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Ajefu, Joseph Boniface

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Does having children affect women's entrepreneurship decision? Evidence from Nigeria

Joseph Boniface Ajefu [1]

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Abstract
This paper investigates the impact of fertility on women's entrepreneurship decision in Nigeria, using the 2008 and 2013 cross-sectional Demographic Health Surveys data. In order to mitigate the potential endogeneity associated with fertility decision, the study explores an exogenous variation in family size using twin births in an instrumental variable (IV) analysis. Both the Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) estimate show that having children is positively associated with women's entrepreneurship decision, and there are heterogeneous effects across the subsamples by women's age. The results of this study are robust to using the number of children younger than age five in the home as an alternative definition of fertility.

Keywords Children · Women · Entreprenuership · Nigeria

1 Introduction

Studies in the social sciences have long been concerned with the impact of women's decision on childbearing and labour market outcomes. For instance, existing evidence supports the assertion that having children is likely to be associated with less labour market participation in paid employment for women (Besamusca et al. 2015; Canning and Schultz 2012; Engelhardt and Prskawetz 2004; Becker 1985; Rosenzweig and Wolpin 1980a, 1980b; Gronau 1973; Mincer 1962). Moreover, the presence of children in the household can be an important factor in explaining variation in women's labour market participation (Contreras and Plaza 2010; Spierings et al. 2010; Browning 1992; Becker 1985).

✉ Joseph Boniface Ajefu
ajefu_joseph@yahoo.com

[1] Postdoctoral Research Fellow, School of Economic and Business Sciences, University of the Witwatersrand, Johannesburg, South Africa

Further, existing theoretical models have established a link between fertility and labour market outcomes (Becker 1985; Gronau 1973; Mincer 1962; Schultz 2009). For example, Mincer (1962) argues that maternal childcare is difficult to be substituted compared to other domestic works. Labour supply of married women with young children is likely to be affected than married women without young children.

Due to the prevailing cultural norms and the absence of organised childcare policies in many developing countries, women are often responsible for childcare and other domestic duties (Maume 2006; Moghadam 2004). Becker (1985) shows that childcare is more effort-intensive than other domestic activities, which has the propensity to affect women's labour market performance. In order to meet family obligations, or balance work and family commitments, recent evidence suggests that many women's labour force participation are significantly affected, while others may consider either part-time or less demanding jobs, such as self-employment[1] (Boden 1996; Budig 2006; Wellington 2006; Simoes et al. 2016; Joona 2017).

The purpose of this paper is to investigate the relationship between fertility and self-employment across a sample of women in Nigeria. Nigeria presents a compelling context to examine the causal effect of fertility on self-employment because of the high fertility and self-employment rates in the country. The fertility rate in Nigeria is one of the highest in the world. For instance, in 1960, the fertility was 6.4 and had only a slight decline to 5.6 in 2015 (World Development Indicators 2015)[2]. Factors responsible for the high fertility rate in Nigeria include: high level of infant and child mortality, early marriage, low use of contraception, high value placed on childbearing, and the prevalence of polygamous marriges (Feyisetan and Bankole 2002).

Nigeria accounts for a significant proportion of global female entrepreneurs (Global Entrepreneurship Monitor 2013). Compared to other countries, about 40.7% of female adults in Nigeria are either nascent entrepreneurs or owner-managers of a new business, while countries like the United States (10.4%), the United Kingdom (5.5%), Norway (3.6%) and France (3.1%) are lagging behind (Global Entrepreneurship Monitor 2013).

Previous studies on fertility and female labour force participation in Nigeria focus on the correlation (rather than the causal impact), and most of the results show that the correlation is negative. For example, Okpala (1984) investigates the relationship between female labour force participation and fertility in Lagos, Nigeria. Also, Okpala (1984) finds a negative correlation between female employment and the number of children. On the other hand, Nwakeze (1987) using the incompatibility and opportunity cost hypotheses finds inconsistent estimates on the relationship between fertility and labour force participation in Nigeria.

Though there is a growing literature that reports positive associations between the presence of children and female self-employment (Caceres-Delpiano 2012; Noseleit 2014; Joona 2017)[3]. The causal interpretation, however, of the relationship between the number of children and female self-employment can be made complex by the endogeneity of fertility. The presence of unobserved factors is likely to influence

[1] Self-employment and entrepreneurship are used in this paper interchangeably.

