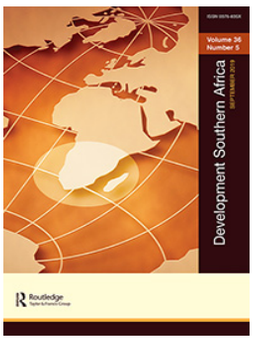

Development Southern Africa

ISSN: 0376-835X (Print) 1470-3637 (Online) Journal homepage: https://www.tandfonline.com/loi/cdsa20

Measuring the causal effect of women's schooling on contraceptive use in Nigeria

Joseph Boniface Ajefu

To cite this article: Joseph Boniface Ajefu (2019) Measuring the causal effect of women's schooling on contraceptive use in Nigeria, Development Southern Africa, 36:5, 716-729, DOI: 10.1080/0376835X.2019.1593109

To link to this article: https://doi.org/10.1080/0376835X.2019.1593109

Published online: 07 Apr 2019.

Submit your article to this journal

Article views: 80

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=cdsa20

DEVELOPMENT SOUTHERN AFRICA
2019, VOL. 36, NO. 5, 716–729
https://doi.org/10.1080/0376835X.2019.1593109

Routledge
Taylor & Francis Group

Check for updates

Measuring the causal effect of women's schooling on contraceptive use in Nigeria

Joseph Boniface Ajefu

School of Economic and Business Sciences, University of the Witwatersrand, Johannesburg, South Africa

ABSTRACT

This paper uses the 2008 Nigerian Demographic Health Survey to investigate the effect of women's schooling on contraceptive use. In order to control for endogeneity of women's schooling, this paper uses an instrumental variable approach, with the free primary education programme in Nigeria introduced from 1976 to 1981, as an instrument for women's schooling. The paper finds that the education of women increases the probability of using contraceptives. Disaggregating the results between traditional and modern contraceptive use, the results show a positive and significant impact of women's education on both modern and traditional contraceptive use. The findings of the study lend credence to the evidence that birth control measures can lead to better timing and spacing of births that allow women to significantly expand their economic opportunities and life prospects. These have implications for women's economic empowerment and gender equality, which are vital for any sustainable development policy.

KEYWORDS

Female; schooling; causal; effect; contraceptives; Nigeria

1. Introduction

Access to modern contraceptives by women in developing countries has been receiving increased attention in the international agenda recently. About 214 million women of reproductive age in developing countries do not have access to modern contraceptives; with sub-Saharan Africa being one of the regions with the highest number of women with an unmet need for modern contraceptives worldwide (UNFPA, 2016).

The lack of access to modern contraceptives is partly responsible for the high or unwanted fertility among the poor and less educated women in developing regions of the world (Jones, 2015). Some of the channels through which female schooling could affect contraceptive use include: First, the benefits associated with education may motivate women to get more schooling, thereby delaying or reducing fertility. The delay or reduction in fertility may lead to the use of contraceptives by women (Ainsworth et al. 1996). Second, women's schooling may lead to higher aspirations for the children's schooling, which often leads to quantity-quality trade-off, resulting in fewer children and more investments in children's education (Black et al., 2005; Caceres-Delpiano, 2006; Dang &

CONTACT Joseph Boniface Ajefu joeajefu@gmail.com School of Economic and Business Sciences, University of the Witwatersrand, Johannesburg, South Africa

© 2019 Government Technical Advisory Centre (GTAC)

Rogers, 2016; Kruger & Kumer, 2017).[1] Third, educated women are more likely to learn about the better use of contraception than uneducated ones (Osili & Long, 2008; Kim, 2010). Also, women with more education are more likely to imbibe healthy practices than uneducated women, which may lead to fewer births and low child mortality (Schultz, 1994; Ainsworth et al. 1996).

The likelihood that a woman will use modern contraceptives, however, is not random. Rather, it appears closely correlated with the woman's level of education. There is a small but growing literature on the relationship between women's schooling and contraceptive use (Feyisetan & Ainsworth, 1994; Shapiro & Tambashe, 1994; Beegle, 1995; Castro-Martin, 1995; Thomas & Maluccio, 1995; Ainsworth et al. 1996; Bbaale & Mpuga, 2011; Buyinza & Hisali, 2014). Most of these studies investigate the relationship between women's schooling and contraceptive use relying on methods that do not control for endogeneity of schooling decision, and the relationship is not necessarily causal. Therefore, empirical results from such studies are likely to be biased. Moreover, empirical evidence on the causal relationship between women's schooling and contraceptive use are scarce.

The present paper, therefore, contributes to the existing literature by using an exogenous variation in schooling as a natural experiment to investigate the relationship between women's schooling and contraceptive use in Nigeria. This paper uses exposure to the Universal Primary Education (UPE) program introduced from 1976 to 1981 by the federal government of Nigeria as an instrument for women's schooling, and the UPE program created exposure to schooling through age of cohorts and state of residence. Also, this paper exploits variations in the intensity of implementation of the UPE program, which differs across the state of residence of the cohorts exposed to the program. This provides the basis for estimating the relationship between women's schooling on contraceptive use. The paper seeks to contribute to the literature that identifies the impacts of education policies and programmes in developing countries (Case & Deaton, 1999; Duflo, 2001; Angrist et al., 2002).

