A comparison of approaches for estimating the effect of women's education on the probability of using modern contraceptive methods in Malawi

Luca Zanin [a,*], Rosalba Radice [b], Giampiero Marra [c]

[a] *Prometeia, G. Marconi, Bologna 40122, Italy*
[b] *Department of Economics, Mathematics and Statistics, Birkbeck, University of London, Malet Street, London WC1E 7HX, UK*
[c] *Department of Statistical Science, University College London, Gower Street, London WC1E 6BT, UK*

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ABSTRACT

The aim of this study is to estimate the effect of education on the probability of married Malawian women using modern contraceptive methods by accounting for both observed and unobserved confounders. We conduct a sensitivity analysis and compare the results of naive models with instrumental variable models to account for the potential endogeneity of education. Our findings demonstrate conflicting results between the two modelling approaches. The naive models report smaller education effects on the probability of using modern contraceptive methods compared to instrumental variable models. We also find that by relaxing the functional form assumption on the effect of continuous covariates, using a flexible instrumental variable model, the education's effect follows a positive, nonlinear pattern. This finding is not observed with a classic instrumental variable model.

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1. Introduction

It is widely recognised that modern contraceptive methods represent an effective way to control births, thereby, preventing unplanned pregnancies and avoiding abortions. Furthermore, contraceptive use can help to prevent certain cancers and the spread of HIV and other sexually transmitted diseases (Chipeta, Chimwaza, & Kalilani-Phiri, 2010). A report from the United Nations on 'World Contraceptive Use 2011' (UN, 2011) indicates that in sub-Saharan African countries only 15.7% of women aged 15–49 years who are married or in a union use modern contraceptive methods. The reasons for this low rate of contraceptive use may be found in socioeconomic and cultural barriers that do not advocate the use of family planning methods (Stephenson, Baschieri, Clements, Hennink, & Madise, 2007). Empirical studies in several developing countries find that the use of modern contraceptive methods is more common among better educated women than among poorly educated women (Alpu & Fidan, 2006; Ayoub, 2004; Martin, 1995; Robinson, 1996; Stephenson et al., 2007). Education plays a crucial role because the knowledge accumulated through education stimulates new ideas, enhances individual talents, and improves social capital, job opportunities, healthcare and knowledge, and the ability to make informed decisions (Bhalotra & Rawlings, 2011;

* Corresponding author. Tel.: +39 0516480451.
E-mail address: luca.zanin@studio.unibo.it (L. Zanin).

Chen & Li, 2009; Martin, 1995). Some of these factors were identified as possibilities for explaining the relationship between education and contraceptive use (Gordon, Sabates, Bond, & Wubshet, 2011). For example, education affects contraceptive use through the labour market channel. Better educated women have the knowledge and skills required to find better jobs in sectors that are incompatible with child-rearing, which requires an intensive effort and a great deal of time on the part of the mother. Hence, women with high levels of education are more inclined to use contraceptive methods to control births than are women with lower levels of education because of higher costs associated with unplanned child-bearing (Birdsall & Griffin, 1988; Kalipeni, 1997). Furthermore, Gordon et al. (2011) find that education and contraceptive use in Ethiopia is mediated by the knowledge of and access to family planning services and by attitudinal factors. Researchers also note that education can contribute to increased women's authority in the household, giving them the power to influence family planning and child-bearing decisions (Alpu & Fidan, 2006). In general, these studies analyse direct and indirect effects of education on the probability of using contraceptive methods after controlling for a number of measurable covariates. However, they do not focus on the presence of unobserved confounders, such as preference and motivation, that affect contraceptive use and are associated with education. Because we cannot directly account for these confounders, we expect biased parameter estimates and, therefore, biased interpretations. In the literature, this issue is known as the endogeneity problem. Furthermore, the aforementioned empirical studies typically impose specific relationships between continuous covariates, such as age and education, and the use of contraceptive methods. These covariates usually enter into the models as categorical variables that are defined after grouping or as pre-specified polynomial functions. One limitation of this approach is that possible important patterns and non-linearities that are unknown to the researcher are not detected (Zanin & Marra, 2012). Both issues, endogeneity and functional form misspecification, call for an approach that account for unobserved confounders and avoid the problems of categorisation and/or a priori specified parametric models.

The present study investigates the effect of education on the probability of married Malawian women using modern contraceptive methods, by accounting for observed and unobserved confounders. Our interest in Malawi stems from its high fertility. The total fertility rate in 2010 was equal to 5.7, whereas the under-five mortality rate per 1,000 live births decreased from 233.8 to 112.1 coupled with declining death rates, thereby, driving a rapid increase in population (MDHS, 2012). This demographic trend is a critical socio-economic issue for Malawi because it coincides with inadequate resources and a lack of efficient policies oriented towards the country's development. A sustainable level of fertility should be pursued through policy initiatives. If education is an important driver for birth control, policies that promote improved knowledge of the use of contraceptive methods among Malawian women represents one strategy to lower the national fertility rate (Zanin, Radice, & Marra, 2014). However, obtaining

a realistic measure of the effect of education on the probability of using contraceptive methods is difficult, especially in the presence of unobserved confounders. Therefore, our empirical investigation is structured as a sensitivity analysis that compares statistical models under different assumptions of specification and estimation. This approach allows us to assess the strengths and/or weaknesses of each method used.

We first assume that unobserved confounders are not present and we control for observed confounders estimating a classic linear probability model (LPM). We then account for both observed and unobserved confounders using a two-stage least squares (2SLS) model. Accordingly, to relax the assumptions of the effects of continuous covariates in a LPM, we use a classic generalised additive model (GAM), as introduced by Wood (2006). To account for both observed and unobserved confounders, we estimate a two-stage generalised additive model (2SGAM), which is a kind of 2SLS generalisation (Marra & Radice, 2011a).

2. Data

We investigate the relationship between education and contraceptive use among married Malawian women using microdata from the Malawi Demographic Health Survey (MDHS; www.measuredhs.com) that were collected between June and November 2010 by the National Statistical Office in partnership with the Ministry of Health Community Sciences Unit (NSO & ICF Macro, 2011). The survey interviewed women between the ages of 15 and 49. This analysis is limited to a sample of 15,445 currently married women that includes married women and women living with a partner because most births occur in marital unions (Martin, 1995; Manda & Meyer, 2005). We exclude women who were never married or who were formerly married (widowed, divorced, separated, and previously lived with a partner but are currently not living with a partner). The variable of interest is *contraceptive*, which is assigned a value of one if, at the time of the interview, a woman was using a modern contraceptive method (pill, injectable, male/female condom, female sterilisation, intrauterine device); otherwise, it is zero. In other words, we investigate whether a woman used at least one modern contraceptive method for birth control. Contraceptive prevalence rate, which is computed as the percentage of married women using modern contraceptive methods, is approximately 42% of the sample. Women's educational status, *education*, is measured in terms of years of schooling by combining information on the educational level attended and grade achieved. Education in Malawi is organised into eight years of primary school (Standard 1–Standard 8), four years of secondary school (Form 1–Form 4), and four years of university education (Kadzamira & Rose, 2003). Only 25.4% of the women in the sample completed a primary education or beyond. The low percentage of educated women is the result of a combination of negative factors in the country that hinder the completion of a primary education. These factors include the absence of adequate infrastructures (e.g., schools, streets, and electricity), the widespread poverty and its social consequences that affect the quality