[2] See the appendix for the trend in fertility rate in Nigeria from 1960–2015.

[3] Rosen (2014) argues that, besides children, factors such as partner's working hours and self-employment decisions are associated with women's self-employment in Norway.

both fertility and female self-employment. For instance, independent women may choose to have fewer children and more likely to pursue full-time wage employment instead of part-time or self-employment. Therefore, the observed positive relationship between fertility and self-employment could be biased. Moreover, having more children could increase the demand for flexible employment which self-employment can offer, and self-employment allows women more flexible time to have more children. This leads to a sort of reverse causality.

This paper aims to extend the existing literature by investigating the causal relationship between fertility and female self-employment in Nigeria. The paper provides answers to the following research questions. Is there a causal relationship between fertility and female entrepreneurship in Nigeria? Are there heterogeneities across the sampled population of women in explaining the relationship between fertility and female entrepreneurship? The objective of this paper is to provide answers to these research questions using a micro perspective under an instrumental variable estimation framework. To address the potential endogeneity and identify the causal relationship between the number of children and self-employment, this paper uses an exogenous source of variation in fertility, which is twin birth as an instrument for the number of children. The choice of this instrument stems from the positive relationship between twin births and the number of children.

This paper is broadly related to two strands of empirical literature. The first category examines the impact of fertility on female labour force participation, taking into account the endogeneity of fertility decisions. The concern of endogeneity was addressed by most of these studies using either mixed sibling-sex composition as an instrumental variable (IV), or twin births as an instrument for fertility to analyse the effects of number of children on labour supply through the use of instrumental variables techniques (Bronars and Grogger 1994; Angrist and Evans 1998; Jacobsen et al. 1999; Cruces and Galiani 2007; He and Zhu 2016; De Jong et al. 2017; Zhang 2017; Heath 2017). There exists a growing number of studies in this category that find that a negative relationship exists between fertility and female labour force participation (Rosenzweig and Wolpin 1980a; Vere 2007; Sprague 1988; Black et al. 2005; Del Boca et al. 2009). For instance, De Jong et al. (2017) used a database of 250,000 women living in Sub-Saharan Africa reported to have twin births to investigate the effect of fertility on women's employment. They find that the number of children below age 6 has a significantly negative effect on women's ability to work in the non-farm sector. The effects of the number of children are stronger for older women and those with more years of education.

However, a small but growing literature find *less consistent or no evidence* on the effect of presence of children on women's labour force participation (Guo et al. 2018; Cruces and He and Zhu 2016; Azimi 2015; Cáceres-Delpiano 2012; Agüero and Marks 2011; Aguero and Marks 2008; Orbeta 2005; Benefo and Pillai 2003). Using twin birth as a natural experiment, Cáceres-Delpiano (2012) finds that fertility decreases labour supply for mothers with more schooling years and living in urban areas, but it does not have a significant effect on maternal labour supply for residents from rural areas.The second strand of literature is related to studies on the relationship between fertility and female self-employment. A growing number of empirical studies have found a positive relationship between fertility and female self-employment (MacPherson 1988; Arai 2000; Caputo and Dolinsky 1998; Carr 1996;

Carrasco and Ejrnæs 2003; Cowling and Taylor 2001; Edwards and Field-Hendrey 2002; Kuhn and Schuetze 2001; Wellington 2006). The mechanisms for the above relationship stem from women being responsible for childcare and household labour, hence their need for flexibility offered by self-employment. Other empirical evidence, however, has shown that the relationship between fertility and self-employment could differ across different types of self-employment. The pattern of self-employment can be determined by the nature of the labour market institutions, the nature of self-employment (having children increases women's non-professional self-employment), and the age of the children (Budig 2006; Joona 2017)[4].

