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Education and fertility revisited: a multilevel study in today's high fertility world

Abstract

Education plays a multidimensional role in the process of the fertility transition. Education and especially educating women does not only have a direct impact on the desired number of children, but also influences most supply and demand factors of fertility. The mechanisms describing fertility require the consideration of a set of factors besides pure socio-economic determinants. Individuals' fertility decisions are subject to their environment, societal values, family and friends. Also, today's developing regions can learn from experiences of countries further ahead in the demographic transition. I will assess the impact of education on fertility outcomes relative to economic factors, gender equality, availability of family planning and child mortality over time, using data from Demographic and Health Surveys (DHS). By employing multilevel modeling techniques, individual effects will be separated from contextual effects.

I. Introduction

This paper will investigate the role of education in the process of fertility transition relative to other determinants, supply and demand factors of fertility. Although education has shown to have an impact not only on mortality, but also on other determinants of fertility, its role is not always straightforward and also depends on the regional and cultural background (Coale and Watkins, 1986). Still, female education is strongly correlated with the knowledge and use of modern contraception, ideal family size and eventually also fertility. Fertility behavior is subject to influences from the outside, exposure to mass media, the cultural background and a women's autonomy within the family (Caldwell, 1976, Lesthaeghe, 1980, Lesthaeghe and Surkyn, 1988). Ideal family size is not 'encoded genetically' but is highly dependent on norms and values within society. Studies have shown repeatedly that community level indicators have an impact on women's fertility and contraceptive behavior (Degraff et al., 1997, Moursund and Kravdal, 2003, Kravdal, 2002, Stephenson et al., 2008). Given recent discussions about stalling fertility in Sub-Saharan Africa (Bongaarts, 2006, Kreider et al., 2009, Schoumaker, 2009) and the inputs from the family planning community emphasizing the importance of family planning programs (Engelman, 2011, Bongaarts and Sinding, 2009), it is necessary to reconsider the role of education relative to other determinants of fertility in a new framework. Most literature sheds light on demographic transition retrospectively, from the perspective of developed countries. However, fertility behavior, norms and values are subject to permanent change, and mechanisms determining the choice of a couple's fertility decisions can never be decoupled from the outside world. Nowadays developing countries do 'learn' from experiences in today's industrialized countries and there is no guarantee that fertility transition follows the same patterns and 'ideal' family size will converge to similar levels within a comparable time frame. Thus, comparative analysis in a cross-sectional framework is not sufficient to determine the pathways of fertility in today's high fertility countries.

This paper is an attempt to quantify the effects of education on current and past fertility levels in the presence of community level indicators using data from the Demographic and Health Surveys (DHS) in Africa, Latin America and Asia.

II. State of the Field

Since the contributions of Susan Cochrane (Cochrane, 1979) and John Caldwell (Caldwell, 1980), the relationship of education and fertility had been researched intensively and is still an important research topic in understanding demographic transition in the developing, as well as in the developed world. Future fertility shapes populations; the magnitude of the impact though, is much higher in the developing regions.

A. Causal mechanisms

Women's autonomy

Education plays a key role in enhancing women's ability to greater decision making and autonomy within the home, leads to greater economic and emotional autonomy and self-reliance, improves physical mobility in interaction with the outside world. Education helps women to overcome traditional, gender-stratified settings (Jejeebhoy, 1995). Women with better education have more say in the family and experience a better position vis-à-vis their partners (Mason Oppenheim, 1987). In general, young men have more exposure to the world outside family and the local community and

are confronted with new ideas automatically, while women often only have access to new ideas and experience through formal schooling. Female autonomy is claimed to be a key factor in transforming women's traditional attitudes to modern values. While education is a necessary condition for female autonomy and increases her exposure to mass media, develops her intellectual abilities, raises her image of herself and her children and opens her mind for technological progress (Caldwell, 1979), low levels of education do not always lead to greater empowerment and some authors claim that in some regions only access to secondary or post-secondary education ensures greater female autonomy (Basu, 2010).

