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Abstract

The nature of the relationship between unemployment rate and the size of a specifically defined age group, or cohort, notably the young workers in the working-age population, has been a subject of an intense debate, widely studied and generated a sizable body of literature. However, while the debate is still inconclusive, an in-depth reading of these expansive extant and crescive literatures suggests that besides the contradictory findings, one of the major drawbacks with these literatures is that hardly any studies have been reported exclusively for African countries, as most of the extant literature principally focused on European, Asian, and American economies. Moreover, generalized studies across countries employing pooled data appears to dominate the literature. Using annual time series secondary data spanning between the period 1970 and 2019, this study employs bounds testing approach to co-integration to examine the nature of the aforementioned relationship in Nigeria. Empirical results obtained revealed that cohort size has an overwhelming positive and statistically significant impact on unemployment rate both in the short- and long-run, suggesting that the size of one's generation, has repercussions not only on (un)employment outcomes of that particular group but also on other age groups in Nigeria.

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1. Introduction

Over the last five decades, the nature of the relationship between unemployment rate and the size of a specifically defined age group, or cohort, notably the young workers in the working-age population, has been a subject of an intense debate, widely acknowledged and discussed in labour and development economics discourse. On the theoretical front, there are two distinct and contentious schools of thoughts to this debate, namely: the cohort crowding hypothesis of Easterlin (1961) and hypothesis of Shimer (Garloff, Pohl, and Schanne, 2013). With regard to cohort crowding hypothesis, premised on a career phase model (see Welch, 1979; Schmidt, 1993; Eguía and Echevarría, 2004), proponents of this view asserts that, firstly, there is a negative relationship between cohort size and its labour market prospects (Fuchs and Weyh, 2014). As postulated by the exponents of this view (in particular, Easterlin, 1961; Perry, 1970; Flaim, 1979), an increase in the size of a specifically defined age group- the proportion of young workers in the working age population - has repercussions on the (un-)employment outcomes of that particular group (Moffat and Roth, 2017; Roth, 2017). Secondly, since the aggregate unemployment rate is a weighted average (Shimer, 2001) of the rates of the various demographic groups, an increase in the proportion of those groups with above average unemployment rates will increase the overall unemployment rate (Reid and Smith, 1981).

Vis-à-vis the hypothesis of Shimer (2001), based on a matching model with increasing returns to scale in the matching process, match-specific productivity, and on-the-job search (Fuchs and Weyh, 2014), proponents of this view posit that an increase in the size of young workers in the working age population lessens the unemployment rate of that age group, as well as, of other age groups. In contrast to the theoretical prediction cohort crowding hypothesis, an upsurge in the share of youth in the working age population causes a sharp reduction in unemployment rate and a modest increase in its labour force participation rate (Shimer, 2001). As argued by the pioneers of this view, the main difference between older and younger individuals is that the latter are more likely to be either unemployed or employed but poorly matched and hence more prepared to either take up or switch jobs (Roth, 2017). Thus, an increase in the size of the youth cohort thus leads to a larger supply of individuals that can be recruited by firms (Roth, 2017). Under reasonable parameters assumptions (Garloff *et al*, 2013), this lessens the firms' expected search and recruitment costs located in such markets and can thus lead to the creation of new jobs that overcompensates the initial increase in labour supply (Fuchs and Weyh, 2014).

On the empirical side, a considerable number of important studies have attempted to assess the empirical implications of these two propositions. However, while some studies (Perry, 1970; Wachter, Hall, and Holt, 1976; Leveson, 1980; Gordon, 1982; Wachter and Kim, 1982; Ahlburg, 1982; Anderson, 1982; Ben Porath, 1985; Easterlin, 1961, 1968; Fair and Dominguez, 1987; Bloom, Freeman, and Korenman, 1988; Flain, 1979, 1990; Korenman and Neumark, 2000; Barwell, 2000; Ahn, Izquierdo, and Jimeno, 2000; Abraham and Shimer, 2001; Jimeno and Rodriguez-Palenzuela, 2002; Foote, 2007; Biagi and Lucifora, 2008; Garloff *et al*, 2013; Fuchs and Weyh, 2014; Simion, 2015; Moffat and Roth, 2014, 2017) found evidence consistent with the cohort crowding hypothesis of Easterlin which underscored the potential negative relationship between cohort size and its labour market prospects, in contrast some others (for instance, Freeman, 1979; Shimer, 2001; Nordström Skans, 2002; Skans, 2005; Ochsen, 2009; Lam, 2014; Roth, 2017) have also substantiated and lent credence to the hypothesis of Shimer which underlined the virtues that an increase in the young workers in the working age population lessens not only the youth unemployment rate but also the overall unemployment rate. Still, a large number of studies (for instance, Organization for Economic Co-operation and Development, OECD, 1980; Russell, 1982; Nardone, 1987; Zimmermann, 1991; Ochsen, 2011; Newhouse and Wolff, 2014) found no clear relationship between unemployment rate and cohort size. From theoretical and empirical perspectives, the debate on the nature of the relationship between unemployment rate and the size of a specifically defined age group, or cohort, particularly the proportion of young workers in the working-age population, has remained a subject of controversy and yet to find a clear consensus.

