Africa's fertility decline is partly driven by diffusion processes among education groups

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Abstract

This paper integrates the extensive literature on diffusion processes in the fertility transition with that on female education and cognition-driven demographic transition and operationalizes this combination for practical use in population projections. It captures the effect of population heterogeneity by the level of education on fertility beyond its purely compositional effect by also including social learning and diffusion processes in the model. Using all available Demographic and Health Surveys (DHS) data for all African countries –it assesses the diffusion processes in both ideal family size and actual fertility at the level of sample clusters, ty. Level effects of women's mean years of schooling on the ideal and actual fertility of women with lower and higher education living in the same sample cluster. The results show strong diffusion effects for both the fertility intention and behavior that suggest that they should also be included in future fertility projections of heterogeneous populations differentiated by level of education.

Introduction

Human beings are inherently social creatures, and their behavior is strongly influenced by the actions and attitudes of others within their society. This phenomenon arises from a fundamental need for social interaction and acceptance. Individuals seek conformity or validation for their behavior from their peers, family, and community members(Asch, 1956). The collective behavior that emerges from these interactions is often regarded as social

norms, which serve as guidelines for acceptable conduct within a given society(Cialdini & Goldstein, 2004).

In 1995, Roger introduced a theory of diffusion, stating that attitudes and behaviors initially rare or absent in a population gradually become more common through a graduated process (Rogers, 1995). He also categorized the population into different groups/ adopters based on their willingness and timing to accept new behaviour (Rogers, 2003). In an authoritative synthesis by the (National Research Council, 2001) entitled "Diffusion Processes and the Fertility Transition," Casterline (2001) stresses that the diffusion argument does not provide a sufficient foundation for a theory of fertility change because it fails to explain why individuals change their reproductive behavior and why certain innovations are accepted, and others are not.

Fertility transition research has disclosed a global phenomenon characterized by the shift from high to low fertility rates within all communities (Bongaarts, 2003; Bongaarts & Casterline, 2013; Kebede et al., 2019; Mason, 1997). This transformative process encompasses changes in normative fertility ideals and the realized fertility outcomes. The transition from high to low ideal/actual fertility rates indicates a shift from preferring larger families to smaller ones (Bongaarts & Casterline, 2018). However, this transition varies in timing and speed across different places and socio-economic groups (Lerch, 2019; O'Neill et al., 1999).

Education plays a significant role during this transition, influencing both the ideal and actual fertility. There is a clear pattern where highly educated women tend to have the lowest fertility rates compared to those with lower levels of education, but education alone cannot

explain the varying fertility rate and pace of decline across different regions and socio-economic groups (Adhikari et al., 2023; Goujon, 2003; Lutz, 2017, 2022). Bongaarts & Watkins, (1996) have suggested that apart from socio-economic development, fertility rates also accelerated by social interaction in close geographical or social proximity. This acceleration leads to different countries undergoing fertility transitions at varying levels and at a different pace.

The field of demography, particularly in the context of fertility, has long explored the impact of social interactions on reproductive decisions and behaviors. However, most studies have primarily focused on contraception and its acceptance through social learning (Behrman et al., 2002; Valente, 1996; Valente et al., 1997) and qualitatively looking at the stated social influence on fertility intention (Bernardi, 2003). Little attention has been given to quantitatively capturing such social learning on the idealization and behavior surrounding human reproduction at a micro level(Bloom et al., 2008; Bongaarts & Watkins, 1996). Studying how people learn from each other and its impact on desired and actual fertility can help us gain a deeper understanding of current and future fertility patterns and demographic changes. Despite the available research, there is a lack of sufficient quantitative evidence to incorporate this social learning aspect into population projections. Currently, multidimensional population projections take into account fertility differences based on age, and education together (Lutz et al., 2014). It thus only covers the compositional effect resulting from different proportions of individuals with different levels of educational attainment. By including social learning on top of it, the effect of improving education may turn out to be stronger. We can thus better forecast the fertility and population dynamics which is used in a broad range of areas such as climate change, environment, economics, health etc. Therefore, our goal is to quantitatively model this social learning and its effects on fertility by examining in a diverse range of countries in the Global South.