Proximate Determinants Infant and Child Mortality

One of the most well known demographic concepts of describing supply of fertility is John Bongaarts' model of proximate determinants (Bongaarts, 1978, Bongaarts, 1987, Bongaarts et al., 1984) of fertility under various conditions. His model describes the supply of children through the proportion of women in unions, patterns of sexual activity, the length of postpartum abstinence, length of breastfeeding, availability of contraception, induced abortion, fetal mortality and natural and pathological sterility. Education increases age at first marriage which in turn influences the frequency of sexual intercourse and therefore has a negative impact on fertility. Duration of postpartum abstinence and breastfeeding are widely regionally dependent or are associated with modernization (Jeffery and Basu, 1996). Better inter-spousal communication has the potential to have positive effects on 'natural fertility' (Jejeebhoy, 1995). Adding child mortality completes the supply factors of children. Infant and child mortality are still widely considered as an important factor determining fertility behavior. Families in societies with high levels of infant and child mortality rather plan their families sequentially and learn about fecundity and survival to adulthood during their reproductive years (Mason Oppenheim, 1997). Since the seminal work of Caldwell in Nigeria (Caldwell, 1979), the relationship of education on infant mortality had been subject to a great deal of research. Higher levels of education are generally linked to higher fecundity by reducing the risk of fetal death, better nutrition and improved maternal health (Lesthaeghe et al., 1981).

Contraceptive Prevalence and Wanted Fertility

The correlation between contraceptive prevalence and female schooling is well documented (Sedgh et al., 2007, United Nations, 1995, Jejeebhoy, 1995). While the use of modern contraceptive methods have to be considered in the context of development, the presence of strong family planning programs and cultural and regional background, straightforward linear patterns are not always confirmed; the relationship of knowledge of modern contraception and education is almost uniformly positive (Jejeebhoy, 1995). In the early stages of fertility transition, women with some education do not necessarily demand a lower number of surviving children, but lower levels of child mortality lead to higher levels of fertility. During the later stages of the fertility decline, it is shown that women with better education do not only want fewer children (Lesthaeghe et al., 1981, Martin, 1995), but also experience lower rates of unwanted fertility (Bongaarts, 2003, Bongaarts, 2010). Schooling helps women to use contraception more effectively and have greater autonomy in the household to overcome obstacles of using modern contraceptive methods.

Other effects: Income, Partner's Schooling, Region and Religion, etc.

Although there is evidence of many other factors influencing fertility behavior, they should not be in the focus of this paper. Household income does not have linear effects on fertility and is highly dependent upon the stage of development and the underlying cultural background (Jejeebhoy and Sathar, 2001). Partner's schooling does not always have a (linear) effect on marital fertility and the

effect is assumed to be less prevailing in Sub-Saharan than in Latin America or North America. (Cleland and Rodriguez, 1988) and might also interact with positive income effects (Jeffery and Basu, 1996). A set of variables including household income, partner's schooling will be used to test the robustness of my findings.

B. Contextual Effects

Although classic demographic transition theory does not incorporate the principle of social learning and diffusion effects explicitly, and fertility transition was originally assigned to industrialization and modernization, the spread of ideas from higher social classes to lower social strata was mentioned in early population studies. Diffusion theories in the context of fertility transition were conceptualized in the work of Rosero-Bixby and Casterline (Rosero-Bixby and Casterline, 1993, Montgomery and Casterline, 1998). Ideational theories implicitly deal with the impacts of changes in norms and values, and as a consequence the change of values of the individuals (Cleland and Wilson, 1987).

Studies by Kravdal (Kravdal, 2000, Kravdal, 2002), Moursund and Kravdal (Moursund and Kravdal, 2003) and Axinn and Barber (Axinn and Barber, 2001) successfully showed that community level variables representing education, infrastructure, etc. have a significant influence on fertility. This is a valuable result in proofing that society shapes populations, individual behavior is always dependent on the contextual background.

However, to my knowledge, there are no studies which consider community level effects of education on fertility over the course of time. The studies introduced here, only present cross country models and measure effects across countries and regions (but within communities). Since the body of literature on fertility transition keeps emphasizing that the underlying societal, regional and cultural circumstances are crucial for the levels of desired family size, I will investigate changes over time, within rather than across a set of countries more closely. While community level effects of education or other socio-economic conditions are also measured in a cross-country model design, introducing time effects will help to understand fertility transition by explicitly considering country-specific fertility norms developing along improvements in educational attainment and other socio-economic indicators.

III. Data and Multilevel Modeling

I will assess the effects of education relative to other determinants of fertility behavior in developing countries by considering the impact of individual and community levels of education on 'children ever born'. I employ multi-level ordered logistic regression models in order to capture this hierarchical structure, assessing both explained and random variation across communities within countries and across individuals within communities over time.

