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Article

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Academic journal of economic studies

Provided in Cooperation with:
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Reference: Aigheyisi, Oziengbe Scott/Oligbi, Blessing O. (2019). Adolescent fertility in Nigeria : implications for economic growth. In: Academic journal of economic studies 5 (3), S. 51 - 57.

This Version is available at:
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Academic Journal of Economic Studies
Vol. 5, No. 3, September 2019, pp. 51–57
ISSN 2393-4913, ISSN On-line 2457-5836

Adolescent Fertility in Nigeria: Implications for Economic Growth

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Abstract

In consideration of the high adolescent fertility rate in Nigeria, the growth effect of this phenomenon is investigated using annual time series data that span the period from 1981 to 2016. Alternative estimation techniques including the ARDL bounds test approach to co-integration and error correction, FMOLS and CCR are employed for the analysis. Results from the analysis indicate that adolescent fertility negatively affects economic growth in Nigeria in the short- and long-run. This suggests that adolescent fertility in Nigeria has serious implications for economic growth as it adversely affects it. The study therefore recommends efforts by the government to address the high adolescent fertility rate in the country. Specific actions steps include prioritizing girl-child education, incorporating sex education in high (or secondary) school curriculum, formulating laws to stop early marriages, and job creation to engage and economically empower parents or guardians of the adolescents to be able to provide adequate care for their adolescent children.

Key words

Adolescent fertility, economic growth, girl-child marriage, ARDL Modelling, developing countries, Nigeria

JEL Codes: I15, I31, J13, O47

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Received: 30 June 2019 **Revised: 10 July 2019** **Accepted: 28 July 2019**

1. Introduction

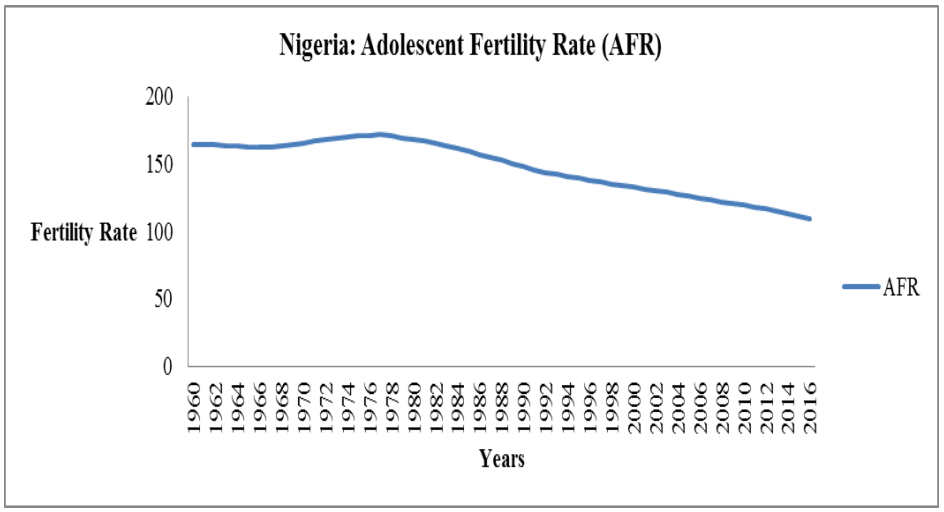
Children at the adolescent stage of existence (particularly those in age range of 15 to 19 years) constitute significant part of a nation's potential work force and human capital. Majority of children in this age group are expected to be in secondary or high schools where they are being trained, educated and nurtured to contribute to economic development of their countries in the future. Though the probability of actualizing this potential is high for highly developed and industrialised countries, yet this cannot be said of less developed countries where poverty and adolescent fertility rates are quite high.