Hypothesis

Dasgupta & Dasgupta, (2017) discusses two distinct social preference classes that play a role in this transition and spread from larger to smaller family size. The “competitive” group, also known as “trendsetters” or “innovators,” aims for a higher social status relative to others and chooses to have fewer children. On the other hand, the “conformist” group, also referred to as “adopters,” desires to align with societal norms and adopts behaviors prevalent in the larger group of people in society. The main hypothesis of this study is that the lower fertility behaviour emerges among higher educated women who probably recognize the advantages of having a smaller family through increased opportunities for participation in the labor force, urban living, and acquiring material possessions(Wang & Zhong, 2022; Westley et al., 2010). This lower fertility behavior then diffuses to less educated women living in close geographic proximity to the highly educated women through social interaction. Therefore, we recognized higher-educated women as “competitive” and lower-educated women as “conformists”.

Research Statement and Questions

To comprehensively understand fertility variations and related demographic changes, our study proposes that social influence can partly explain this variation. While some studies have touched upon the influence of social interaction on individual fertility preferences and outcomes (Bloom et al., 2008; Bernardi, 2003), there is a lack of empirical evidence to quantitatively incorporate this social influence into population projections. To address this research gap, our study aims to answer the following research questions:

1. To what degree do social characteristics impact an individual's decision-making process and behavior regarding family size within a community?
2. How the fertility intention and behavior of highly educated women influence the fertility intention and behavior of lower educated women residing in close geographic proximity?

Data and Methods

To address these research questions, we used data from the Demographic and Health Surveys (DHS) conducted in 34 countries in Africa. The DHS data serves as a comprehensive source of information, providing insights into fertility preferences, outcomes, and individual as well as societal characteristics of women in the study countries. Our analysis focused specifically on ever-married women who provided numerical responses regarding their ideal fertility, allowing us to quantitatively examine fertility ideals and behaviors within the context of marriage.

The DHS data also provided spatial information at multiple levels: clusters (the smallest area), regions, rural/urban residences, and nations (the largest area). To include the social factor in the study, we defined each society or community for each DHS cluster.

Methodologically, we used a multilevel Poisson regression model with fixed effects for clusters and countries to study the impact of social education on individual ideal and actual fertility behaviors. We used the mean years of schooling (MYS) of women within each cluster as a measure of social characteristics. Firstly, we examined how the MYS of each cluster impacted the fertility intentions and behaviors of individual women residing within the same cluster. Secondly, we explored the interaction effect between women's education and the MYS of the cluster on individual fertility intentions and behaviors.

The analysis was divided into two parts: the first focuses on ideal fertility or normative ideas, while the second examines period fertility or actual fertility outcomes. We primarily examined women's individual education and cluster's MYS as the major predictors, controlling for women's age, rural/urban residence, survey years, and parity.

The model used in this study can be specified as,

$$\log(E[y_{ijk}]) = \beta_0 + \beta_1 * \text{Education}_{ijk} + \gamma_0 * \text{MYS}_{jk} + \gamma_{01} * \text{Education}_{ijk} * \text{MYS}_{jk} + \alpha i + \lambda j + \varepsilon_{ijk}$$

Where, y_{ijk} = Ideal fertility in first part and actual fertility in the second part.

Preliminary Results

Figures 1 and 2 below show the predicted ideal and actual number of children by women's individual and community education, respectively. In sub-Saharan Africa, we found that the relationship between individual education and ideal as well as actual fertility, differs based on the aggregate education level of the society where women live. Lower-educated women demonstrated a sharper decline in their ideal fertility preferences as well as actual fertility behaviour as the level of cluster education increased. This suggests that women living in societies where the majority of women have higher levels of education are more likely to prefer a smaller family size, similar to highly educated women. This observation supports the notion of a spillover effect or the diffusion of the concept and behaviour of a small family from highly educated women to their lower-educated counterparts through social learning processes.

Figure 1: Predicted ideal number of children per woman by individual (in color) and cluster's education (mean Years of Education in cluster given on x axis) in Sub-Saharan Africa