DHS collect full birth histories and allows to analyze not only recent births to women interviewed, but to examine their whole reproductive careers. The richness of the dataset offers many opportunities; however, cohort and age effects have to be disaggregated to draw meaningful conclusions. All women who have had a life birth at the time of the interview with a minimum age of 16 are included. This accounts for selection effects for women who have not yet completed their educational career. I also include variables controlling for age at first birth and separate models are run for women aged 15-29 and 30-49. This strategy corrects for time effects of changes in the age at

marriage (keeping the interval between age at marriage and first birth constant) and the higher expected number of children for women at older ages.

This study uses the statistical software MlwiN (Rasbash et al., 2009) to model a three level regression analysis. The hierarchical structure of the DHS data allows to consider individuals (mothers) i nested into communities j which are nested into country k simultaneously. Households are not modeled separately; descriptive analysis of the data has shown that there are not enough households with multiple births in the sample selected. Random errors at each level are modeled individually. The binomial response y_{ijk} describes whether the child is dead (1) or alive (0) and is modeled using a logit link function.

Although female autonomy is supposed to be highly correlated with formal education, I try to model separate effects of a women's position in the household independent of her education. DHS includes questions on spending of money, attitudes towards physical violence and refusal of sex. As mentioned above, female education does not always lead to a higher status within the family or vis-à-vis her husband, controlling for indicators of female autonomy is expected to reveal these relationships.

To account for the impact of child mortality on the fertility behavior, I include the total number of children who died within the household. I will also include an indicator of infant mortality on the community level as a proxy for development and/or the proximity to health services. This variable might become redundant when including an average wealth index score on the community level. An indicator of wealth will be also included on the household level.

A second and third set of regressions will be conducted, exchanging children ever born by 'current use of contraception' and 'ideal family size'. While use of contraception is limiting the sample to women who are not pregnant and postpartum amenorrheic, 'ideal family size' is strongly correlated with a woman's parity. Still, both indicators allow drawing an exhaustive analysis of current determinants of fertility and might allow giving directions for future development.

IV. Expected Results

Analogous to previous studies on the impact of education on fertility, I expect high and significant relationships from increasing formal education on fertility behavior. Depending on the countries considered, the effects of wealth might vary across countries. It will be interesting to quantify the community level effects and to see whether the effects of the community level variables vary over time. The scope of the study though, is limited. Combining cross-sectional time series is only a poor approximation for a true micro-panel study. By accounting for cohort, age and time effects, I try to account for limitations within the given modeling framework.