Adolescent fertility refers to the number of birth per 1000 women within the age range of 15 to 19 years (Population Reference Bureau (PRB), 2013). Child bearing at adolescent stage of life exposes young women to numerous risk, chief of which is death, as the chance of dying during child birth is twice as high for adolescent women than women who wait till they are in their twenties to begin childbearing (PRB, 2013). The implication of this is that adolescent fertility has the potential to reduce an economy's potential human capital, which is key requirement for growth as postulated by the endogenous growth models, particularly the human capital augmented Solow growth model in an economy. McQuestion, Silverman and Glassman (2012, abstract) argued that "adolescent fertility in low- and middle- income countries presents a severe impediment and can lead to school dropout, lost productivity and intergenerational transmission of poverty"

Adolescent fertility could be attributed to several factors ranging from social/cultural to economic factors. Rising access to, and abuse of social media and other communication platforms may have also contributed to expose children in adolescent ages to factors that increase their sexual awareness and boost their desires to indulge in sexual activities (most times, unprotected) resulting in unwanted pregnancies and sometimes automatic termination of educational pursuit for those from poor homes whose parents are also uneducated and unenlightened. Research has shown a positive relationship in general, between educational status and age of marriage and age of first pregnancy (Parasuramanu *et al.*, 2010). A poorly educated adolescent mother may not be able to properly raise up her child children to contribute meaningfully to the development of the economy, especially in less developed economies where social security insurance and unemployment benefits are nonexistent. Regrettably, Palanca-Tan *et al.* (2017) noted that "teenage pregnancies constitute 11% of pregnancies worldwide and 95% of teenage pregnancies happen in low- and middle-income countries". It has been argued that education and economic participation of young women in late adolescence has the potential to mitigate material, social and cultural barriers to economic gains in adulthood, and these gains do not only accrue to them, but also to their children and families (Morrison and Sabarwal, n.d). However, the educational advancement and economic participation of young women may be thwarted by adolescent fertility.

As recently observed by some researchers (Deshpande, 2005; Urdinola and Ospino, 2015), younger mothers hold lower class jobs as early child bearing among adolescent women adversely affect their employability, engendering lifelong economic dependency. Many also suffer domestic violence and have a higher share of deceased children as studies have shown that children born to adolescent mothers are at higher risk of infant mortality due amongst others to high probability of having low birth weight babies with serious illness and mental and physical disabilities to inadequate education on the part of the young mothers to give the best child care. A combination of all these could tend to adversely affect economic growth in the long run.

Economic factors such as poverty, unemployment, low wages, high cost of living, etc. could also be fingered for rising adolescent fertility in developing countries including Nigeria. These factors propel some parents to give out their female children in marriage at very early ages. Tradition and family pressure have also been identified as main causes of early girl child marriage and teenage pregnancy (Parasuramanu *et al.*, 2010). Also contributing to the escalation of adolescent fertility in poor countries is inadequate sex education in secondary schools. Though adolescent fertility rate in Nigeria has been declining at marginal rates since 1981, as a result of increased awareness of the dangers of unprotected sex, as reported by the World Bank in its World Development Indicators (2017), yet it remains quite high. The trend in Nigeria's adolescent fertility rate is shown in Figure 1.



Source: Data from the World Bank's WDI (2018)

Figure 1. Adolescent Fertility Rate in Nigeria

Figure 1 shows that adolescent fertility rate in Nigeria between 1960 and 2016 had been quite high at over 100 births per 1000 women ages 15 to 19 per annum. In fact, the PRB (2003) reports that sub-Sahara Africa region has the highest adolescent fertility rate in the world. In spite of the high adolescent fertility rate and its potential implications for economic growth, to the best of our knowledge, no study has yet empirically investigated the effect of the phenomenon on economic growth in Nigeria. Admittedly, there exist ample studies on the effect of fertility on economic growth. However, studies on the effect of adolescent fertility on economic growth are scarce. The objective of this study is to empirically investigate the effects (long run and short run effects) of adolescent fertility on economic growth in Nigeria. This study is relevant as the outcome will guide policy directions as regards adolescent fertility in the country.

2. Literature review

2.1. Determinants of adolescent fertility

Palanca-Tan, *et al.* (2017) utilized Becker's framework to identify factors that contribute to adolescent fertility in a sample of 34 Asian countries. The study found that lower incidence of adolescent fertility was associated with higher labor productivity, lower inflation (stable prices) and educational opportunities targeted at young female segment of the society. It further found that subsidies for child rearing had no significant impact on adolescent fertility in the continent. Alamayehu *et al.* (2010) examined the socio-demographic and economic determinants of adolescent fertility in Ethiopia using primary data from the Ethiopia Demographic Health Survey analysed with a multivariate logistic regression model and the Bongaarts' model of fertility. The study identified age, marriage, educational status, place of residence, employment, contraceptive use and postpartum infecundity as major causative factors of adolescent fertility in the country. Specifically, it was found that the chances of higher adolescent fertility was higher among females in early adolescent, females with lower education,