The relevance of this study is underscored in the economic empowerment benefits associated with women's contraceptive use (women's reproductive rights and women's economic empowerments are interconnected). Access to and use of contraceptives are associated with women's career investment through the prevention of early marriage, unwanted pregnancy and other associated consequences (Goldin & Katz, 2002; Angeles et al., 2005). This could provide the opportunity for increased educational attainment for women, more participation in formal sector and paid work, raise the number of annual hours of labour, and other socioeconomic gains (Bailey, 2006; Miller, 2010); reduce gender wage gap (Bailey et al. 2012); decrease the likelihood of the need for public assistance, increase children's resources and decrease household poverty (Bailey, 2006, 2012).

The findings of this paper suggest that women's schooling, measured both by years of schooling and completion of at least 7 years of schooling significantly are positively associated with the likelihood of using contraceptives. The results are consistent for the OLS, Probit and 2SLS regression estimates. The remainder of the paper is organised as

[1]On the contrary, Zhong (2017) found evidence for quantity-quality trade-off in children's health but not in children's education in China.

follows: Section 2 discusses the literature review. Section 3 presents the data source and empirical strategy. Section 4 discusses the results of the study, and Section 5 concludes the paper.

2. Literature review and general background

Existing studies have shown that, in the absence of contraception knowledge, the control over the number of births can be achieved through either abortion or abstinence (Becker, 1960, 1993). Therefore, the fundamental changes in fertility are due to changes in the demand for children, rather than birth control methods. Attempts by some empirical studies to establish causality between access to contraceptives and fertility decline was not conclusive due to the contemporaneous changes in social norms and contraceptives legalisation (Bloom & Canning, 2003; Pop-Eleches, 2006).

Moreover, there is a growing empirical literature on the determinants of contraceptive use. The first strand of studies discusses the relationship between women's schooling and contraceptive use. The evidence shows a positive association between female schooling and contraceptive use (Feyisetan & Ainsworth, 1994; Shapiro & Tambashe, 1994; Beegle, 1995; Castro-Martin, 1995; Thomas & Maluccio, 1995; Ainsworth et al., 1996; Al Riyami et al., 2004; Bbaale & Mpuga, 2011; Buyinza & Hisali, 2014).[2] The positive relationship between women's schooling and contraceptive use stems from the desire of educated women to have smaller families, despite the fact they can cater for more children. One plausible explanation is that higher income tends to lead people to want fewer children. The desire to spend more on children makes it more expensive to have large numbers of children (Becker & Lewis, 1973). Thus, women's education is often assumed to increase the opportunity cost of children. Also, children are likely to restrain women from labour market participation, and an increase in women's wages due to education will lead to in an increase in the shadow price of children and hence decline in the number of children (Ben-Porath, 1973).

The second strand of studies considers the relationship between preference for a gender, number of children and contraceptive demand and use (Leung, 1991; Khan & Parveen, 2000; Yount et al. 2000; Arokiasamy, 2002; Dahl & Moretti, 2008). Moreover, household wealth and income have been demonstrated by some studies to influence the demand for contraceptive use by considering the impact of unanticipated shocks to housing prices on contraceptive use (Lovenheim & Mumford, 2013; Dettling & Kearney, 2014); job loss of either partner from paid employment (Lindo, 2010; Bono et al., 2015); change in husband's wage resulting from world commodity prices (Black et al., 2013); and economic crises (McKelvey et al., 2012). In view of the above, this study contributes to the existing literature by investigating the relationship between women's schooling and contraceptive use in Nigeria using the UPE program as an instrument for education.

2.1. The universal primary education program in Nigeria

In the year 1976, the government of Nigeria introduced the UPE program, with the aim to increase access to primary school enrolment. The nationwide UPE program was

[2]These studies consider evidence from the following countries: Sub-Saharan Africa, Oman, Uganda, Tanzania, Kinshasa (Congo DR), and Zimbabwe.

announced on 1 October 1974 and came into effect on 6 September 1976 for the whole country. The UPE was a large-scale, nationwide educational policy designed to increase educational attainment through the provision of tuition-free primary education.

In order to achieve the planned expansion of primary education, construction of a large number of class rooms was undertaken. The government proposed the construction of 150 995 new classrooms for primary school (Osili & Long, 2008). Also, the UPE program proposed the recruitment of 80 000 new teachers and the construction of 6699 new classrooms for teacher-training institutions. For the execution of the program, about 700 million naira was disbursed to states by the federal government (Federal Office of Statistics, Social Statistics in Nigeria, 1979; Nwachukwu, 1985). As a result of the introduction of the UPE program, school enrolments increased from 4.4 million students in 1974 to 14.5 million primary school students in Nigeria by 1982 (Federal Office of Statistic, Nigeria). Moreover, while the gross primary enrolment rate for boys increased from 60.3% in 1974 to 136.8% in 1981, female enrolment rate also increased from 40.3% in 1974 to 104.7% in 1981 (Federal Government of Nigeria, 1978–1979; World Bank, 2002).

