A meta-analysis of the relationship between women's fertility intentions and level of education

Maria Rita Testa and Fabian Stephany

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Introduction

The complex effect of education on fertility has been widely studied in the literature and is a topic of high relevance in research on reproductive behaviour (Kohler and Rodgers 2003). The diffusion of modern contraception has not levelled socioeconomic differentials in completed fertility (Sweet and Rindfuss 1983) and college graduate women usually tend to have fewer children than women with a high school degree or a lower education level (for a review see Björklund 2006). Fertility intentions are an important channel through which education affects fertility. However, the relationship between fertility intentions and education is not necessarily the same as the relationship between actual fertility and education. Empirical evidence indicates that more educated women do not intend to have fewer children than less educated women but they end up with fewer children and they revise downwards their intentions more often than their lower-educated counterparts. Fertility postponement of highly educated women and parity-specific distribution of their fertility intentions (Sobotka 2009) play an important role in reading this contradictory finding. Aim of this study is to investigate the conditions under which a positive relationship between women's educational level and childbearing intentions is observed.

Research questions

The research aims to answer the following questions: 1) How does women's educational level correlate with women's ultimately intended family size? 2) How do women's enrolment in education and women's level of completed education correlate with the timing of the first and the additional intended children? 3) How does this relationship vary along the individual life course, by parity, and from country to country?

Data and Methods

The methodology of meta-analysis has been used increasingly in social sciences (Cook and Leviton 1980; Wampler 1982; Amato and Keith 1991; Waldforf and Pillsung 2005; Matysiak 2008; Matysiak and Vignoli 2008; Borenstein 2010). Meta-analysis is used to synthesize and interpret research results from different studies under one topic of interest. Its advantage in comparison to classical reviews of existing literature lies in the clear and systematic way of comparing inter-study results. A first stage consists in a literature review and a selection of suitable research papers according to criteria of comparability. In a second stage, using a standardized procedure, the coefficients of each study are recalculated to the so called *effect sizes,* a comparable measure size of the association between the dependent and the independent variables.

Building a meta-analysis sample of studies on fertility intentions and education

The major trade-off in the process of meta-analysis is in the selection of relevant studies. Single pieces of research must still satisfy the criteria of comparability while the researcher on the other hand would like to collect as many studies as possible. In addition, the meta-analysis aims to be comprehensive while also being not to heterogeneous (Blettner et al. 1999). In our study the meta-analysis is focused on the effect of human capital on fertility intentions.

The collection of the most suitable and relevant studies was made in four steps. First, appropriate studies were identified by a search of Google Scholar and Web of Knowledge (WoK). The following keywords and combinations have been applied in this search: ‘fertility intention’ ‘fertility desire’ and ‘education’, or ‘intended fertility’ and ‘education’ or ‘fertility intention’ and ‘education’ or ‘human capital’ and ‘fertility intention’ or ‘intended number of children’ and ‘education’ or ‘reproductive decision making’ and ‘education’. Second, previously undiscovered references given in the selected papers were included in the literature collection. Only papers written in English, German, French and Italian have been considered. Eventually, experts were consulted for recommendations of papers not collected in the first two phases. After the application of this collection method, 84 papers have been found through the web search and additional 74 papers have been recommended by selected experts in the field. 25 works did not describe the relationship between measures of human capital and fertility intentions. Another 35 papers have been withdrawn since they did not give a quantitate description of the relation. Inaccurate measurements of human capital and/or fertility intentions have led to exclusion in 23 cases. Eleven papers were excluded because they had focus on subgroups too specific for our analysis and in seven cases studies have been named twice by experts. After all refinements, 57 papers remained. According to model specifications and separations by gender, age groups, parity or other individual or regional characteristics, the finally selected papers contained a total of 142 study lines. In 91 of these lines women's education has been used to explain changes in fertility intentions. While 28 studies lines examined men's education and fertility desire and 23 lines did not separate by the gender of the respondent. Where models have been structured in a step-wise fashion, only the most complete model specification, in terms of control variables, has been used. To avoid a study-selection bias, results from different studies have been included in the analysis even if they have emerged from the same dataset. The collected studies cover data in a time span from 1979 to 2011. Regionally, data is widely distributed, though with a strong focus on Europe.