Nearly all countries in the world have undergone, or are currently undergoing, growth in the proportion of youth labour force (aged 15 to 24 years) occasioned by different patterns in fertility, mortality and migration. As of 2015, globally, this subset of population, was estimated at 1.2 billion, accounts for one (1) out of every six (6) people worldwide, according to the United Nations Department of Economic and Social Affairs, UNDESA, Population Division (2015). By 2030, it is projected to have grown by seven (7) percent to nearly 1.3 billion. Albeit, initially experienced by developed countries, growth in the proportion of youth labour force is now a global phenomenon experienced in almost all countries of the world. In Europe, Northern America and Oceania, Latin America and the Caribbean, where total fertility rates have declined for decades, this subsection of population has stabilized in size and is projected to change little over the coming decades (UNDESA, 2015). In Asia, after rapid and sustained increase throughout the latter half of the twentieth century (20th), it is projected to decline from 718 million in 2015 to 711 million and 619 million in 2030 and 2060 respectively. Contrary to other regions of the world where the size of youth labour force has peaked, Africa's youth population has continued to grow rapidly. According to the 2017 revision of the United Nations World Population Prospects, this age group, numbering 226 million, as of 2015, constitutes about two fifths of Africa's labour force and accounts for 19 percent of the global youth population. By 2030, it is projected to increase by 42 percent and continue to grow throughout the remainder of the twenty-first (21st) century, more than double from current levels by 2055 (UNDESA, 2015).

In Sub-Saharan Africa (SSA hereafter) alone, according to the Berlin Institute for Population and Development (2011), this subset of population will grow by 225 million people by the middle of the century (Sippel, Kiziak, Woellert, and Klingholz, 2011), making SSA the "youngest" region in the world. More remarkable is the fact that about one quarter of the youth surplus SSA will face by 2050 will be accounted for by Nigeria alone (Sippel *et al*, 2011). In fact, by 2030, according to the Next Generation Nigeria Task Force (2010) convened by the British Council, Nigeria will be one of the few countries in the world that has young workers in plentiful and growing supply (Bloom, 2010). As a matter of fact, in the coming decades, while a global scarcity of young adults will accelerate, Nigeria will remain a young country throughout most of the twenty-first (21st) century, with a median age of twenty-one. With the current population of 200 million as of 2019, ranking 7th in the World, premised on the latest United Nations estimates, this age cohort, having risen from 35 million in 2015 to 37 million in 2018, is projected to grow continuously from current 37 million in 2018 to 51 million and 86 million by 2030 and 2050 respectively (Sippel *et al*, 2011; Lam and Leibbrandt, 2013). In this regard, the critical question is this: what is the relationship between the size of this specifically defined age group and its labour market prospects in Nigeria? Put differently, has increased in the proportion of young workers in the working-age population affect the overall unemployment in Nigeria?

Albeit, as evidenced in the bulk of the empirical studies cited above, the question of whether cohort size affects the labour-market prospects of its members (Moffat and Roth, 2017) has been widely studied and generated a sizable body of literature. However, while the debate is still inconclusive, an in-depth reading of these expansive extant and crescive literatures suggests that other than the contradictory findings, one of the major drawbacks with these literatures is that hardly any studies have been reported exclusively for African countries (Odedokun and Round, 2001), partly because of limited number of household data points for African countries, as the bulk of the extant cohort-size literature principally focused on European, Asian, and American economies. In addition to this, as evinced from the above studies, generalized studies across countries employing pooled data appears to dominate the literature as the attention of most of the extant-literatures has been heavily biased towards regional or cross-section/-country (sometimes, panel) studies and often failed to use long period data. The main drawbacks with such discourse, as reasoned in Hundie (2014), is the homogeneousness of assumptions throughout the countries, which is implausible because of differences in economic, social and institutional conditions. Also, cross-sectional/-country regressions are infamous for downsides such as omitted variables bias, endogeneity, and so on. In view of these, to provide new insights into the nature of the aforementioned relationship and related policy issues, and, also shed more light on the extant contradiction-prone evidence, country-specific studies are needed.

Using time series data spanning between the period 1970-2019, this study employs the recently developed bounds testing approach to co-integration to examine the subject in the context of Nigerian economy. The use of Nigerian data is supported not only by the high level of unemployment and poverty in Nigeria, but also because of the country recent renaissance to lessen unemployment and as well poverty, which makes country-specific evidence of immediate relevance to anti-unemployment/-poverty policies. Albeit, there is a sizable literature, as section 2 highlights, assessing the macroeconomic implications of this specifically defined age group in terms of growth opportunities it presents, the question of whether this cohort size affects the labour-market prospects of its members has so far been left largely unaddressed. This study, thus, aims to fill this gap. Following the introduction, the rest of the study is set out as follows. In section two (2) a brief review is presented of theoretical and empirical evidence. Section three (3) focused on methodology and data. This is followed by estimation techniques and empirical analysis in section four (4). Findings from the analysis were summarized in section five (5), in addition with conclusions and policy recommendations.