It is important to note that, while the UPE program lasted, the amount of federal capital funds across the states were not uniform. Some states received a high federal capital allocation for the program compared to others. Following Osili & Long (2008) and Oyelere (2010), states with high federal capital funds and expenditure are classified as high-intensity states, while those with low federal capital allocation are classified as low-intensity states. The variation across the state in the federal government capital allocation towards classroom construction provides an interesting feature for the identification strategy of this paper using the UPE program.[3] The classification into high-intensity and low-intensity states follows the education expenditure in the non-western and western states.[4] Apart from Lagos State, funds per capita for the UPE program were higher in non-western (high-intensity states) than the western states. It was reported that there was controversy on the underestimation of the of the population figure of Lagos State during the 1953 population census in Nigeria (Lagos Executive Development Board, 1971). However, estimated results show that Lagos dropped from the sample do not alter the results of this study. See the results of Table A3 in the appendix.

The UPE program ended abruptly in September 1981 when the financing of primary schools was handed over to states and regional governments. The regional governments were unable to fund the nationwide universal free education scheme. The reduction in funding to primary schools due to a decline in oil revenue in the 1980s led to the collapse of the program. One of the immediate effects of the collapse of the UPE program was a fall in primary school enrolments across the country (Francis, 1998).

3. Data sources and empirical methodology

3.1. Data sources

To investigate the relationship between women's schooling and contraceptive use, this study uses the 2008 Nigerian Demographic Health Survey (NDHS). This dataset is a nationally representative survey that contains information on socioeconomic and

[3]See Table A1 in the appendix for details of the expenditure for the UPE program across states in Nigeria.
[4]The western states are classified as the low-intensity state, while non-western states are the high-intensity state.

demographic variables of 34 070 households and 33 385 women. The 2008 NDHS interviewed women aged 15–49 in the households and men aged 15–59 in a sub-sample of half of the households.[5]

The 2008 NDHS is suitable for this study because the survey captures information that provides answers to the questions being investigated. It provides the following information on the respondents: level of education, fertility, family-planning practice (such as contraceptive use), region and state of residence etc. The sample of data used in this analysis was restricted to women born between 1970 and 1975 (1–6 years in 1976) who were exposed the UPE program (treatment group) and older women born between 1958 and 1961 (15–18 years in 1976) that were likely not to have benefitted from the UPE program (control group). Hence, the sample comprises women born between 1958 and 1975 (aged between 33 and 49 in 2008).

This study uses dichotomous variables as the dependent variables to measure women's contraceptive use. The variables are: currently using contraceptives, use of modern contraceptives, and use of traditional contraceptives. Table 1 provides summary statistics for the data. This study uses respondents' state of current residence to link individuals to the impact of the UPE program.[6] For the 16% of women reported as being users of any form of contraceptives, about 11% were reported to be using modern contraceptives and 5% reported using traditional contraceptives. For the treatment group, 74% of the women in the final sample were in primary school age (1–6 years) in 1976, while 26% of the women were above primary school age in 1976 (control group). The average age of women in the final sample used in the analysis is 39 years.

3.2. Empirical methodology

To investigate the impact of women's schooling on the use of contraceptives, this paper uses an instrumental variable (IV) approach that controls for the potential endogeneity of women's schooling using natural experiment, whereby the exposure to the UPE program was by date of births and variation in the intensity of implementation of the program across states serve as an instrument for women's schooling. This paper uses an identification strategy similar to Duflo (2001) and Osili & Long (2008).[7] The interaction between cohorts of primary school age in 1976 (1–6 years in 1976) and resident in a high-intensity state of UPE program (equal to 1 if resident in a high-intensity state and 0 otherwise) was used as an instrument. Specifically, the treatment group was women aged 1–6 years in 1976 and the control group was women aged 15–18 years in 1976. The choice of the instrument used assumed that exposure to the program (the interaction between primary school age in 1976 and resident in a high-intensity state) is correlated with women's education.

[5]This study uses the female recode sample because the focus of the study is on the relationship between women's schooling and contraceptive use.

[6]The 2008 DHS captures respondents across the 36 states and Federal Capital Territory (Abuja). These 36 states and Abuja falls under six geopolitical regions in the country. These regions are North Central, North West, North East, South East, South-South, and South West. These regions, following Osili and Long (2008) were broadly categorized as Western region and Non-western region. The categorization was motivated by the number of regions (Northern, Western, and Eastern) at the time of the announcement of the UPE policy. I match each respondents state at the time of the survey (36 states) to the 19 states that existed during the UPE program in 1976.

[7]This paper's identification strategy is also similar to Case and Deaton (1999), and Breierova and Duflo (2004). For example, Breierova and Duflo (2004) use an individual date of birth and region of schooling to investigate the causal impact of male and female schooling on child mortality on fertility.