This paper differs from previous studies in a number of important ways. First, this paper examines the relationship between the number of children and female self-employment in Nigeria-country with high fertility rate and high female self-employment in which empirical evidence on the causal relationship of the phenomenon under investigation is scarce. Second, until recently, a study of this nature was not feasible due to the lack of survey data and plausible instrumental variables that can correct for the endogeneity of fertility most developing countries. This paper therefore fills the gap in the literature on the relationship between fertility and female labour market outcomes using twin births as positive shocks to the number of children. Third, the paper contributes to the broad literature of family size and labour force participation, which is relevant to issues of gender equality as well as living standard, dependency burden, and money-saving behaviour of households (Anderson and Eswaran 2009; Buvinic et al. 2009; Fallon and Lucas 2002; Kritz and Makinwa-Adebusoye 1999; Yount and Li 2009). Fourth, the focus of the study on Nigeria offers new insights into understanding the relationship between fertility and female self-employment, and this would aid in developing innovative policies for achieving optimal family size, which is essential for women's long-term career outcomes (Albrecht et al. 1999; Herr 2007).

The relevance of this study is underscored by the increasing recognition of gender equality as one of the pillars of sustainable development (UNDP 2013; World Economic Forum). Policy makers have over the years given priority to women's emancipation, which has been a proxy or measure for equal opportunities (UNDP 1995). Evidence shows that women's labour market integration enhances the prospects for economic growth (World Economic Forum 2014), and an increase in female labour incomes through labour market activities help to reduce poverty (Buvinic and Gupta 1997). Thus, women's labour force participation can be a vital force in shaping a country's economic and human development (Besamusca et al. 2015).

The empirical results from the study confirm the hypothesis that the number of children is causally related to women being self-employed. Specifically, using the instrumental variable approach, having children increases women's probability of being self-employed. In addition, there is a heterogeneous impact across the sub-

[4] Other studies show that an increase in the number of children negatively affects the probability that a woman works in the formal sector. This demonstrates that formal sector employment is less suited to childcare than informal employment (Miller and Urdinola 2010; Aguero and Marks 2011; Francavilla and Giannelli 2011).

population through women's age. These results are consistent with evidence from Noseleit (2014)[5] and Joona (2017).

The remainder of this paper is organised as follows. Section 2 discusses the labour market context in Nigeria. Section 3 introduces the data and empirical methodology. Section 4 presents the main results and, Section 5 concludes the paper.

2 Labour market context in Nigeria

Labour markets in Nigeria can be categorised into formal or informal; or between private sector and public sector. There have been various classifications of the structure of the Nigerian labour market. For example, in a study of selected metropolitan areas in Nigeria, the National Manpower Board (1998) had seven classified forms of the Nigeria labour market, namely; employer, self-employed (farmer), self-employed (trader), self-employed (others), employed wage and salary earners (private), employed wages and salary earners (public) and paid apprentice.

Nigeria is endowed with diverse human and material resources. However, unemployment is rife, due to the under-utilisation of resources that results from years of negligence and adverse policies (National Bureau of Statistics 2010). The household and informal sector survey conducted by the National Bureau of Statistics (NBS) in 2010 showed that the unemployment rate in 2010 was 21.1%, which was 1.2% increase over the 2009 rate. See Table 1 below for the trends of the national unemployment rates from 2000 to 2010. The unemployment rate disaggregated by gender, in 2014, male unemployment rate was 5.4%, while female's rate was 7.5% (Kale and Doguwa 2015).

3 Data sources and empirical methodology

To investigate whether the number of children have causal impact on women's self-employment, this paper uses two waves from the cross-sectional data of the Nigerian Demographic and Health Surveys (NDHS) conducted in 2008 and 2013. The NDHS are nationally representative household surveys that, in addition to providing information on children and men in the household, women also answered questions on their employment status, birth history, contraceptive use, number of children born, age at first marriage, age at first child birth, marital status, geographic location, occupation, and other socioeconomic characteristics.

The NDHS samples were selected using a stratified two-stage cluster design. While 2008 NDHS consists of 34,070 households and 33,385 women interviewed, the 2013 NDHS, on the other hand, had a much larger sample of 38,522 households and 38,522 were successfully interviewed. For the purpose of this study, the sample

[5] Noseleit (2014) investigates the relationship between fertility and self-employment for the European Union and the non-EU countries, using parents' preference for a mixed sibling-sex composition as an instrument for the presence of children. The results show that women have a likelihood of becoming self-employed when additional children are present in the household.

