Educational Differentials in Women's Fertility: The Moderating Role of Learning

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Although demographers have long studied the educational differentials in women's fertility (Bongaarts, 2010; Cleland & Rodriguez, 1988; Cochrane, 1979; Martin, 1995), most focus on years of schooling or levels of educational attainment. Schooling does not always translate to learning (Pritchett, 2013; UNESCO, 2013; World Bank, 2018). The acute gap between schooling and learning in low- and middle-income countries has been well documented by recent research. However, it remains unclear whether it has any consequences for demographic outcomes such as fertility. Some scholars postulate that poor learning outcomes may compromise the transformative effect of schooling on delaying childbearing and lowering fertility (Esteve & Florez-Paredes, 2018; Grant, 2015). Others argue that schooling can lower fertility even without imparting skills or knowledge (Basu, 2002; Bledsoe et al., 1998; Cleland, 2002).

Does the relationship between education and fertility depend on learning? Is more schooling without learning still associated with lower fertility? This study presents one of the first cross-country investigations into these questions. We draw on comparable, cross-sectional data from 31 low- and middle-income countries collected by the Demographic and Health Surveys (DHS) and examine the extent to which learning moderates the relationship between levels of schooling and women's fertility. To distinguish levels of schooling from learning, we construct a standardized literacy rate for each country to measure the learning outcomes of women at childbearing age. By conceptually and empirically distinguishing schooling from learning, this study contributes to the explanation of educational differentials in fertility and a more nuanced understanding of the role of education in shaping women's fertility behaviors and outcomes in low- and middle-income countries.

Background

A large body of literature has demonstrated a pervasive negative relationship between women's education and fertility in low- and middle-income countries (Ainsworth et al., 1996; Bongaarts, 2003, 2010; Cleland & Rodriguez, 1988; Cochrane, 1979; Martin, 1995; Shapiro, 2012). However, debates about *how* and *why* more educated women have lower fertility continue to this date (Basu, 2002; Bongaarts, 2010; Cleland, 2002; Jeffery & Basu, 1996; National Research Council, 1998). Most recently, research has uncovered that increased education is only weakly associated with fertility decline in some regions (Bongaarts et al., 2017; Esteve & Florez-Paredes, 2018; Liu & Raftery, 2020) and that it does not always lead to later family formation or childbearing (Esteve & Florez-Paredes, 2018; Grant, 2015). This has led some to speculate that the transformative power of women's education might have been compromised by the poor quality of learning (Ainsworth et al., 1996; Bongaarts et al., 2017; Esteve & Florez-Paredes, 2018; Grant, 2015).

Conceptually, the relationship between education and fertility may or may not depend on learning. While education can impart knowledge and skills, improving women's abilities to acquire new information and use contraception (Cochrane, 1979; Rosenzweig, 1995, p. 150), education can also affect fertility through social and ideational influences independent of cognitive skills (Cleland, 2002; Cochrane, 1979, p. 150; Diamond et al., 1999). Moreover,

individuals can be selected into different levels of education based on their background characteristics (Bledsoe et al., 1998; Cochrane, 1979, p. 150). If indeed education and fertility are linked through social and ideational pathways or through selection, this means more educated women can have lower fertility even without acquiring more knowledge or skills.

Empirical evidence on whether and how the education-fertility relationship is moderated by quality of learning is largely lacking (Glewwe, 1998; Psaki et al., 2019). The few existing, country-specific studies suggested that, while cognitive skills, such as literacy, mediate the relationship between women's schooling and lower fertility (Levine et al., 2012; Oliver, 1999; Thomas, 1999), the relationship does not solely depend on cognitive skills (Oliver, 1999; Thomas, 1999). The current study extends the existing literature by systematically investigating the educational differentials in fertility vary across countries by quality of learning, and how learning moderates the relationship between education and the proximate determinants of fertility, such as age at first birth, fertility ideals, and contraceptive use.

Data and Methods

We pooled IPUMS-DHS data from 31 low- and middle-income countries. These 31 nationally representative surveys are used because they collected literacy information by asking the respondent to read aloud a sentence on the card. The final analytic sample contains 1,175,031 women aged 15-49 surveyed between 2003 and 2017.

To measure learning, we construct a standardized literacy rate for each country. A respondent is considered literate if she can read a whole sentence. While we can use literacy rate to measure learning, literacy rate is influenced by the educational composition of each country. To adjust for differences in the levels of schooling, we calculate a standardized literacy rate. Specifically, we first calculate a literacy rate specific to each level of schooling. We then calculate the average of the schooling level-specific literacy rates, assuming a uniform schooling level distribution for all countries. Across the 31 countries in our sample, the variable, standardized literacy rate, has a mean of 0.81 with a standard deviation of 0.08.