Table 1. Descriptive statistics.

Variable	Mean	Standard Deviation
Currently use any contraceptives (=1)	0.155	0.362
Use modern contraceptives (=1)	0.109	0.312
Use traditional contraceptives (=1)	0.045	0.207
Years of education	4.792	5.386
Completed 7 years of schooling	0.286	0.452
Cohorts		
Treatment: born 1970–1975	0.742	0.437
Control: born 1958–1961	0.257	0.437
Age of respondent: female	38.594	5.749
Religion		
Catholic	0.104	0.305
Other Christian[a]	0.411	0.492
Muslim	0.462	0.498
Other religion	0.022	0.146
Ethnicity		
Hausa/Fulani	0.285	0.451
Igbo	0.149	0.356
Yoruba	0.159	0.365
Others	0.406	0.491
Other variables		
Number of children	5.611	2.861
Currently employed (=1)	0.763	0.424
Urban (=1)	0.310	0.462
Wealth index1 (Poorest)	0.224	0.417
Wealth index2 (Poorer)	0.206	0.404
Wealth index3 (Middle)	0.192	0.394
Wealth index4 (Richer)	0.181	0.385
Wealth index5 (Richest)[b]	0.195	0.396
Observations	6211	

Notes: Contraceptives indicator: It is a binary variable that takes a variable 1 if either modern or traditional contraceptive is used, or 0 if otherwise. Modern contraceptives include: female sterilisation, male sterilisation (for respondent's partner), pills, intrauterine device, injectable, implants, female condom, male condom (for respondent's partner), diaphragm, and emergency contraception pills after sex. On the other hand, traditional contraceptives include: periodic abstinence, withdrawal, norplant, lactational amenorrhea, and foam/jelly.

[a]The 2008 DHS captures respondents' religious affiliation on the following: (i) Catholic (ii) Other Christian (iii) Islam (iv) Traditionalist (v) Other religion. However, I recode Traditionalist and Other religion to other religion.

[b]The wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. The DHS wealth categories households into 5 wealth quintiles, which allows for an observation on how wealth differs between the poor and wealthy.

The model for the IV approach is described as follows:

$$C_{ijk} = \alpha + \beta S_{ijk} + \theta X_{ijk} + \varphi Z'_{ijk} + \varepsilon_{ijk} \tag{1}$$

where C_{ijk} is an indicator variable for contraceptive use by a female respondent i born in year j in UPE state or state k. S_{ijk} is years of schooling of individual i born in year j in UPE state k. X_{ijk} is the age of individual i born in year j in state k. Z'_{ijk} are other individual and household covariates used as control variables in the regression. The regression controls used are year of birth fixed effects and state fixed effects.[8] The first stage regression for the impact of UPE program on women's schooling is presented below as

$$S_{ijk} = \alpha_0 + \alpha_1 X_{ijk} + \alpha_2 Z'_{ijk} + \alpha_3 UPE_{ijk} + \nu_{ijk} \tag{2}$$

[8]The use of year of birth fixed effects help to control for year-specific shocks common across all individuals within a birth cohort, and state fixed effects help to purge any time-invariant state characteristics for individuals in the sample.

where UPE_{ijk} is the exposure to the universal free education (interaction between women of primary school age in 1976 and the state of residence) of individual i born in year j in UPE state group k. Using the IV approach, β is the parameter of interest that captures the impact of the program on the use of contraceptives. The error terms in Equation (1), ε_{ijk}, and Equation (2), ν_{ijk}, are uncorrelated.

Formally, OLS estimates of Equation (1) may lead to biased estimates if ε_{ijk} is correlated with schooling due to omitted factors such as ability, community wealth or family background. Therefore, based on this limitation, Equation (1) is estimated using the IV approach.

3.3. The universal primary education as an instrument

The instrument used for women's schooling in this analysis is the exposure of an individual to the UPE program, which is determined by age of the cohorts and state of residence. The assumption is that those individuals within primary school age in 1976 were exposed to the UPE program, and therefore had a higher likelihood of attaining increased years of schooling. The intuition behind this argument stems from the lower cost of schooling associated with universal free education. Moreover, variation in the instrument arises from variations in the exposure to the UPE by date of birth and intensity of UPE program implementation across states in Nigeria.

In view of the above, this paper considers the following reasons why the UPE program is a suitable instrument for women's schooling: First, a good instrument must be relevant. There is ample evidence of how the free education program stimulated school attainment in Nigeria. For example, Casapo (1983), Nwachukwu (1985), Osili & Long (2008) and Oyelere (2010) lend credence to the impact of the UPE program on primary school attainments. Between 1974 and 1982, primary school enrolment increased from 4.4 million to 14.5 million. This increase was credited to the UPE program introduced by the federal government. For the Northern region that never had a free education before 1976, primary school enrolment increased by 63% between 1976 and 1981, while for the South, the increase was by 23% (Oyelere, 2010). Furthermore, for the North region, the proportion of children in primary school in Nigeria snowballed from 28.7% in 1976 to 46.2% in 1981. After the UPE program ended, however, there was a drop in this share of enrolment to 42.4% in 1985.