2. Literature Review

There are two contrasting and distinct views on the relationship between unemployment rate and the size of a specifically defined age group, in particular, the proportion of young workers in the working-age population, in development and labour economics discourse. Intrinsically, from a theoretical perspective, the cohort crowding hypothesis of Easterlin (1961) and hypothesis of Shimer (Garloff *et al*, 2013). On the one hand, re the "cohort crowding hypothesis" literature, advocates of this view, premised on Welch's (1979) career-phase model in which workers follow a given career path independently of cohort size (Schmidt, 1993), postulate that members of relatively large cohort faced depressed labour market outcomes (Roth, 2017). Simply put, this strand of literature asserts that, an increase in the size of a specifically defined age group- the proportion of young workers in the working age population- affects the (un-)employment outcomes of that group (Moffat and Roth, 2017) and, since the aggregate unemployment rate is a weighted average of the rates of the various demographic groups, an increase in the proportion of those groups with above average unemployment rates will increase the overall rate (Reid and Smith, 1981). As postulated by exponents of this view, an increase in the share of youth in the working age population (Shimer, 2001) has both direct and indirect effects on unemployment rate. As to the direct effect, a shift in the age-composition of the working-age population results in distinct age-specific unemployment rates. An indirect effect follows from the possibility that cohort size affects the age-specific unemployment rates and, through these, the overall unemployment rate (Garloff *et al*, 2013).

Regarding the hypothesis of Shimer (2001), advocates of this view, contrary to cohort crowding literature, based on a model of frictional unemployment with on-the-job search (the fluid labour market hypothesis), postulate that the overall unemployment rate tends to be lower when many young people supply labour (Ochsen, 2011). This strand of literature, contrary to the conventional assumptions about demographic effects on labour markets (Foote, 2007), posits that a younger labour force implies a more flexible labour market, with a larger proportion of the labour force willing to accept a new job (Kochar, 2007). This, in turn, suggests that firms will find areas with higher concentrations of younger workers more conducive to the opening of new firms (Kochar, 2007; Garloff *et al*, 2013) and thus focus on these areas because younger workers undertake more search activities which reduce the firms' recruitment costs (Ochsen, 2011), thereby generating additional jobs and reducing unemployment rates for both young and older workers (Kochar, 2007; Garloff *et al*, 2013; Moffat and Roth, 2017). Primarily, an increase in the size of the cohort- the share of youth in the working-age population (Shimer, 2001)- not only lessens the unemployment rate of that particular cohort, it also raises the labour force participation rate of other age groups (Nordström Skans, 2002), i.e. a reduction in unemployment and an increase in employment, respectively (Garloff *et al*, 2013).

On the empirical front, the nature of the relationship between youth shares in the working-age population and unemployment rates has been a subject of an intense debate and yet to find a clear consensus. Whereas an extensive review of the extant studies is beyond the scope of this paper, excellent reviews (with a wide coverage of the literature) are available {see for instance among others; Bloom *et al*, (1988), Johnson and Zimmermann (1993), Korenman and Neumark (2000), and Biagi and Lucifora (2008)}. For this reason, this study focusses on literature that precisely addressed the relationship between unemployment rate and the size of young workers in the working-age population. To retain simplicity and also provide an excellent starting point for a comparison on data, methodology and results (Biagi and Lucifora, 2008), an overview and synopsis of the existing literature on the said relationship is presented in Table 1 below. Attention is given to empirical literatures from the early 1960s.

As shown in the table, the debate on the aforementioned relationship has received a great deal of attention, widely studied and generated a substantial body of literature from different countries and time periods. Also, in accordance with the theoretical discrepancy, empirical evidences have failed to suggest an overall dominance of one view over the other. However, while the debate is still inconclusive as the juxtaposition of the hypothesis of Shimer and cohort crowding literature reveals, an in-depth reading of these expansive extant and crescive literatures suggests that other than the contradictory findings, one of the major drawbacks with these literatures is that hardly any studies have been reported exclusively for African countries, partly because of limited number of household data points for African countries, as the bulk of the extant cohort-size literature primarily focussed on European, Asian, Northern American and Oceanian, Latin American and the Caribbean economies. Apart from this, generalized studies across countries employing pooled data appears to predominate the literature as the attention of the bulk of these literatures has been heavily biased towards regional or cross-sectional and cross-country (sometimes, panel) studies and often failed to use long period data. The downsides with such discourse are the homogeneousness of assumptions throughout the countries, which is implausible because of differences in economic, social and institutional conditions. Cross-sectional/-country regressions are infamous for drawbacks such as omitted variables bias, endogeneity, etc.