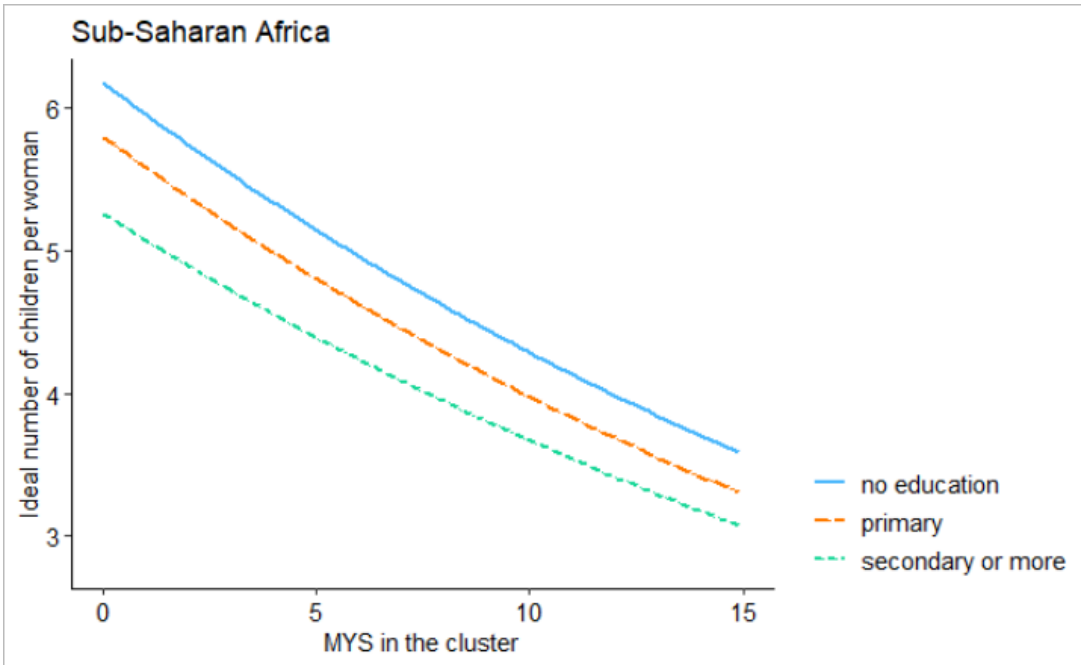
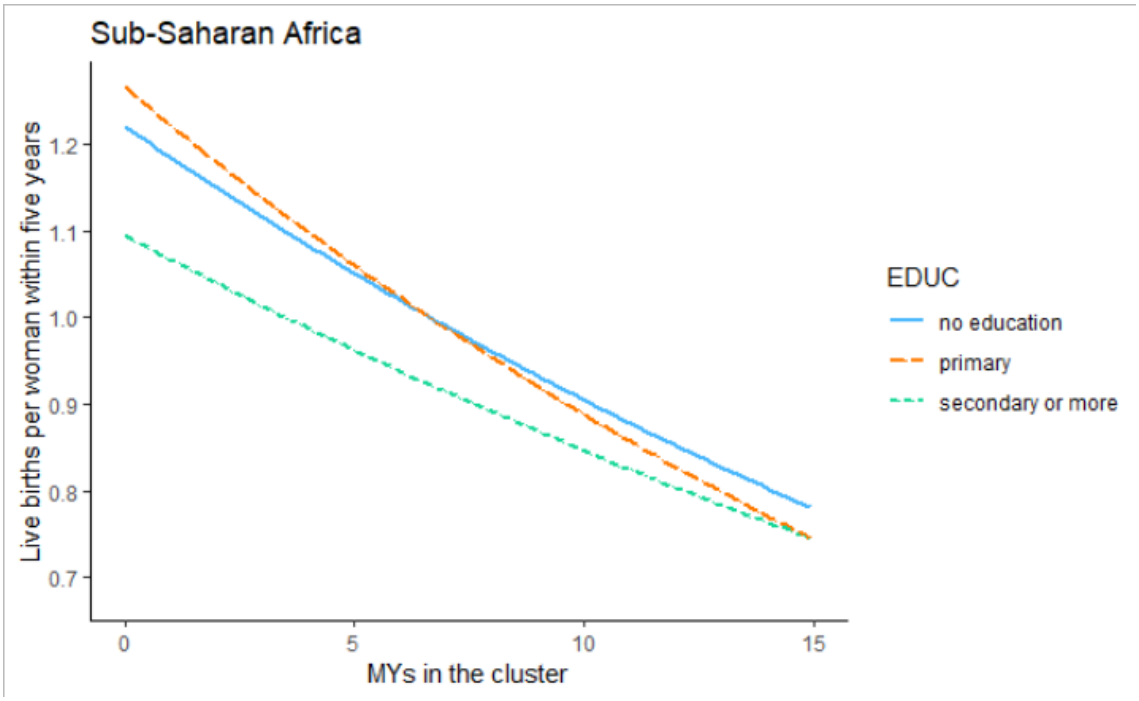


Figure2: Predicted number of live births within five years per woman by individual and cluster's education in Sub-Saharan Africa


Sub-Saharan Africa
Live births per woman within five years
1.2
1.1
1.0
0.9
0.8
0.7
0
5
10
15
MYs in the cluster
EDUC
no education
primary
secondary or more