teenagers living in rural areas and unemployed adolescents. Lower fertility rate was found to be associated with non-marriage, delayed marriage, contraceptive use and postpartum infecundity.The trends and determinants of adolescent fertility in Nigeria across the six geopolitical zones of Nigeria were examined in the study by Olurinola (2016). Nigeria Demographic and Health Survey (NDHS) data for 2003, 2008 and 2013 were employed for the analysis which involved descriptive statistics and binary logistic regression. The study revealed that adolescent fertility in Nigeria was determined by region of residence, income of parents, age, religion, etc.

Nyarko (2012) examined the determinants of adolescent fertility in Ghana using data from the 2008 Ghana Demographic and Health Survey. The methods of analysis employed were bivariate and binary logistic regression model analyses. The study found that adolescent fertility in Ghana was determined by the level of education of the female adolescent and her partner, exposure to media, work status of the female adolescent and the wealth status of the female adolescent. The trends and determinants of adolescent fertility in Northeastern Brazil were examined in the study by Gupta and Leite (1999). Data from the Demographic and Health Surveys for 1986, 1991 and 1996 were analysed with the Discrete-time hazard model. The study found that the level of education of the female adolescent was the major determinant of adolescent fertility in the region. Specifically, it was found that female adolescents with no more than primary education were twice as likely to have their first child as those with no less than secondary education.

2.2. Fertility and economic growth

Our search of the literature reveals that most of the previous related studies focused on the relationship between fertility and economic growth. Several studies found negative relationship between fertility and economic growth, while others revealed that at high levels of development, the negative relationship between fertility and growth turns positive (Fox, 2015). Schultz (2005) argued that within societies, fertility is higher in poorer families, and across countries, average fertility rate tends to be higher in low income countries. This suggests that the effect of fertility on economic growth depends on the level of economic development. High fertility rate in highly developed countries could imply increase in potential human capital required for long run growth. In less developed countries, it could imply potential decrease in the level of per capita income, higher poverty rates or decrease in consumption per capita. It has also been argued that decreasing fertility could adversely affect economic growth as a result of its effect on labour supply (Prettner *et al*., 2012). This argument may hold for highly developed countries with capacity to *turn population* into *human capital*, or for countries with "closed" economies, where there are restrictions to labour inflows or immigration. To the best of our knowledge, studies which specifically investigate the effect of adolescent fertility on economic growth are scarce. In this section we review the literature on fertility-economic growth relationship.

The effect of exogenous reduction in fertility on per capita income in Nigeria was investigated in the study by Ashraf, Weil and Wilde (2013). The study found that reduction in fertility rate was associated with increase in per capita income. The researchers however gave a caveat that GDP per capita is not an accurate welfare criterion. The implication is that reduction in fertility rate may not necessarily engender improvement in welfare. Similar study on the effect of decline in fertility on economic growth in Nigeria was conducted by Kara, Canning and Wilde (2017). The study which employed a demographic-economic macro-simulation model revealed that reduction in total fertility would engender multiple increases in per capita income. This implies that decline in fertility may be associated with economic growth. Hafner and Mayer-Foulkes (2013) examined the causal relationship between fertility, economic growth and human development using a balanced panel data covering the period from 100 to 2007 on 72 countries. The study found a causal relationship between low fertility, high income and high human development.

3. Methodology of research

3.1. Model and estimation techniques

To achieve the objective of this study, we augment the basic Solow growth model and specify a growth model by regressing growth rate of per capita income on gross capital formation annual growth rate and adolescent fertility rate, while controlling for the effect of government final consumption expenditure annual growth and lending interest rate. The model is specified functionally as:

$$pcyg = f(gcfgr, afr, gfcegr, intr) \quad (1)$$

Where: pcyg = real GDP per capita annual growth (proxy for economic growth); gcfgr = gross capital formation annual growth; afr = adolescent fertility rate; gfcegr = government final consumption expenditure; and intr = lending interest rate.

The model is specified in static (long run) form as:

$$pcyg_t = \beta_0 + \beta_1 gcfgr_t + \beta_2 afr_t + \beta_3 gfcegr_t + \beta_4 intr_t + \varepsilon_t \quad (2)$$

The *a priori* expectations are $\beta_1 > 0$; $\beta_2 < 0$; $\beta_3 > 0$; $\beta_4 < 0$.