The second argument for the suitability of the UPE program as an instrument is the satisfaction of the exclusion restriction requirement. This paper argues that the only way through which the UPE program affects the use of contraceptives by women is through the increase in school enrolment. This identification strategy would fail to hold if the free education program is correlated with changes in school quality, and school quality is an omitted variable in Equation (1). To test this assumption, Oyelere (2010) found no systematic correlation between teacher and student ratios, education expenditure per student and program implementation over time, no correlation between UPE and students' ability which is often omitted in schooling regression. Lastly, the monotonicity assumption seems to be met with the introduction of the free education program. The assumption could be violated if there were individuals that dropped out of school as a result of the introduction of the free education program (defiers). This line of thought, however, seems counterintuitive. So, it is plausible to assume that there are no defiers.

In view of the points above, it is reasonable to argue that the instrument (interaction between women of primary school age in 1976 and residence in a high-intensity state)

used in the analysis meets the sufficient conditions required for an instrumental variables analysis.[9]

3.4. Potential threats to identification

This study identifies some potential threats to estimating the causal effect of women's schooling on the use of contraceptives. One possible threat is the migration of women over time from high-intensity UPE program states to low-intensity UPE program states. This could constitute a threat to the identification strategy of this study because the dataset does not contain information on either the place of residence during primary schooling or the state of birth. The NDHS provides information only on the respondents' current state or region of residence. Respondents' current residence could be different from the place of residence during primary schooling and regression estimates will be biased due to endogenous migration.

This concern has, however, been allayed by evidence from the Federal Office of Statistics (1999, 2000) which shows that 95.3% and 95.8% of people are still living in their states of birth. Therefore, most migration in Nigeria are within states, from rural to urban areas and not across states. Also, most migration is within the same region and this accounts for 4.2% of the people. With this evidence, the threat to identification is likely to be minimal.

Another threat to identification is cultural factors and belief systems. Cultural factors are prevalent in developing countries and could significantly affect economic outcomes. Many women in developing countries are sceptical about using contraceptives based on long-held cultural beliefs. Unfortunately, the dataset does not provide any of such variables to be used as a proxy for cultural belief. However, in the analysis, the study controls for the ethnicity and religious belief of the respondents. The ethnicity of an individual could be an embodiment of the individual's identity and beliefs. These differences across individuals when controlled for can mitigate the impact of the omission of cultural factors.

4. Results and discussions

Table 2 shows regression results for OLS, Probit and 2SLS using years of schooling as the dependent variable. The results show that an increased educational attainment increases the current use of any contraceptives by women. For the 2SLS results, an additional year of schooling is associated with the probability of using any contraceptives by 12 percentage points. However, the OLS and Probit regressions are lower in magnitude than the 2SLS. This is likely to be as a result of underestimation of the impact of the free education program on the use of contraceptives using the OLS regression model. The results for the probit model capture the marginal effects from the probit regressions.

Table 3 shows regression results for OLS, Probit and 2SLS using seven completed years of schooling as the dependent variable. The results show that completing at least seven

[9]See Table A2 in the appendix for the first-stage regression summary statistics. The F-statistic for the strength of the instrument is 10.87, which is considerably larger than the rule of thumb value of 10 that is often suggested. Therefore, the UPE program does not seem to be a weak instrument.

Table 2. Impact of schooling on contraceptive use (year of schooling).

Variable	OLS	Probit	2SLS
Years of schooling	0.007***	0.004***	0.124***
	(0.001)	(0.001)	(0.039)
Controls	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Year of birth fixed effect	Yes	Yes	Yes
R-squared	0.188	0.232	
Observations	6138	6138	6138

Notes: Control variables used in the regression include: current age, urban dummy variable, religion dummies, ethnicity dummies, and wealth index dummies. Robust standard errors in parentheses are clustered at the state of residence. ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

Table 3. Impact of schooling on contraceptive use (completed seven years of schooling).

Variable	OLS	Probit	2SLS
Completed 7 years of schooling	0.062***	0.027***	1.004***
	(0.013)	(0.008)	(0.199)
Controls	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Year of birth fixed effect	Yes	Yes	Yes
R-squared	0.187	0.230	
Observations	6138	6138	6138

Notes: Control variables used in the regression include: current age, urban dummy variable, religion dummies, ethnicity dummies, and wealth index dummies. Robust standard errors in parentheses are clustered at the state of residence. ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

Table 4. The impact of education on contraceptives use-modern contraceptives.

Variable	OLS	Probit	2SLS
Years of schooling	0.005***	0.003***	0.057***
	(0.001)	(0.001)	(0.021)
Controls	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Year of birth fixed effect	Yes	Yes	Yes
R-squared	0.115	0.178	
Observations	6138	6138	6138

Notes: Control variables used in the regression include: current age, urban dummy variable, religion dummies, ethnicity dummies, and wealth index dummies. Robust standard errors in parentheses are clustered at the state of residence. ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

years of schooling is positively associated with women's use of any contraceptives. The 2SLS result is stronger in magnitude than the OLS and Probit regression results.