Table 1 National unemployment rates (2000–2010)

Year	Unemployment rates
2000	13.1
2001	13.6
2002	12.6
2003	14.8
2004	13.4
2005	11.9
2006	12.3
2007	12.7
2008	14.9
2009	19.7
2010	21.1

National Bureau of Statistics (2010)

is restricted to women aged 18 to 45, who are in childbearing and active labour market participation age[6].

The dependent is a dichotomous variable, which is women's self-employment. That is, it is a dummy variable that is equal to one if a woman reported being self-employed during the interview and zero otherwise. To capture self-employment, the following questions were asked during the interview: "Respondent works for (i) family (ii) someone else (iii) self-employed." A respondent is identified as self-employed if option (iii) was selected conditioning on the respondent currently working, which is the definition of self-employment used in the analysis. The comparison group to the self-employed comprises women working for family businesses and those employed by someone other than the family. The independent variables used in the regression include the number/presence of children living at home, woman's age, age squared, marital status, having above primary education, urban residence, religious dummies (Christian, Islam, and Traditionalist), and spouse having above primary education.

Table 2 shows that about 80% of the respondents currently working reported being self-employed, the average number of births per woman is 3.8, and about 7% of the sampled women reported twin births, which corresponds to 2612. The average women's age is 32 years, and for the husband/partner, the average age was 44 years. The average women's age at first birth reported was 19 years.

Table 3 presents the test for equality of means of women's characteristics by twin birth status. Specifically, the descriptive statistics shows an investigation of the difference between women that reported twin births (b_1) and women without twin birth (b_0). The average number of children for women without twin births is 4, while women with twin births have an average of 5 children. Ninety-eight percentage of women without twin births reported having at least a child, while 99% of women with twin births had at least a child. Moreover, 80% of the women without twin

[6] This study restricts the sample to women of this group because they are in the age category most likely to have young children and prone to making labour market decisions. Also, women with missing twin births information were excluded from the sample.

Table 2 Summary statistics

Variable	Mean	Standard deviation
Twin births	0.07	0.26
Number of children	3.77	2.16
Number of children under 5 years	1.56	1.32
Has at least a child	0.98	0.12
Self-employed	0.80	0.40
Wage employed	0.08	0.28
Work at family business	0.11	0.31
Age of woman	32.45	8.44
Woman's age at first birth	19.49	4.43
Above primary education	0.34	0.47
Currently married	0.91	0.28
Urban residence	0.34	0.50
Religion-Christian	0.46	0.50
Religion-Islam	0.42	0.30
Religion-Traditionalist	0.01	0.12
Religion-other	0.02	0.13
Age of partner/husband	43.79	11.76
Partner education above primary	0.44	0.49
Observations	37,314	

Source: Author's computation using the Nigerian 2008 and 2013 DHS data

births reported being self-employed, and on the other hand, 81% with twin births were self-employed.

For the age at first birth, women with twin births reported have a slightly lower age at first birth of 19.51 years compared to women without twin births that reported an average of 19.24 years. Whilst women without twin births reported an average current age as 33.12 years, those with twin births reported an average of 37.56 years.

Table 4 presents descriptive statistics of women's labour market characteristics by number of children status (married women with no children vs married women with children). In line with the theoretical postulation, women with children are more likely to be self-employed compared to women without children; with 79% of women without children reported being self-employed, while 80% of women with children were self-employed. For wage-employment (paid-employment), and ~8% of the women with and without children were engaged in wage-employment. Also, 11% of the women were engaged in family business. Another indicator of labour market participation, which is working full-year shown in Table 4 supports the hypothesis that women with children are less likely to work full-year (work intensity).