References

- AXINN, W. G. & BARBER, J. S. 2001. Mass Education and Fertility Transition. *American Sociological Review*, 66, 481-505.
- BASU, A. M. 2010. Mass schooling, empowerment, and demographic and economic outcomes. *Vienna Yearbook of Population Research* 8, 25-29.
- BONGAARTS, J. 1978. A framework for analyzing the proximate determinants of fertility. *Population and Development Review*, 4, 105-132.
- BONGAARTS, J. 1987. The Proximate Determinants of Fertility. *Technology in Society*, 9.
- BONGAARTS, J. 2003. Completing the fertility transition in the developing world: The role of educational differences and fertility preferences. *Population Studies*, 57, 321-336.
- BONGAARTS, J. 2006. The Causes of Stalling Fertility Transitions. *Studies in Family Planning*, 37, 1-16.
- BONGAARTS, J. 2010. The causes of educational differences in fertility in Sub-Saharan Africa. *Vienna Yearbook of Population Research*, 8, 31-50.
- BONGAARTS, J., FRANK, O. & LESTHAEGHE, R. 1984. The Proximate Determinants of Fertility in sub-Saharan Africa. *Population and Development Review*, 10, 511-537.
- BONGAARTS, J. & SINDING, S. 2009. A Response to Critics of Family Planning Programs. *International Family Planning Perspectives*, 35, 39-44.
- CALDWELL, J. C. 1976. Toward a Restatement of Demographic Transition Theory. *Population and Development Review*, 2, 321-366.
- CALDWELL, J. C. 1979. Education as a Factor in Mortality Decline An Examination of Nigerian Data. *Population Studies*, 33, 395-413.
- CALDWELL, J. C. 1980. Mass Education as a Determinant of Timing of Fertility Decline. *Population and Development Review*, 6, 225-255.
- CLELAND, J. G. & RODRIGUEZ, G. 1988. The Effect of Parental Education on Marital Fertility in Developing Countries. *Population Studies*, 42, 419-442.
- CLELAND, J. G. & WILSON, C. 1987. Demand Theories of the Fertility Transition: An Iconoclastic View *Population Studies*, 41, 5-30.
- COALE, A. J. & WATKINS, S. C. (eds.) 1986. *The Decline of Fertility in Europe*, Princeton, New Jersey: Princeton University Press.
- COCHRANE, S. H. 1979. *Fertility and Education: What Do We Really Know?*, Washington D.C., World Bank.
- DEGRAFF, D. S., BILSBORROW, R. E. & GUILKEY, D. K. 1997. Community-Level Determinants of Contraceptive Use in the Philippines: A Structural Analysis. *Demography*, 34, 385-398.
- ENGELMAN, R. 2011. An End to Population Growth: Why Family Planning Is Key to a Sustainable Future. *Solutions*, 2.
- JEFFERY, R. & BASU, A. M. 1996. Schooling as Contraception? In: JEFFERY, R. & BASU, A. M. (eds.) *Girls' Schooling, Women's Autonomy and Fertility Change in South Asia*. New Delhi: Sage Publications India Pvt Ltd.
- JEJEBHOY, S. J. 1995. *Women's Education, Autonomy and Reproductive Behaviour*, Oxford, Clarendon Press.
- JEJEBHOY, S. J. & SATHAR, Z. A. 2001. Women's Autonomy in India and Pakistan. *Population and Development Review*, 27, 678-714.
- KRAVDAL, Ø. 2000. A Search for Aggregate-Level Effects of Education on Fertility, Using Data from Zimbabwe. *Demographic Research*, 3.
- KRAVDAL, Ø. 2002. Education and Fertility in Sub-Saharan Africa: Individual and Community Effects. *Demography*, 39, 233-250.
- KREIDER, A., SHAPIRO, D., VARNER, C. & SINHA, M. 2009. Socioeconomic Progress and Fertility Transition in the Developing World: Evidence from the Demographic and Health Surveys. *IUSSP*. Marrakesh, Morocco.
- LESTHAEGHE, R. 1980. On the Social Control of Human Capital. *Population and Development Review*, 6, 527-548.

- LESTHAEGHE, R., OHADIKE, P. O., J., K. & H.J., P. (eds.) 1981. *Child-Spacing and Fertility in Sub-Saharan Africa: An Overview of Issues*.
- LESTHAEGHE, R. & SURKYN, J. 1988. Cultural Dynamics and Economic Theories of Fertility Change. *Population and Development Review*, 14, 1-45.
- MARTIN, T. C. 1995. Women's Education and Fertility: Results from 26 Demographic and Health Surveys. *Studies in Family Planning*, 26, 187-202.
- MASON OPPENHEIM, K. 1987. The Impact of Women's Social Position on Fertility in Developing Countries. *Sociological Forum*, 2, 718-745.
- MASON OPPENHEIM, K. 1997. Explaining Fertility Transitions. *Demography*, 34, 443-454.
- MONTGOMERY, M. R. & CASTERLINE, J. B. 1998. Social Networks and the Diffusion of Fertility Control. *Working Paper 119*. Population Council.
- MOURSUND, A. & KRAVDAL, Ø. 2003. Individual and community effects of women's education and autonomy on contraceptive use in India. *Population Studies*, 57, 285-301.
- RASBASH, J., CHARLTON, C., BROWNE, W. J., HEALY, M. & CAMERON, B. 2009. MLwiN. 2.1 ed.: Centre for Multilevel Modelling, University of Bristol.
- ROSERO-BIXBY, L. & CASTERLINE, J. B. 1993. Modelling Diffusion Effects in Fertility Transition. *Population Studies*, 47, 147-167.
- SCHOUMAKER, B. 2009. Stalls in Fertility Transitions in Sub-Saharan Africa: Real or Spurious? Université catholique de Louvain: Département des Sciences de la Population et du Développement.
- SEDGH, G., HUSSAIN, R., BANKOLE, A. & SINGH, S. 2007. Women with an Unmet Need for Contraception in Developing Countries and Their Reasons for Not Using a Method. *Occasional Report* New York: Guttmacher Institute.
- STEPHENSON, R., BEKE, A. & TSHIBANGU, D. 2008. Contextual influences on contraceptive use in Eastern Cape, South Africa. *Health & Place*, 14.
- UNITED NATIONS 1995. Women's Education and Fertility Behavior: Recent Evidence from Demographic and Health Surveys. In: NATIONS, U. (ed.). New York.