Table 4 considers the impact of women's years of schooling on the use of modern methods of contraception. The 2SLS results show that an additional year of schooling is associated with the probability of women using modern contraceptives by approximately 6 percentage points. For the OLS and Probit regression estimates, years of schooling increases the probability of contraceptive use by 0.5 and 0.3 percentage points respectively.

Table 5 shows the relationship between an additional year of schooling and the probability of using traditional contraceptives.[10] The results show that an additional year of schooling is associated with the likelihood of using traditional contraceptives.

[10]Traditional contraceptives include: periodic abstinence, withdrawal, norplant, lactational amenorrhea, and foam/jelly.

Table 5. The impact of education on contraceptives use-traditional contraceptives.

Variable	OLS	Probit	2SLS
Years of schooling	0.002***	0.001***	0.066***
	(0.001)	(0.000)	(0.025)
Controls	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Year of birth fixed effect	Yes	Yes	Yes
R-squared	0.097	0.171	
Observations	6138	6138	6138

Notes: Control variables used in the regression include: current age, urban dummy variable, religion dummies, ethnicity dummies, and wealth index dummies. Robust standard errors in parentheses are clustered at the state of residence. ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

Table 6. Heterogeneous effects: employment status and contraceptive use.

Variable	Dependent variable: contraceptive indicator	
	Employed	Unemployed
Years of schooling	0.138**	0.161
	(0.063)	(0.108)
Controls	Yes	Yes
State fixed effect	Yes	Yes
Year of birth fixed effect	Yes	Yes
Observations	4665	1432

Notes: Control variables used in the regression include: current age, urban dummy variable, religion dummies, ethnicity dummies, and wealth index dummies. Robust standard errors in parentheses are clustered at the state of residence. ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

4.1. Heterogenous effects

The relationship between women's schooling and the use of contraceptives can be identified through other heterogeneous effects. The paper identifies the employment status of the woman as one of the possible heterogeneous effect that can motivate the use of contraceptives. This study investigates the heterogeneous effects of the employment status of the sample of women used in the analysis. Table 6 estimates the relationship for employed women using 2SLS and the results show that among employed women, there is a positive association between women's schooling and the use of contraceptives. Specifically, an additional year of schooling is associated with the probability of using any contraceptives by 14 percentage points among the employed. This infers that, given an increase in the years of schooling, women's labour force participation is a motivation for the use of contraceptives. The study, however, finds no association between schooling and contraceptive use among unemployed women. This finding agrees with the labour force participation and fertility trade-off in development studies literature.

5. Summary and conclusion

This paper examines the causal relationship between women's schooling and the use of contraceptives in Nigeria. In order to control for endogeneity of schooling decisions, an instrumental variable approach was used. Specifically, the free education program that was introduced in 1976 by the Federal government of Nigeria was used as an instrument for female schooling. This paper identifies other channels that could affect the use of contraceptives by women. The study finds that among the employed women, there is an association between years of schooling and the use of contraceptives.

The findings of this paper are vital for policy discussions in the following aspects: First, increasing access to schooling through the reduction or elimination of schooling costs in developing countries can be linked to women empowerment, which can have positive implications for birth control. Second, increased participation in labour market activities can stimulate the use of contraceptives among educated women. This can be achieved through creating productive and decent employment opportunities for women in developing countries. This shows that not only a reduction in costs of schooling is important to achieve the desired outcome of empowerment, but also access to paid labour market employment. The outcomes of this study bring to the fore an important agenda of the Sustainable Development Goals (SDGs). A proper birth control that leads to the timing and spacing of births will allow women to significantly expand their economic opportunities and life prospects. These have implications for women's economic empowerment and gender equality, which are vital components of any sustainable development policy.

Disclosure statement

No potential conflict of interest was reported by the author.

ORCID

Joseph Boniface Ajefu http://orcid.org/0000-0001-6333-3708

References

Ainsworth, M, Beegle, K & Nyamete, A, 1996. The impact of women's schooling on fertility and contraceptive use: A study of fourteen sub-Saharan African countries. The World Bank Economic Review 10(1), 85–122.

Al Riyami, A, Afifi, M & Mabry, RM, 2004. Women's autonomy, education and employment in Oman and their influence on contraceptive use. Reproductive Health Matters 12, 144–54.

Angeles, G, Guilkey, DK & Mroz, TA, 2005. The effects of education and family planning programs on fertility in Indonesia. Economic Development and Cultural Change 54, 165–201.

Angrist, JD, Bettinger, E, Bloom, E, King, E & Kremer, M, 2002. Vouchers for private schooling in Colombia: evidence from a randomized natural experiment. American Economic Review 92(5), 1535–58.

Arokiasamy, P, 2002. Gender preference, contraceptive use and fertility in India: regional and development influences. International Journal of Population Geography 8(1), 49–67.