3.1 Empirical methodology

The objective of this study is to investigate the causal effect of the number of children on women's self-employment. To estimate the effect of the number of

Table 3 Women's characteristics by twin birth status

Women's characteristics	Twin birth (b_0)	Twin birth (b_1)	Test $b_0-b_1=0$
Number of children	3.65 (0.01)	5.25 (0.04)	−1.59*** (0.04)
Has at least a child	0.98 (0.00)	0.99 (0.00)	−0.11*** (0.00)
Self-employed	0.80 (0.00)	0.81 (0.01)	−0.00 (0.01)
Wage employment	0.09 (0.00)	0.08 (0.01)	0.01 (0.01)
Age of woman	33.12 (0.04)	37.56 (0.13)	−4.43*** (0.16)
Woman's age at first birth	19.51 (0.02)	19.24 (0.08)	0.26*** (0.08)
Above primary education	0.34 (0.00)	0.31 (0.01)	0.03*** (0.01)
Currently married	0.91 (0.00)	0.91 (0.01)	−0.00 (0.01)
Urban residence	0.34 (0.00)	0.33 (0.01)	0.01 (0.01)
Religion-Christian	0.47 (0.00)	0.44 (0.01)	0.03*** (0.01)
Religion-Islam	0.41 (0.00)	0.44 (0.01)	−0.03*** (0.01)
Religion-Traditionalist	0.10 (0.00)	0.1 (0.01)	0.00 (0.01)
Religion-other	0.02 (0.00)	0.02 (0.00)	−0.00* (0.00)
Age of partner/husband	43.45 (0.06)	48.03 (0.22)	−4.58*** (0.24)
Husband above primary education	0.44 (0.00)	0.39 (0.01)	0.04*** (0.01)
Woman on wage-employment	0.09 (0.00)	0.08 (0.01)	0.01 (0.01)
Observations	34,546	2768	

Standard errors are in parentheses

***$p<0.01$, **$p<0.05$, *$p<0.1$

children on women's self-employment decision, we estimate the following equation:

$$y_{it} = \beta_0 + \beta_1 n_{it} + X_{it}^{'}\delta_1 + Z_{it}^{'}\delta_2 + \varepsilon_{it} \quad (1)$$

where y_{it} is a binary outcome indicating woman i in time t being self-employed, which takes a value of one if self-employed and 0 otherwise[7]. β_1 is the coefficient of interest, which captures the effect of fertility or number of children. X is a vector of maternal characteristics such as age, age-squared, education above primary education, and marital status; while Z is a vector of husband's and other household's characteristics such as age of husband, husband's education above primary education, and religion. ε_{it} is an error term.

Table 5 presents the OLS results using dummy variables to denote the number of children. With 0 used as the reference point, number of children was in the categorical variables 1, 2, 3, 4 and 5. The results suggest positive association between number of children and the likelihood of self-employment. Specifically, having two children is associated with the likelihood of self-employment by 3.8 percentage points. Also, having five children and above is associated with the likelihood of self-employment by 6.8 percentage points. These results lend credence to the hypothesis that number of children is often correlated with the desire for women to seek self-employment.

[7] The comparison group is women employed (working) either in family businesses or employed by someone else.

Table 4 Women's labour market characteristics by number of children

Women's characteristics	With no children (b_0)	With children (b_1)	Test $b_0-b_1=0$
Self-employed	0.79 (0.02)	0.80 (0.00)	−0.00 (0.02)
Wage-employment	0.08 (0.01)	0.08 (0.00)	−0.00 (0.01)
Worked for family	0.11 (0.01)	0.11 (0.00)	0.01 (0.01)
Work full-year	0.76 (0.00)	0.71 (0.01)	0.05*** (0.02)
Observations	529	36,785	

Standard errors are in parentheses. Work full-year refers to work intensity

***$p<0.01$, **$p<0.05$, *$p<0.1$

Table 5 OLS results of the effect of fertility on self-employment

Dependent variable	Self-employment (=1)
Number of children	
0	Reference
1	0.0171 (0.0180)
2	0.0379** (0.0176)
3	0.0611*** (0.0169)
4	0.0567*** (0.0181)
5 and above	0.0676*** (0.0160)
Control variables	Yes
State fixed effect	Yes
Year fixed effect	Yes

The number of observations used in the regression is 37,314. Robust standard errors are in parentheses and are clustered at the regional level. Survey weights are used in all the regressions. Control variables used in the regression include woman's age, age squared, marital status, above primary education, urban resident, religious dummies (Christian, Islam, and Traditionalist; other religion is the omitted category), and spouse's education above primary education

***$p<0.01$, **$p<0.05$, *$p<0.1$

Based on Eq. (1), the OLS estimates are consistent only if the number of children (fertility) is not correlated with the error term, which is likely not the case in this framework from Eq. (1). To address the possible endogeneity of the number of children, we use twin births as an instrument for the number of children. The choice of twin births as an instrument is consistent with studies on fertility and household outcomes (for example, Rosenzweig and Wolpin 1980a; Bronars and Grogger 1994; De Jong et al. 2017; Jacobsen et al. 1999; Zhang 2017).