Based on theoretic predictions (the neoclassical theory and the Keynesian economic theory and Ram's (1986) growth accounting model, respectively), we expect increase in capital formation (investment) and government final consumption expenditure to positively affect economic growth. Increase in lending interest rate is expected to adversely affect economic growth as it implies increase in cost of funds needed for investment which is a key requirement for economic growth. Though there is yet no theoretic or empirical consensus on the effect of adolescent fertility on economic growth(except that it affects growth partly through its effect on population which could be considered a potential source of labour), considering its adverse effect on the health of the newborn and their adolescent mothers, and its effect on education and socio-economic participation of adolescent mothers, and their participation in productive and social activities in the economies of LDCs, the effect could be adverse.

The error correction model is specified as:

$$\Delta pcyg_t = \pi_0 + \pi_1 \Delta pcyg_{t-1} + \pi_2 \Delta gcfgr_t + \pi_3 \Delta afr_t + \pi_4 \Delta gfcegr_t + \pi_5 \Delta intr_t + \alpha\varepsilon_{t-1} + \mu_t \quad (3)$$

The variables are as previously defined. The βs are long run coefficients indicating the long run effects of the explanatory variables on the dependent variable. The πs are the short run parameters indicating the short run effects. Δ represents first difference operator. ε is the error (residual) term of the long run model, ε_{t-1} and μ_t are the error correction term and the residuals of the cointegrating (error correction) equation respectively. The coefficient of the error correction term α is expected to be negatively signed and statistically significant to play the role of error correction in the model.

The stationarity properties of the variables were tested using the augmented Dickey Fuller (ADF) unit root test, while co-integration or long run relationships among the variables were tested using F-test within the framework of an autoregressive distributed lag (ARDL) model. The ARDL (Bounds) test approach to co-integration and error correction modeling developed by Pesaran and Shin (1999) and further developed by Pesaran, Shin and Smith (2001), was employed for the analysis. The choice of this methodology was informed by the facts that it corrects for regressor endogeneity, it is applicable in cases of variables with mixed order of integration and it is applicable in cases of small finite data sizes (Nkoro and Uko, 2016).

3.2. Data

Data used for the study are annual time series data spanning the period from 1981 to 2016. The data were obtained from the World Bank's World Development Indicators (2016).

4. Results and discussions

4.1. Unit Root and Cointegration Tests

The results of unit root test for the variables are presented in Table 1.

Table 1. Unit Root Test Results

Augmented Dickey Fuller Unit Root Test							
Level				First Difference			d*
Variables	ADF test stat.	Critical Value (5%)	Inference	ADF test stat	Critical Value (5%)	Inference	
pcyg	-5.24	-3.29	S	-	-	-	0
gcfgr	-2.87	-3.56	NS	-11.86	-3.56	S	1
afr	-0.02	-2.92	NS	-3.14	-2.92	S	1
gfcegr	-5.91	-3.55	S	-	-	-	0
intr	-2.25	-3.54	NS	-5.42	-3.55	S	1

NS = Non-stationary; S = Stationary; d* = Order of integration

Source: Author's estimation using EVIEWS 9.

The unit root test results indicate that the variables are of mixed order of integration. Some are integrated of order 1; that is they are stationary at first difference, while others are integrated of order 0, that is, they are stationary at level. These differences notwithstanding, we tested the possibility for a linear combination of the variables to be stationary; that is the possibility of existence of long run relationship between them. Since the variables are of mixed order of integration, we employed the Bounds testing approach to cointegration test which is an appropriate method of testing long run relationships where variables are of mixed order of integration. The result of the test is presented in Table 2.

Table 2. Cointegration Test: Bounds Test

ARDL Bounds Test		
Included observations: 34		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	3.84	4
Critical Value Bounds		
Significance	I0	I1
10%	2.45	3.52

K = Number of explanatory value, I0 = upper bound, I1 = lower bound

Source: Authors' Estimation using Eviews 9

The co-integration test result indicates that the null hypothesis that "no long-run relationships exist" among the variables is rejected at the 10% level. This is because the F-statistic is greater than the lower and upper bounds' critical values at the 10% significance level.