Bailey, MJ, 2006. More power to the pill: The impact of contraceptive freedom on women's life cycle labour supply. The Quarterly Journal of Economics 121(1), 289–320.

Bailey, MJ, 2012. Re-examining the impact of U.S. family planning programs on fertility: evidence from the war on poverty and the early years of title X. American Economic Journal: Applied Economics 4(2), 62–97.

Bailey, MJ, Hershbein, BJ & Miller, AR, 2012. The opt-in revolution? Contraception and the gender gap in wages. American Economic Journal: Applied Economics 4(3), 225–54.

Bbaale, E & Mpuga, P, 2011. Mother's education, contraceptive use and fertility in Uganda. The Journal of Sustainable Development 6(1), 20–47.

Becker, GS, 1960. An economic analysis of fertility, nber chapters. In Universities-National Bureau (Eds.), Demographic and economic change in developed countries, 209–40. Columbia University Press, New York.

Becker, G, 1993. A treatise on the family: Enlarged edition. Harvard University Press, Cambridge, MA.

Becker, GS & Lewis, HG, 1973. On the interactions between quantity and quality of children. Journal of Political Economy 81, 279–88.
Beegle, K, 1995. The quality and availability of family planning services and contraceptive use in Tanzania. LSMS Working Paper 114. World Bank, Washington, DC.
Ben-Porath, Y, 1973. Economic analysis of fertility in Israel: Point and counterpoint. Journal of Political Economy 81, 202–33.
Black, S, Devereux, P & Salvanes, K, 2005. The more the merrier? The effect of family size and birth order on children's education. Quarterly Journal of Economics 120, 669–700.
Black, DA, Kolesnikova, N, Sanders, SG & Taylor, LJ, 2013. Are children normal? The Review of Economics and Statistics 95(1), 21–33.
Bloom, DE & Canning, D, 2003. Contraception and the celtic tiger. Economic and Social Review 34, 229–47.
Bono, E, Weber, A & Winter-Ebmer, R, 2015. Fertility and economic instability: The role of unemployment and job displacement. Journal of Population Economics 28(2), 463–78.
Breierova, L, & Duflo, E, 2004. The impact of education on fertility and child mortality: Do fathers really matter less than mothers? National Bureau of Economic Research Working Paper No. 10513.
Buyinza, F & Hisali, E, 2014. Microeffects of women's education on contraceptive use and fertility: The case of Uganda. Journal of International Development 26, 763–78.
Caceres-Delpiano, J, 2006. The impacts of family size on investment in child quality. Journal of Human Resources 41, 738–54.
Casapo, M, 1983. Universal primary education in Nigeria: Its problems and implications. African Studies Review 26(1), 91–106.
Case, A & Deaton, A, 1999. Schooling inputs and educational outcomes in South Africa. Quarterly Journal of Economics 114(3), 1047–84.
Castro-Martin, T, 1995. Women's education and fertility: results from twenty demographic and health surveys. Studies in Family Planning 26(4), 187–202.
Dahl, GB & Moretti, E, 2008. The demand for sons. Review of Economic Studies 75, 1085–120.
Dang, H-A & Rogers, H, 2016. The decision to invest in child quality over quantity: household size and household investment in education in Vietnam. World Bank Economic Review 30, 104–42.
Dettling, LJ & Kearney, MS, 2014. House prices and birth Rates: The impact of the real estate market on the decision to have a baby. Journal of Public Economics 110, 82–100.
Duflo, E, 2001. Schooling and labour market consequences of school construction in Indonesia: evidence from an unusual policy experiment. American Economic Review 91(4), 795–813.
Federal Government of Nigeria, 1978–1979. Implementation Committee for the National Policy on Education blueprint.
Federal Office of Statistics (FOS), 1979. Social statistics in Nigeria, FOS, Lagos, Nigeria.
Federal Office of Statistics (FOS), 1999. Poverty profile for Nigerians, 1980–1996, FOS, Lagos.
Federal Office of Statistics (FOS), 2000. Annual abstract of statistics, FOS, Lagos.
Feyisetan, BJ & Ainsworth, M, 1994. Contraceptive use and the quality, price, and availability of family planning in Nigeria, LSMS Working Paper 108, World Bank, Washington, DC.
Francis, PA, 1998. Hard lesson: primary schools, community and social capital in Nigeria, World Bank Technical Paper No. 420, Africa Region Series, Washington, DC, World Bank.
Goldin, C & Katz, LF, 2002. The power of the pill: Oral contraceptives and women's career and marriage decisions. Journal of Political Economy 110(4), 730–70.
Jones, KM, 2015. Contraceptive supply and fertility outcomes: evidence from Ghana. Economic Development and Cultural Change 64(1), 31–69.
Khan, MA & Parveen, AK, 2000. Influence of son preference on contraceptive use in Bangladesh. Asia-Pacific Population Journal 15(3), 43–56.
Kim, J, 2010. Women's education and fertility: An analysis of the relationship between education and birth spacing in Indonesia. Economic Development and Cultural Change 58(4), 739–74.
Kruger, AD & Kumer, S, 2017. Preference for boys, family size, and educational attainment in India. Demography 54(3), 835–59.