To provide new insights into the nature of the aforesaid relationship and related policy issues, country-specific studies are needed. Albeit, in Nigeria, there is a substantial body of literature (Ashford, 2007; Soyibo, Olaniyan, and Lawanson, 2008; Bloom, 2010; Alao, 2010; Mason, Olaniyan, and Soyibo, 2010; Bloom, Finlay, Humair, Mason, Olaniyan, and Soyibo, 2010; Olaniyan, Soyibo, and Lawanson, 2012; Cleland, 2012; Omoju and Abraham, 2014; Fürnkranz-Prskawetz, Lee, Lee, Mason, Miller, Mwabu, Ogawa, and Soyibo, 2013; Reed and Mberu, 2014; Drummond, Thakoor, and Yu, 2014; Canning, Raja, and Yazbeck, 2015; Aiwone, 2016; Jimenez and Pate, 2017; Dramani and Mbacké, 2017; and more recently Ogunjimi and Oladipupo, 2018) assessing the macroeconomic implications of this specifically defined age group in terms of economic growth opportunities it presents, however, the question of whether this cohort size affects the labour-market prospects of its members has so far been left largely unaddressed. This study, thus, aims to fill this gap.

Table 1: An overview and synopsis of the extant literature on the relationship between unemployment rate and cohort size

Study	Brief Description	Effect on Unemployment
Easterlin (1961)	Easterlin notes that the labour market fortunes of workers are inversely related to the relative size of their birth cohort. As such the paper anticipated that as the baby boomer generation entered the labour market, they would face less favorable conditions than the cohort that preceded them. Easterlin's main focus was on how economic conditions affect fertility, and he correctly predicted that the relatively unfavorable conditions created by the entry of the baby boomers into the labour market would depress fertility rates.	Positive. The study posits cyclical changes in demographic and social behavior as the result of fluctuations in birth rates and cohort size during the post-World War II period. Large cohort size reduces the economic opportunities of its members and reduces income relative to smaller parental generations. Low relative economic status in turn leads to lower fertility, higher rates of female labour force participation, later marriage, higher divorce and illegitimacy, and increasing homicide, suicide, and alienation. Cycles in birth rates and cohort size suggest that the small baby bust cohorts entering adulthood in the 1990s will enjoy higher relative income, more traditional family structures, and lower levels of social disorganization.
Wachter, Hall, and Holt (1976)	Time-series regression of the unemployment rates of male and female teenagers in the USA on the unemployment rate of 25-54 year-old men and the proportion of the working-age population in the age group 16-24. The period studied is 1948-1975	Positive. Every regression reveals a strong positive association between unemployment and cohort size. Note, however, the limited number of other control variables
Freeman (1979)	This study estimates two main regression models using US data. First, it regresses average weekly earnings for men computed from the 1969 and 1978 Current Population Surveys on a vector of education/age-group interaction terms. Second it regresses teenage unemployment rates for men, over the period 1948 to 1977, on a time trend, the aggregate unemployment rate, a minimum-wage variable, and a variable measuring the relative number of young male workers	Negative. The regression results indicate a significant positive cohort-size effect only for 16-17 years old. The estimated effect is close to (and not significantly different from) zero for 18-19 and 20-24 years old. These results therefore suggest that the main effect of generational crowding is on wages and not on employment
Leveson (1980)	Time-series regressions are fitted to US data over the post-World War II period. One set of regressions covers the period 1967-1977 and relates real income to relative cohort size and to a constructed variable that captures the effects of secu- lar productivity growth and business-cycle fluctuations. These regressions are fitted separately to data for different race/gender groups and for both all workers and full-time workers only. A second set of regressions model teenage unemployment rates as linear functions of cohort size, adult unemployment rates, and a minimum-wage variable. These re- gressions are fitted separately to data for different race/gender groups. They cover the periods 1947-1979 and 1954-1979	Positive. The coefficient of the cohort- size variable is positive and statis- tically significant in unemploy-ment-rate equations fitted over dif- ferent time periods and to differ- ent race/sex groups
Organization for Economic Co-operation and Development (1980)	This study fits regression equations to time-series data on the natural logarithm of unemployment rates of both male and female teenagers at different ages. The independent variables in these regressions are the logarithm of the adult unemploy-ment rate, a linear time trend, and the logarithm of a relative cohort-size varia- ble. Equations are estimated separately for ten countries including Australia, Canada, Finland, France, Germany, Italy, Japan, Sweden, the UK, and the USA. Time periods covered vary by country.	Mixed. The cohort-size variable has a small or statistically insignificant effect in most of the regressions for Australia, Finland, France, and Sweden. On the other hand, the estimated cohort-size effect tends to be positive and is often signifi- cant for youth cohorts in Canada, Germany, Italy, Japan, the UK, and the USA.
Ahlburg (1982)	Simple time-series analysis of the ratio of median income received by 14-24 years old American males (and 25-34 years old) to 45-54 years old. Regression analyses are also presented in which the ratios of the unemployment rates of 20-24 years old American males (and 25-34 years old) to 45-54 years old are treated as the dependent variables. In all cases, the only independent variable is the ratio of the male population aged 16-29 to the male population aged 30-64. The time periods covered are 1953-1976 in the earnings regressions and 1948-1976 in the unemployment regressions. The empirical results of this study are best interpreted as simple correlations, and not as evidence of causal relationships.	Positive. The number of unemployed younger workers rises relative to older workers as the ratio of younger to older individuals in the population rises.

