686577. URL: http://proquest.umi.com/pqdweb?did=860891321&Fmt=7&clientId=15810&RQT=309&VName=PQD.

[14] R. Lesthaeghe. "The second demographic transition in Western countries: An interpretation". In: *Gender and family change in industrialized countries*. Ed. by K. O. Mason and A. M. Jensen. Clarendon Press Oxford, 1995, pp. 17–62.

[15] R. Lesthaeghe and G. Moors. "Living Arrangements, Socio-economic Position, and Values Among Young Adults: A Pattern Description for Belgium, France, the Netherlands, and West-Germany, 1990". In: *Gender and Family: Change in Industrialized Countries*. Ed. by K. O. Mason and A M Jensen. Clarendon Press, 1995.

[16] C. Pfeiffer and V. Nowak. "Transition to Adulthood in Austria". In: *Transitions to Adulthood in Europe*. Ed. by M Corijn and E. Klijzing. Dordrecht: Kluwer, 2001, pp. 43–66.

[17] C. Pop-Eleches. "The Supply of Birth Control Methods, Education, and Fertility". In: *Journal of Human Resources* 45.4 (2010), p. 971.

[18] R.R. Rindfuss and S.R. Brauner-Otto. "Institutions and the transition to adulthood: Implications for fertility tempo in low-fertility settings". In: *Vienna yearbook of population research/Vienna Institute of Demography, Austrian Academy of Sciences* 6 (2008), p. 57.

[19] S. Scherer. "Patterns of labour market entry–long wait or career instability? An empirical comparison of Italy, Great Britain and West Germany". In: *European Sociological Review* 21.5 (2005), p. 427.

[20] Z. Spéder. "Rudiments of recent fertility decline in Hungary". In: *Demographic Research* 15.8 (2006), pp. 253–288.

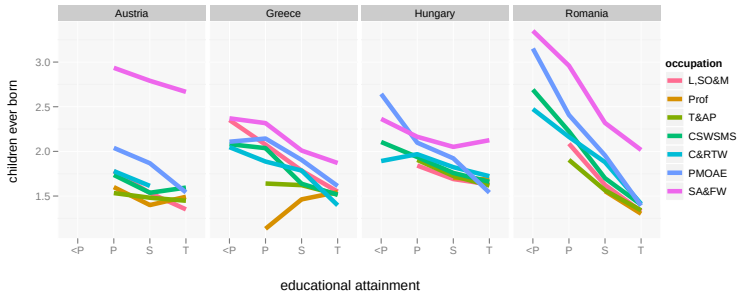

Figure 1: Children Ever Born by education and occupation (women aged 40-54, 2000-2002 census round)

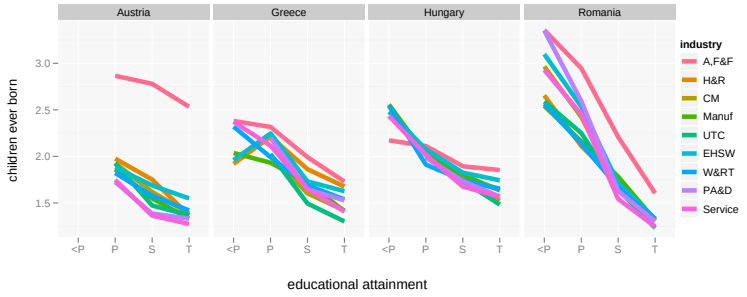

Figure 2: Children Ever Born by education and industry (women aged 40-54, 2000-2002 census round)

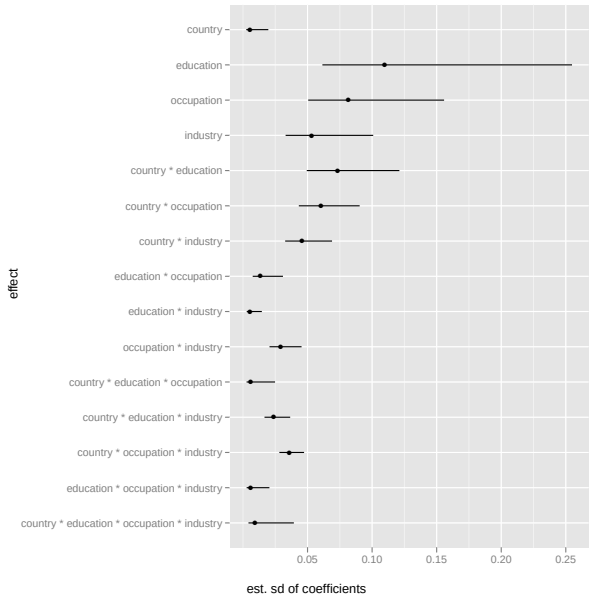

Figure 3: Estimated standard deviation of parameter groups in Bayesian Poisson regression model of CEB