Table 1 - Composition of the sample for the meta-analysis of the educational gradient on feritlity intentions

Country(s)	No. of effect sizes	Country(s)	No. of effect sizes
Continental Europe and UK		*Asia and Oceania*	
Austria	4	Australia	4
France	10	India	3
Germany*	13	Pakistan	1
Netherlands	1	South Korea	7
Italy	10		
United Kingdom	6	*North America*	
		Canada	6
Eastern Europe		United States	4
Bulgaria	13		
Hungary	9	*South America*	
Poland	8	Brazil	2
Russia	9		
		*Africa***	
Nothern Europe		Cameroon	1
Finnland	4	Ethopia	4
Norway	2	Mozambique	3
		Nigeria	2
European Union		South Africa	2
EU 27	8	Tanzania	1
EU 27 + Croatia and Turkey	4	Uganda	1

** Counts for Germany include both studies in East and West Germany.*

*** most of the studies in Africa examine the fertility intentions in connection to HIV infections, they are therefore marked as 'problematic' in comparison to other results.*

Computing effect size for the meta-analysis

We computed the effect size (ES) according to the following procedures comparing the highly educated to those less educated:

$$ES = \begin{cases} COEF_{high} - COEF_{low}, \\ \log(COEF_{high}) - \log(COEF_{low}), \quad for\ Exp.Models\ (e.g., Odds\ Ratios). \end{cases} \quad (1)$$

The model, we use, assumes Random Effects, which means that there are several ESese, which vary from study to study according to the underlying sample. A theoretical infinite number of study-specific ESses would then be distributed around some mean. The ESses in the actually performed studies are just a (random) sample of a particular distribution of ESes (Borenstein et al. 2010). Therefore the ES variance is composed of two elements: a between-study variance, referring to the differences between studies, and a within-study variance, which most generally could be described by the standard error of the parameter reported in the studies. In some cases the within-study variance needed a more sophisticated method to be computed, which will be explained in the next passage. Formally, the model which accounts for both types of variances can be described by:

$$Y_i = \theta_i + \varepsilon_i, \quad \varepsilon_i \sim N(0, \sigma_i^2) \quad (2)$$

$$\theta_i = \theta + \mu_i, \quad \mu_i \sim N(0, \tau^2) \quad (3)$$

Here, Y_i is the estimated effect in study and θ_i is the true effect in this study. θ, on the other hand is the overall true effect, while σ_i^2 is the within-study variance and τ^2 is the variance between studies.

Mainly three difficulties have been encountered by calculating the SE and the corresponding standard errors properly. First, one of the most severe problems in calculating the effect of education on fertility intentions was the recalculation of the different measures of education. In most of the studies, education has been coded on a three category scale, ranging from ‘low’ to ‘medium’ and to ‘high’ levels of education. ‘Low’ levels of education corresponded to compulsory primary education, while ‘high’ levels of education contained all individuals who had completed university education. This categorization was kept as a benchmark for all studies with different scales. In some cases education was treated as a continuous variable. Here, the coefficient, or its logarithm, was multiplied by the number of years necessary to complete tertiary education according to the present model. The same procedure was used to recalculate the standard errors. A second problem was the estimation of the standard errors in cases where the middle category had served as a reference group for educational attainment. In general the following procedure has been applied to calculate the standard error of the ES (SEES);

$$SEES = \begin{cases} \sqrt{{SE_{high}}^2 + {SE_{low}}^2}, & if\ refrence\ lies\ in\ between \\ SE_{low}, & if\ SE_{High}\ is\ reference, \\ SE_{high}, & if\ SE_{Low}\ is\ reference. \end{cases} \quad (4)$$

Third, an additional hurdle was discovered in cases where neither the standard error nor additional statistics, e.g., *t-statistics* or *p-values*, have been reported. The sequent assumptions have been made in those cases following the example of Matysiak, Styrc and Vignoli (2008). Results marked as significant without any further explanation, the p-value was set to 0.05. Results marked as insignificant and with a limit p-value of 0.05, the p-value was set at 0.5. For studies with a limit p-value of 0.1, the imaginary p-value was set to 0.55.

To have a first impression of the magnitude and the direction of the educational gradient on fertility intentions, a descriptive analysis was carried out. To this aim, different measures of fertility intentions have been considered: Childbearing intentions, which describe the wish to have a(nother) child at some point in the future; Child-number intentions, which measures how many children individuals intend to have as completed family size; and child-timing intentions, which refer to the intention to have a(nother) child in a given time frame, in most of the cases within the next two or three years. For each of these different measures of fertility, a descriptive test (forest plot) has been performed to examine the changes of the gradient by parity, sample size of the study, and temporal changes.

Technical Footnote

For the described analysis the software environment of STATA/SE 13.1 has been used. To perform the descriptive analysis in the form of forest plots the command *'metan'* has been employed. The *'metareg'* command has served for the part of the meta-regression.

Preliminary results

A positive relationship between women's human capital and child-number intentions is expected, above all, in those countries in which egalitarian gender roles in the family and in the market offset the higher price of time paid by the highly qualified women for their children; in those countries with a higher level of social expenditure for families and children; in those countries in which availability of childcare services offset the higher opportunity costs paid by the highly qualified women for their children.

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