Study	Brief Description	Effect on Unemployment
Anderson (1982)	This study estimates a large disaggregated economic-demographic model of the US labour market. Separate equations are estimated for the earnings and unemploy- ment of males and females in different age groups. Cohort size (or some function of cohort size) is included as an indepen- dent variable in each equation, although the range of other control variables is limited. Thus, the empirical results of this study should not be interpreted as causal	Positive. The unemployment rate of young cohorts of both males and females, relative to the unemploy- ment rate of 25-54 year-old men, is positivdy and significantly asso- ciated with a measure of relative cohort size.
Wachter and Kim (1	The central argument of this paper is that increased cohort size associated with the baby boom led to a worsening of youth unemployment in the USA. The authors model this relationship by emphasizing the notion that increased cohort size creates downward pressure on wages which, because of institutional constraints such as the minimum wage, results in increased unemployment rates. This hy- pothesis is tested empirically using quarterly time-series data for white and black teenagers in different age groups. Alternative measures of unemployment rates, which presumably provide better measures of economic hardship, are con- structed and analyzed. The youth unem- ployment rates are regr~sed on the adult unemployment rate, a vector of seasonal dummies, a cohort-size variable, and a time trend.	Positive. The coefficients of the cohort-size variables are positive and statistically significant in all the equations estimated. In ad- dition, the elasticities of the unem- ployment rates with respect to the cohort-size variable tend to be larger in magnitude for males than for females. The results of this study provide support for a supply-side/institutional view of worsening youth unemployment
Russell (1982)	Regresses the unemployment rates of 16-17, 18-19, and 20-24 years old on a business-cycle indicator, a time trend, and the proportion of the working-age population in the age group 16-24. The regressions were run separately for males and females over the time period 1947-1980.	Indeterminate. All of the regressions indicate strong positive associations between unemployment and cohort size when just the business cycle is controlled for. However, this partial correlation changes sign in every regression when a time-trend variable is included. Although it is not al- together dear why a trend variable should be included in the specification, the instability of the cohort-size effect with respect to the change in specification suggests that the econometric results of Anderson (1982) and Wachter (1976) are weak.
Ben Porath (1985)	This paper investigates the effect of cohort size on earnings and unemployment using data from Israel. This is a particularly interesting experiment since cohort size in Israel changed substantially after the late 1940s (i.e., the changes are even more dramatic than the American baby boom). Regression models are estimated in which annual and hourly earnings for younger relative to older cohorts are modeled as functions of a cyclical unemployment variable and a relative employment cohort-size variable. Regression models are also fitted to logged unemployment rates for young men, with employment rates for older men and a relative (iabour-foree) cohort-size variable entered as right-hand side variables	Positive. Relative cohort size has a positive effect on unemployment rates.
Fair and Dominguez (1987)	The effects of the changing U.S. age distribution on various macroeconomic equations are examined in this paper. The equations include consumption, money demand, housing investment, and labour force participation equations. Seven age groups are analyzed: 16-19, 20-24, 25-29, 30-39, 40- 54, 55-64, and 65+. There seems to be enough variance in the age distribution data to allow reasonably precise estimates of the effects of a number of age categories on the macro variables. The results show that, other things being equal, age groups 30-39 and 40-54 consume less than average, invest less in housing than average, and demand more money than average. Age group 55-64 consumes more and demands more money. If these estimates are right, they imply, other things being equal, that consumption and housing investment will be negatively affected in the future as more and more baby boomers enter the 30-54 age group. The demand for money will be positively affected.	Yes. If, as Easterlin argues, the average wage that an age group faces is negatively affected by the percent of the population in that group, then the labour force participation rate of a group should depend on the relative size of the group. If the substitution effect dominates, people in a large group should work less than average, and if the income effect dominates, they should work more than average. The results indicate that the substitution effect dominates for women 25-54 and that the income effect dominates for men 25-54.