Lagos Executive Development Board, 1971. Annual report and accounts. Lagos Executive Development Board, Lagos, Nigeria.
Leung, SF, 1991. A stochastic dynamic analysis of parental sex preferences and fertility. Quarterly Journal of Economics 121, 1063–88.
Lindo, JM, 2010. Are children really inferior goods? Evidence from displacement-driven income shocks. Journal of Human Resources 45(2), 301–27.
Lovenheim, MF & Mumford, KJ, 2013. Do family wealth shocks affect fertility choices? Evidence from the housing market. The Review of Economics and Statistics 95(2), 464–75.
McKelvey, C, Thomas, D & Frankenberg, E, 2012. Fertility regulation in an economic crisis. Economic Development and Cultural Change 61(1), 7–38.
Miller, G, 2010. Contraception as development? New evidence from family planning in Colombia. The Economic Journal 120(545), 709–36.
Nwachukwu, AE, 1985. An historical analysis of the roots of universal public primary education in Nigeria (1900–1980). Ph.D. dissertation, University of Kansas.
Osili, U & Long, BT, 2008. Does female schooling reduce fertility? Evidence from Nigeria. Journal of Development Economics 87(1), 57–75.
Oyelere, RU, 2010. Africa's education enigma? The Nigerian story. Journal of Development Economics 91, 128–39.
Pop-Eleches, C, 2006. The impact of an abortion ban on socioeconomic outcomes of children: evidence from Romania. Journal of Political Economy 114, 744–73.
Schultz, TP, 1994. Sources of fertility decline in modern economic growth, Yale University, Department of Economics, New Haven, Conn. Processed.
Shapiro, D & Tambashe, O, 1994. Education, employment, and fertility in Kinshasa and prospects for changes in reproductive behaviour, Penn State Department of Economics Working Paper. Pennsylvania State University, State College, Pa Processed.
Thomas, D & Maluccio, J, 1995. Contraceptive choice, fertility, and public policy in Zimbabwe. LSMS Working Paper 109, Washington, DC: World Bank.
UNFPA, 2016. Universal access to reproductive health, progress and challenges, United Nations population fund 605 Third Avenue, New York, NY 10158.
World Bank, 2002. African development indicators, database.
Yount, KM, Langsten, R & Hill, K, 2000. The effect of gender preference on contraceptive use and fertility in rural Egypt. Studies in Family Planning 31(4), 290–300.
Zhong, H, 2017. The effect of sibling size on children's health and education: Is there a quantity-quality trade-off? Journal of Development Studies 53(8), 1194–206.

Appendix A

Table A1. Federal capital funds allocated for primary school construction in 1976 (in naira).

State	Region	Funds allocated	Using 1953 census population estimates for towns	
			Population	Funds/capita
Low-intensity areas				
Oyo	Western	1 744 305	1 243 090	1.40
Ogun	Western	321 524	166 274	1.93
Ondo	Western	717 838	219 741	3.27
Lagos	Western	13 890 626	267 407	51.95
High-intensity areas				
Anambra	Eastern	8 342 532	213 561	39.06
Borno	Northern	2 601 302	77 730	33.47
Kaduna	Northern	11 116 441	145 440	76.43
Rivers	Eastern	5 821 876	71 634	81.27
Imo	Eastern	8 271 194	93 633	88.34
Kano	Northern	12 131 038	130 173	93.19
Sokoto	Northern	8 369 744	87 845	95.28
Kwara	Northern	9 538 412	94 264	101.19
Bauchi	Northern	2 973 215	29 075	102.26
Gongola	Northern	5 005 510	47 643	105.06
Bendel	Midwestern	10 062 666	76 092	132.24
Niger	Northern	2 025 000	12 810	158.08
Plateau	Northern	6 287 450	38 527	163.20
Benue	Northern	3 175 804	16 713	190.02
Cross-river	Eastern	10 256 206	46 705	219.60

Source: Federal Office of Statistics, Social Statistics of Nigeria (1979).

Table A2. First-stage regression summary statistics.

Variable	R-sq.	Adjusted R-sq	Partial R-sq	Robust $F(1,36)$	Prob > F
Years of Schooling	0.5907	0.5863	0.0033	10.8687	0.0022

Source: Author's estimation.

Table A3. Impact of schooling on contraceptive use (year of schooling)

Variable	OLS	Probit	2SLS
Years of schooling	0.007***	0.004***	0.115***
	(0.002)	(0.001)	(0.037)
Controls	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Year of birth fixed effect	Yes	Yes	Yes
R-squared	0.162	0.216	
Observations	5855	5855	5855

Notes: Control variables used in the regression include: current age, urban dummy variable, religion dummies, ethnicity dummies, and wealth index dummies. Robust standard errors in parentheses are clustered at the state of residence. ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.