The first stage of the IV estimation is as follows:

$$children_{it} = \alpha_0 + \alpha_1 Twins_{it} + X_{it}^{'}\rho_1 + Z_{it}^{'}\rho_2 + \varepsilon_{it} \quad (2)$$

where $children_{it}$ [8]is the number of children for woman i in time t. $Twins_{it}$ is a binary variable that equals to one if a woman reported having ever given birth to twins and 0 otherwise. X_{it} and Z_{it} are vectors of control variables same as Eq. (1).

3.2 IV estimate: twin births as an instrument

The OLS estimate from the non-twins sample is likely not to have a causal interpretation due to the endogeneity of fertility decision. Fertility is endogenous because the decision to be self-employed could be influenced by unobserved factors such as women's autonomy, which can also affect women's desire to have more children.

Following the study by Rosenzweig and Wolpin 1980a; Jacobsen et al. 1999; Black et al. 2005; Rosenzweig and Zhang 2009; Zhang 2017, this study uses twin births as an instrument for women's fertility through an instrumental variable (IV) estimation approach. The identification strategy used in this study relies on the following assumptions: First, the exogenous variation in family size generated by a positive external shock, in this case, twin births. Second, the exclusion restriction that twin births is highly unlikely to be correlated with self-employment directly, except through an increase in family size. According to Imbens and Angrist (1994), the IV estimate can be interpreted as a Local Average Treatment Effect (LATE). This identifies the treatment effect of an increase in fertility induced by twin births on female self-employment.

However, it is important to note that recent studies have questioned the extent to which twin births, particularly dizygotic twins, is a random event[9] (Farbmacher et al. 2018). More specifically, it has been established that dizygotic twining depends on factors such as maternal age, height, weight, race, and the use of fertility treatments (Fauser et al. 2005).

Though it is not possible to determine from the DHS data whether the twin births sample used in this analysis are predominantly either monozygotic or dizygotic twins, this concern can be mitigated based on the following: First, dizygotic twins are often associated with fertility treatments. The costs of fertility treatments are expensive for an average Nigerian population and were introduced recently. Therefore, only an insignificant part of the population of the high-income brackets are likely able to afford fertility treatments in Nigeria. Based on this, fertility treatments may not have significant impact on the number of twin births in Nigeria.

Moreover, according to Professor Osato Giwa-Osagie, who is the Coordinator of The Assisted Fertility Centre at the Lagos State University Teaching Hospital, Nigeria, there are 45 in vitro fertilisation (IVF) clinics in Nigeria, of which only five are publicly owned, while private individuals or businesses own the rest. The average cost of an IVF procedure is about 1.1 million naira (approximately US$3000). However, US$3000 may be hard to come by in a country where two-thirds of the population live on less than US$2 a day (Vanguard 2016). The high cost of IVF

[8] The use of number of children as proxy for fertility is consistent. However, further estimations using a dummy variable to denote presence of children, which is equal to one if a woman has at least a child and zero otherwise, and the number of children younger than age five were carried out as robustness checks.

[9] Existing evidence shows that, monozygotic (identical) twin births, on the other hand are often a random event (MacGillvray et al. 1988; Tong and Short 1998).

treatment and widespread poverty among Nigerians could lead to significant proportion of the population not being able to have access to fertility clinics in Nigeria. Considering this, we could argue for randomness or exogeneity of twin births in Nigeria, which is being used as an instrument in this paper.

Second, from the descriptive statistics presented in Table 2, the average age at first birth for women with twin births is 19.19 years. Women in this age category are less likely to opt for fertility treatment because such procedures are common with women that are not able to conceive naturally after some years of being married.