4.2. Model Estimation Results

The results of estimation of the short run and long run models are presented in Table 3.

Table 3. ARDL Cointegrating and Long Run Form

Dependent Variable: pcyg			
Selected Model: ARDL(2, 0, 0, 1, 0)			
Included observations: 34			
Cointegrating Form			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
Δ(pcyg(-1))	0.19	1.90	0.07
Δ(gcfgr)	0.14	4.28	0.00
Δ(afr)	-0.12	-2.20	0.04
Δ(gfcegr)	0.06	8.45	0.00
Δ(intr)	0.15	1.01	0.32
CointEq(-1)	-1.41	-6.78	0.00
Long Run Coefficients			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
gcfgr	0.10	4.51	0.00
afr	-0.08	-2.53	0.02
gfcegr	0.05	7.22	0.00
intr	0.10	1.01	0.32
C	9.19	1.83	0.08

Cointeq = pcyg - (0.10*gcfgr + 0.08*afr + 0.05*gfcegr + 0.10*intr + 9.19)

Source: Authors' Estimation using EVIEWS 9

The results of estimation of the short run and long run models indicate that adolescent fertility adversely affects economic growth in Nigeria in both the short run and the long run. The short run and the long run effects are significant at the 5% and the 2% levels respectively. The results also show that annual growth of investment and government final consumption expenditure are positively and significantly related to economic growth in the short and in the long run. This suggests that investment and government expenditure are significant growth drivers in Nigeria. The short- and long-run effects of each of these variables on economic growth in Nigeria are both significant at the 1% level as indicated by the p-values of the coefficient which are approximately zero. The short run and the long run effects of interest rate on economic growth are not statistically significant.

The coefficient of the error correction term (Cointeq or α) is negatively signed (as expected), and highly significant even at the 1% level. This further indicates that the variables are co-integrated, and that equilibrium is restored in the relationship in the event of short run deviation from the long run relationship. However, the absolute value of the coefficient of the error correction term which lies does not lie between 0 and 1 suggests that the adjusted to equilibrium is oscillatory, not asymptotic (Narayan and Smith, 2005).

4.3. Robustness checks

To check the robustness of the long run coefficient estimates, we performed alternative estimations of the long run model using the fully modified ordinary least squares (FMOLS) estimator developed by Phillips and Hansen (1990), and the canonical cointegrating regression (CCR) procedure introduced by Park (1992). These estimators are asymptotically efficient. The results of the estimations are presented in Table 4.

Table 4. Alternative Estimations (Robustness Checks)

Dependent Variable is pcyg		
Sample: 1982 to 2016		
Regressors	FMOLS Estimates	CCR Estimates
gcfgr	0.11*** (5.13)	0.10*** (3.59)
afr	-0.07** (-2.14)	-0.07** (-2.10)
gfcegr	0.06*** (11.99)	0.06*** (8.40)
intr	0.09 (0.88)	0.09 (0.85)
C	7.32 (1.53)	7.71 (1.49)
R^2	0.75	0.75
Adj.R^2	0.72	0.72
Long run Variance	6.63	6.63

*T-ratios are in brackets; ***, ** represent statistical significance at 1% and 5% level respectively*

Source: Authors' Estimation using EVIEWS 9

Results from alternative estimation techniques confirm that high adolescent fertility has adverse consequences for economic growth in Nigeria. Also confirmed are the positive and significant growth effects of capital formation and government final consumption expenditure in the country.

5. Conclusions and recommendations

From the outcome of the empirical analysis, it can be concluded that high adolescent fertility rate adversely affects economic growth in the long run and in the short run in Nigeria. The results of the empirical analysis also provide the basis to conclude that economic growth is enhanced by both investment (growth in capital formation) and government final consumption expenditure. Based on the empirical evidence, it is recommended that the government of Nigeria takes conscious step to stymie the menace of high adolescent fertility rate in the country. This could be achieved by prioritizing girl-child education, incorporating sex education in high (or secondary) school curriculum, formulating laws to stop early marriages, and job creation to engage and economically empower parents or guardians of the adolescents so they will be able to provide adequate care for their adolescent children. It is also recommended that measures are taken to enhance the rate of capital formation in the country by creating an environment that is conductive for businesses and investments to thrive; and to increase government final consumption expenditure to boost the level of economic activities in the country.

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