Study	Brief Description	Effect on Unemployment
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Study	Brief Description	Effect on Unemployment
Bloom, Freeman, and Korenman (1988)	This paper attempts to distinguish between two alternative views of the labour-market problems faced by young workers in a number of industrialized countries (Australia, Canada, France, Japan, Sweden, UK and US) in the 1970s and early 1980s. The first view is that the low relative earnings and high unemployment rates experienced by these cohorts were largely age-related; the second is that they are a consequence of large cohort size.	Positive. A multi-country empirical analysis indicates that large cohort size tends to have a negative effect on the expected earnings (product of earnings and the employment-to-labour-force ratio) of a cohort; there is, moreover, a marked trade-off between the relative-earnings effect and the relative-employment effect, with large cohort sizes reducing relative earnings in some countries and relative employment in others. More detailed data for the USA show that the relatively low wages and high unemployment of the 'unlucky' cohorts have tended to converge to the patterns that would have resulted had the cohorts been more ' normal' in size, but that their lifetime income has been permanently reduced. Finally, baby-boom cohorts in several countries are shown to have been absorbed in a wide range of industries rather than through expansion of the traditionally youth-intensive industries.
Zimmermann (1991)	Generation size and structure may have substantial effects on the labour market. This perspective is crucial for the German economy which is one of the most rapidly ageing societies. The paper studies the effects of relative cohort size and relative cohort age on unemployment. The time-series analysis employs cointegration techniques to discriminate between short-run and long-run developments.	Mixed. The econometric investigations suggest that in the long-run, there is no sufficient evidence that young cohorts experience higher unemployment rates if their cohort size is relatively high. In the short-run, there is in general a positive impact of relative cohort size and relative cohort age on unemployment.
Barwell (2000)	The study observed that the proportion of youths in the labour force in the UK has fallen dramatically over the past 15 years, following the collapse in the fertility rate in the 1970s *('the baby bust').* Given that youths always have higher unemployment rates than adults, this shift in the composition of the labour force towards those with lower unemployment rates may have been responsible for a fall in the aggregate unemployment rate.	Positive. Using data from the Labour Force Survey, the study found that about 55 basis points of the 565 basis point fall in the UK unemployment rate between 1984 and 1998 can be accounted for by changes in the age structure of the labour force. Changes in the fraction of each age group that is economically active will also affect the composition of the labour force (and therefore potentially the unemployment rate); however, even when we control for changing labour force participation rates by age, demographically driven shifts in the age composition of the labour force still explain about 40 basis points of the fall in the unemployment rate. Finally, they estimated that demographic change will have a negligible impact on the unemployment rate over the next decade, on the basis of recent labour force projections.
Korenman and Neumark (2000)	The paper assesses the evidence on the contribution of changes in the population age structure to the changing fortunes of youths in labour markets in advanced economies over the 1970s, 1980s and early 1990s, and use this evidence to project the likely effects of future cohort sizes on youth labour markets. A series of regression models were estimated to isolate the effects of exogenous changes in potential youth labour supply on youth employment and unemployment rates using a panel data set on 15 countries over more than 20 years.	Positive. The estimates show large youth cohorts lead to increases in the unemployment rate of youths, with elasticities as high as .5 or .6. But the estimates generally indicate little effect of relative cohort size on employment rates of youths.
Shimer (2001)	An increase in the share of youth in the working age population of one state or region relative to the rest of the United States causes a sharp reduction in that state's relative unemployment rate and a modest increase in its labour force participation rate. This is inconsistent with many theories of the labour market, but can be easily explained by a model of frictional unemployment with on-the-job search. The theory makes strong predictions regarding the behavior of wages which are shown to be consistent with the data. The paper also reconciles its findings with an existing body of apparently contradictory empirical evidence	Negative. This paper shows that a relative increase in the youth share of the population in one state causes an immediate decline in the unemployment rate and an increase in the labour market participation rate, and later causes an increase in wages for women and younger men. This is inconsistent with standard theories of unemployment, which predict either no relationship or the opposite relationship between these variables. However, it is consistent with a theory of the labour market in which mismatch of young workers is important, and firms prefer to locate in markets with a lot of mismatch because it is easier to find good employees in these labour markets.
Abraham and Shimer (2001)	This paper accounts for the observed increase in unemployment duration relative to the unemployment rate in the U.S. over the past thirty years, typified by the record low level of short-term unemployment. We show that part of the increase is due to changes in how duration is measured, a consequence of the 1994 Current Population Survey redesign. Another part is due to the passage of the baby boomers into their prime working years. After accounting for these shifts, most of the remaining increase in unemployment duration relative to the unemployment rate is concentrated among women, whose unemployment rate has fallen sharply in the last two decades while their unemployment duration has increased.	Positive. Using labour market transition data, the study shows that this is a consequence of the increase in women's labour force attachment.