4 Results and discussions

Table 6 presents the first-stage regression results of the instrumental variable estimation using twin births as an instrument for fertility. From Column 1, the coefficient of the 'twin births' is positive and statistically significant at 1%. Specifically, twin births significantly increase the number of children by 0.8955.

There is no evidence of weak instrument from the regression. The F-statistic is above the Staiger and Stock (1997) rule-of-thumb conventional threshold of 10; meaning that 'twin birth' is a strong determinant of the number of children. The Kleibergen–Paap Wald rk F-statistic equals 84.03 and 14.06 for regressions involving Column 1 and Column 2, respectively.

Table 7 shows the results for the Reduced Form, OLS and 2SLS regressions. Column 2 in Table 6 presents the OLS estimate, which suggests that each additional child increases the decision to be self-employed by 0.73 percentage points. Column 3 shows results of the 2SLS estimate. It suggests that each additional child increases the likelihood of a woman being self-employed by 3.4 percentage points. Exploiting variation in the number of children that comes through the twin births, the 2SLS is smaller than the OLS estimates. This finding is similar to evidence from Noseleit (2014), who instruments fertility by parents' preference for a mixed sibling sex-composition for a sample of European Union and the non-EU countries respectively.

Table 6 First-stage OLS regression results of the impact of fertility on self-employment

Variable	Number of children
Twin birth	0.8955*** (0.0376)
Control variables	Yes
Kleibergen-Paap F statistic	84.03
Year fixed effect	Yes
State fixed effect	Yes
Observations	37,314

Robust standard errors are in parentheses and are clustered at the primary sampling unit. Survey weights are used in all the regressions. Control variables used in the regression include woman's age, age squared, marital status, above primary education, urban resident, religious dummies (Christian, Islam, and Traditionalist; other religion is the omitted category), and spouse's education above primary education

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 7 Results of the effect of fertility on self-employment

Variable	Reduced form (1)	OLS (2)	2SLS (3)
Twin birth	0.0682*** (0.0160)		
Number of children		0.0073*** (0.0012)	0.0343** (0.0176)
Control variables	✓	✓	✓
Year fixed effect	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Observations	37,314	37,314	37,314

Robust standard errors are in parentheses and are clustered at the primary sampling units. Survey weights are used in all the regressions. Control variables used in the regression include woman's age, age squared, marital status, above primary education, urban resident, religious dummies (Christian, Islam, and Traditionalist; other religion is the omitted category), and spouse's education above primary education

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 8 Results of the effect of fertility on wage-employment −.0113635 .0008

Variable	Reduced form (1)	OLS (2)	2SLS (3)
Twin birth	−0.0059 (0.0052)		
Number of children		−0.0114*** (0.0008)	−0.0066 (0.0057)
Control variables	✓	✓	✓
Year fixed effect	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Observations	37,314	37,314	37,314

Standard errors are in parentheses. Survey weights are used in all the regressions. Control variables include woman's age, age squared, marital status, above primary education, urban resident, religious dummies (Christian, Islam, and Traditionalist), and spouse's education above primary education

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

4.1 Exploring mechanisms, channels and heterogeneities

Table 8 presents the results of the relationship between fertility and wage-employment, which has been identified in the literature as one of the potential mechanisms through which fertility affect self-employment. Nigeria presents an interesting scenario because a vast majority of employed women are self-employed and have many children.

Column 3 in Table 8 presents the 2SLS estimates, which suggests that each additional child decreases wage-employment by 0.66 percentage points. The estimate

Table 9 Heterogeneity by woman's age

Variable	18–30 years		31–45 years	
	OLS	2SLS	OLS	2SLS
Number of children	0.0209 (0.0147)	0.0036 (0.0046)	0.0298* (0.0033)	0.0123** (0.0050)
Control variables	✓	✓	✓	✓
Year fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Observations	17,764	17,764	19,550	19,550

Standard errors are in parentheses. Survey weights are used in all the regressions. Control variables include marital status, above primary education, urban resident, religious dummies (Christian, Islam, and Traditionalist), and spouse's education above primary education

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 10 Heterogeneity by woman's education

Variable	No education or primary education		Secondary education and above	
	OLS	2SLS	OLS	2SLS
Number of children	0.0149 (0.0123)	0.0209 (0.0147)	0.0127* (0.0071)	0.0111** (0.0048)
Control variables	✓	✓	✓	✓
Year fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Observations	23,508	23,508	13,806	13,806

Standard errors are in parentheses. Survey weights are used in all the regressions. Control variables include woman's age, age squared, marital status, urban resident, religious dummies (Christian, Islam, and Traditionalist), and spouse's education above primary education

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

is statistically insignificant and there is no evidence for the causal impact of children on wage employment. This result is similar to evidence from Aguero and Marks (2008).