Following Schoumaker (2013), we first use the birth histories in DHS surveys to compute the number of births within the three years preceding the survey date and exposure between exact ages. Next, we fit a Poisson model to investigate the relationship between level of schooling, learning, and fertility rate. Specifically, for individual i in country j, her number of births at age k, μ_{ijk}, can be modelled as:

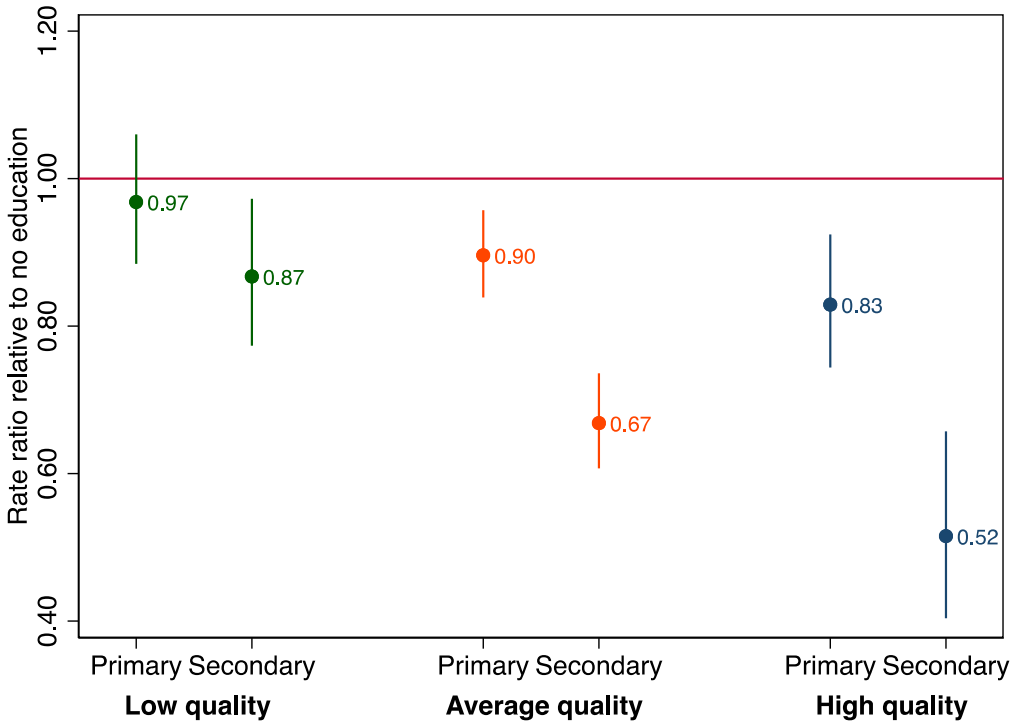
$$\log \mu_{ijk} = \log n_{ijk} + \alpha_k + \boldsymbol{X}_{ijk}\beta + \left(\boldsymbol{X}_{ijk} \cdot L_j\right)\gamma + b_j + \epsilon_{ijk} \qquad (1)$$

where n_{ijk} is the exposure in person-years, which enters the model as an offset. α_k controls for 1-year age groups. $\boldsymbol{X}_{ijk}$ is a vector indicating the highest level of schooling an individual has attended (with no education as the reference category), and L_j is the standardized literacy rate of country j. We center the standardized literacy rate at mean so that the coefficients on level of schooling, β, indicate the educational gradient when quality of learning is average. We are mainly interested in estimating γ, the coefficients on the interaction terms between level of schooling and standardized literacy rate, which tell us whether and how the educational gradient in fertility varies according to the quality of learning. b_j represents the country fixed effect, which effectively controls for any country-level heterogeneity including but not limited to socioeconomic development, phases of fertility transition, access to family planning, and any regional differences. In addition, we also control for the rural/urban residence of the individual.

Results

Does the educational differential in total fertility rates depend on learning? In Figure 1, we present the predicted educational gradient of fertility at low, average, and high quality of learning, using estimates from the Poisson model specified in Eq (1). Educational gradient is expressed in rate ratios relative to no education (Schoumaker, 2013). In countries with higher quality of learning, the negative educational gradient is steeper. For example, where quality of learning is high (i.e., standardized literacy rate two standard deviations above the mean), compared to women with no education, women who have attended primary school have 17% lower fertility rates than those with no education, and those who have attended secondary school have 48% lower fertility rates. In contrast, in countries with low quality of learning (i.e., standardized literacy rate two standard deviations below the mean), women who have attended primary school have 3% lower fertility rates than those with no education, and women who have attended secondary school have 13% lower fertility rates. Notably, in countries with low quality of learning, a negative albeit weak educational gradient of fertility still exists.

Figure 1. Predicated educational differentials in fertility at low, average, and high quality of learning: Ratios of total fertility rates relative to women with no education.



Why does the educational gradient in total fertility rates vary significantly by quality of learning? We further examine how learning moderates the relationship between education levels and intervening variables between education and fertility. We find that while more educated women have first birth and marry at a later age, the size of the educational differentials in age at first birth/marriage does not vary significantly by quality of learning. Similarly, while more educated women desire fewer children, the size of the educational differentials in fertility desires does not vary significantly by quality of learning. The educational gradient in contraceptive use, however, does depend significantly on learning. Where quality of learning is low, contraceptive use is not significantly more prevalent among

educated women than uneducated women. Where quality of learning is high, a clearer positive educational gradient in contraceptive use emerges.

In summary, we find that, the strength of the education-fertility relationship depends on learning: the higher the quality of learning, the steeper the negative educational gradient in total fertility rates. However, even when quality of learning is poor, there still exists a negative educational gradient in fertility. Even without learning, women with more schooling still have lower fertility because the educational differentials in age at childbearing and fertility desires do not depend on quality of learning. Meanwhile, because the educational differentials in contraceptive use only emerge at average or higher quality of learning, the negative educational gradient in fertility is weaker in countries with poorer quality of learning.

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