Study	Brief Description	Effect on Unemployment
Jimeno and Rodriguez-Palenzuela (2002)	The paper uses a panel of OECD countries to gauge the relevance of the relative size of the youth population, labour market institutions and macroeconomic shocks at explaining observed relative youth unemployment rates.	Positive. The fluctuations of the youth population size caused by the baby boom of the 1950s and 1960s and the subsequent decline of fertility in many European countries are positively associated with fluctuations in relative youth unemployment rates.
Nordström Skans (2002)	The paper studies the effects of changes in the age structure on aggregate labour market performance using a panel of Swedish local labour markets. The methodology of Shimer (2001) is used for studying the effects of youth cohort size and is extended to include the full age distribution.	Negative. The results show that young workers benefit from belonging to a large cohort. This is in line with previous results for the US.
Skans (2005)	The paper studies the effects of changes in the age structure on aggregate labour market performance using a panel of Swedish local labour markets. The methodology of Shimer (2001) is used for studying the effects of youth cohort size and is extended to include the full age distribution.	Negative. The results show that young workers benefit from belonging to a large cohort. This is in line with previous results for the US. Furthermore, it is shown that most of the positive effect for young workers is due to an inward shift in the Beveridge-curve even though tightness seems to increase as well. In contrast to the US experience, older workers in Sweden do not benefit from large youth cohorts. Further results show that large numbers of 50 to 60 years old workers have an adverse effect on the labour market.
Foote (2007)	This paper updates Shimer's regressions and shows that this surprising correlation essentially disappears when the end of the sample period is extended from 1996 to 2005. This shift does not occur because of a change in the underlying economy during the past decade. Rather, the presence of a cross-sectional (that is, spatial) correlation in the state-level data sharply reduces the precision of the earlier estimates, so that the true standard errors are several times larger than those originally reported.	Positive. Using a longer sample period and some controls for spatial correlation in the regression, point estimates for the youth-share effect on unemployment are positive and close to what a conventional model would imply. Unfortunately, the standard errors remain very large. The difficulty of obtaining precise estimates with these data illustrates a potential pitfall in the use of regional panel data for macroeconomic analysis.
Biagi and Lucifora (2008)	The study analyses the effects of demographic and education changes on unemployment rates in Europe. Using a panel of European countries for the 1975–2002 period - disaggregated by cohort and education - they empirically test the economic effects of the "baby bust" and the "education boom".	Positive. Structural shifts in the population age structure play an important role and that a significant share of variation in unemployment rates is also attributable to educational changes, the latter being usually neglected in aggregate studies. Results show that demographic and education shocks are qualitatively different for young (adult) workers as well as for more (less) educated people. Changes in the population age structure are positively related to the unemployment rate of young workers, while have no effect on adults. Conversely, changes in the education structure show a negative effect on the unemployment of the more educated
Ochsen (2009)	This paper analyzes how the aging labour force affects the unemployment rate at the regional level in Germany. A theoretical model of equilibrium unemployment with spatial labour market interactions is used to study the effects of age-related changes in job creation and job destruction. Using data for 343 districts, we then examine empirically the consequences of an aging labour force for the local labour markets in Germany. The study applies different estimation techniques to a spatial and time dynamic panel data model.	Negative. According to the estimates, unemployment increases due to decreasing shares of young job seekers in surrounding areas.
Ochsen (2011)	This study I apply different regional data sets (including Robert Shimers original data) and analyze how aging affects unemployment in a framework that considers spatial interactions	Mixed. At the state level, I can neither confirm the findings of Robert Shimer nor the cohort crowding hypothesis. Using county level data, however, I find local effects that are compatible with the cohort crowding hypothesis but also with specific assumptions about the heterogeneity of older and younger workers.
Garloff, Pohl and Schanne (2013)	The study analyzes the relationship between (un)employment and cohort sizes using a long panel of Western German labour market regions. In this context, the paper accounts for both the likely endogeneity of cohort size due to migration of the (young) workforce across regions using lagged births as instruments as well as for temporal and spatial autocorrelation	Positive. The results provide good news for the (Western) German labour market: small entry cohorts are indeed likely to decrease the overall unemployment rate and thus to improve the situation of job seekers. Accordingly, with regard to the employment rate we find that it is positively affected by a decrease in the youth share.