Tables 9 and 10 explore heterogeneities in subsample by women's age and education. It has been argued in previous studies (see for instance, Carr 1996) that women's age and education are important predicators of women's self-employment status.

Table 9 investigates whether the effect of the number of children on self-employment could be observed for women of different age categories. The sample was restricted to women aged 18–30 years and 31–45 years, respectively. For women aged 31–45 years, the 2SLS result suggests that additional children increase self-employment by 1.23 percentage points.

One plausible explanation for women in age category 31–45 years sensitive to self-employment is the likelihood of the number of children in the family to increase with women's age. The increase in the number will trigger the desire for self-employment in order to balance work and family commitments.

Table 10 presents the results of the effects of fertility on self-employment for women with different categories of education (no education or primary education

Table 11 Effect of fertility on self-employment using an alternative definition of fertility

Variable	OLS	2SLS
Number of children under 5 years	0.0051*** (0.0016)	0.0374** (0.0181)
Control variables	✓	✓
Year fixed effect	Yes	Yes
State fixed effect	Yes	Yes
Observations	37,314	37,314

Standard errors are in parentheses. Survey weights are used in all the regressions. Control variables include woman's age, age squared, marital status, above primary education, urban resident, religious dummies (Christian, Islam, and Traditionalist), and spouse's education above primary education

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

and, secondary education and above). The results find no evidence for women in the no education level category and the relationship between number of children and self-employment. The results of the relationship between number of children and self-employment are significant for women in the secondary education and above category.

4.2 Robustness checks

Table 11 investigate the robustness check of the previous findings of this study using alternative definitions of fertility.

In Table 11, the study uses total number of children younger than the age of five as the measure of fertility. At this age, the care of young children is more rigorous, therefore having younger children is likely to influence the decision of the mothers to be self-employed. The 2SLS result shows that each additional child younger than five years increases the probability of self-employment by 3.7 percentage points.

5 Summary and conclusion

Existing evidence shows that women having children are likely to be self-employed. Being self-employed will enable women to achieve a balance between work and family commitments. This paper used a pooled cross-sectional data from the 2008 and 2013 Nigerian Demographic Health Survey to investigate the causal effect of fertility on women's self-employment. The study used twin births as an exogenous source of variation for the number of children in an instrument variables (IV) approach to correct for potential endogeneity associated with fertility decision.

Consistent with evidence from Joona (2017), Noseleit (2014), Caceres-Delpiano (2012), and Wellington (2006), the findings of the study reveal a positive relationship between fertility and the probability of self-employment. The results of this study are robust to the use of number of children younger than age five as an alternative definition of fertility in the analysis.

The findings of this paper have important policy implications for Nigeria. There is a need for the Nigerian government to identify constraints to self-employment and design the necessary policies to promote its growth. Conducive environment for self-employment to thrive could help women to balance family duties and participate in the labour market through self-employment.

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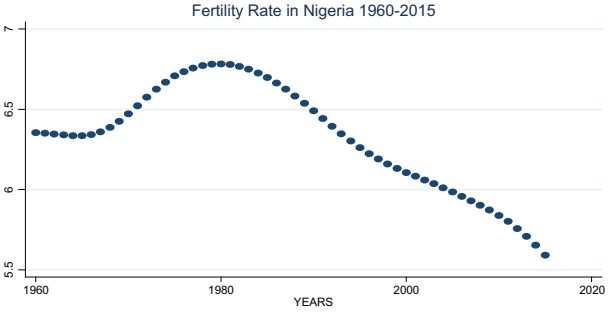
Compliance with ethical standards

Conflict of interest The author declares that he has no conflict of interest.

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6 Appendix

Source: World Development Indicators, data for Nigeria



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