Study	Brief Description	Effect on Unemployment
Newhouse and Wolff (2014)	This paper utilizes a cross-country panel of 83 developing countries to examine how changes in cohort size are correlated with subsequent employment outcomes for workers at different ages.	Mixed. The results depend on countries' level of development. In low-income countries, young adults that are born into smaller cohorts are less likely to work, but school attendance remains unchanged. In middle-income countries, young adults in smaller cohorts are less likely to be unemployed and more likely to work outside of agriculture. Neither pattern can be discerned among older adults, although the estimates are imprecise. In sum, reductions in cohort size are associated with moderate improvements in employment outcomes for youth in middle-income countries, but there is scant evidence that these improvements persist into adulthood.
Moffat and Roth (2014)	Will the projected decline in the youth share of European countries' populations alleviate the currently high levels of youth unemployment in Europe? Economic theory predicts that in the absence of perfectly competitive labour markets, changes in the relative size of age groups will cause changes in age-specific unemployment rates. In light of the expected development of the youth population's size over the coming decades, this paper utilizes the existing heterogeneity in the structure of youth populations across European countries and regions to identify the effect of nationally and regionally defined age-cohort size on the probability of young individuals being unemployed. To account for the possibility that individuals self-select into areas of low unemployment, the empirical analysis employs an instrumental variables estimator to identify the causal effect of age-cohort size.	Positive. The results show that individuals in larger cohorts are more likely to be unemployed and that this effect is more pronounced when analysis is conducted at the regional level. While shrinking youth cohorts therefore have the potential to contribute to improving the current youth unemployment situation, this mechanism should not be relied in isolation upon due to the relatively greater importance of changes in the macroeconomic environment
Fuchs and Weyh (2014)	The paper analyzes the relation between population aging and the decline of unemployment in East Germany for the years from 1996 to 2012. To this end, it scrutinizes both a direct and an indirect effect of aging on unemployment. The direct effect includes a decomposition of the East German unemployment rate into three components considering changes in the workforce's age structure, labour market participation, and age-specific unemployment rates. Results show that changes in the age structure of the workforce counteracted unemployment decline since 2005. Spatial panel regressions on the small-scale regional level, however, point towards an indirect effect of aging on unemployment that works through the increasing competition for labour.	Positive.Overall results show that the declining unemployment rate in East Germany is indeed affected by aging as evidenced by a declining youth share and an increasing old-age share. This indicates that a reversed cohort crowding effect has taken place.
Simion (2015)	This paper assesses the impact of the cohort size on labour market outcomes. Using exogenous variation and micro-level data for France, the UK and the US, the paper studies the effect of supply shocks on unemployment, wages, education and migration.	Positive. The results show that ballooning generations spent less time in school and face persistent high unemployment rates: a 10% increase in the cohort size increases unemployment rate by around 0.35 - 1.1 percentage points.
Moffat and Roth (2017)	Using data from 49 European regions covering 2005-2012, this paper estimates the effect of cohort size on youth employment and unemployment outcomes	Positive. The effects are found to be very sensitive to the age range of the sample used for estimation. In particular, the results show a negative (positive) effect of cohort size on employment (unemployment) among individuals aged 18-22 but the opposite effects among older individuals. This heterogeneity is driven by Eastern and Western European countries. For Southern European countries, belonging to a larger cohort is found to be beneficial across all age groups
Roth (2017)	This paper estimates the effect that the size of an individual's labour-market entry cohort has on the subsequent duration of search for employment. Survival-analysis methods are applied to empirically assess this relationship using a sample of apprenticeship graduates who entered the German labour market between 1999 and 2012.	Negative.The results suggest that apprentices from larger graduation cohorts take less time to find employment, but this effect appears to be significant only for a period of up to six months after graduation. These results therefore do not support the cohort-crowding hypothesis that members of larger cohorts face depressed labour-market outcomes.

Source: Author's computation (2020)

3. Data and Methodology

3.1 Sources of Data

The study made use of annual time series secondary data spanning between the period 1970 and 2019 sourced majorly from the publications of Central Bank of Nigeria Statistical Bulletin (2019), World Development Indicators (2019), and Africa Development Indicators (2019). The specific source and measurement as well as the description and justification for each variable employed in the study are depicted in Table 2 below.

Table 2: Data Sources, Description and Justification of Variables

Variable	Proxy	Sources	Justifications
Unemployed Labour Force	Unemployment Rate (%)	National Bureau of Statistics (2010:2; 2003-2018)	Bassanini and Duval (2007); Njoku and Ihugba (2011); Adawo, Essien, and Ekpo (2012); Adekola, Allen, Olawole-Isaac, Akanbi, and Adewumi (2016); Jajere (2016); Matuzeviciute, Butkus, and Karaliute, (2017); Raifu (2017); Seth, John, and Dalhatu (2018)
Cohort Size	Age groups 15-24 and 25-34 (% of Population) & Growth Rates of Age groups 15-24 and 25-34	Africa Development Indicators (2019)	Welch (1979); Bloom, Freeman, and Korenman (1988); Schmidt (1993); Korenman and Neumark (2000); Ahn, Izquierdo, Jimeno (2000); Eguía and Echevarría (2004); Biagi and Lucifora (2008); Simion (2015); Moffat and Roth (2017); Roth (2017)
Economic Growth	Real GDP Growth Rate (Annual %)	World Development Indicators (2019)	Abbas (2014);Kamran, Shujaat, Syed, and Ali, (2014); Mahmood, Ali, Akhtar, Iqbal, Qamar, Nazir, and Sana (2014); Oladipo (2010); Cheema and Atta (2014); Ola-David, Oluwatobi, and Ogundipe, (2016); Chand, Tiwari, Phuyal (2017); Onwachukwu (2016); Jajere (2016); Seth, John, and Dalhatu (2018); Soylu, Çakmak, and Okur (2018)
Inflation Rate	Consumer Price Index (2010 = 100)	Central Bank of Nigeria Annual Statistical Bulletin (2019)	Adachi (2007); Dornbusch, Fischer, and Startz (2011); Orji, Orji-Anthony, and Okafor (2015);Okafor, Chijindu, and Ugochukwu (2016);Jelilov, Obasa, and Isik (2016); Folawewo and Adeboje (2017); Raifu (2017)
Foreign Direct Investment (FDI)	Foreign Direct Investment, Net Inflows (BoP, current US$)	World Development Indicators (2019)	Agarwal (1996); Dornbusch, Fischer, and Startz (2011); Inekwe, (2013);Zeb, Qiang, and Sharif (2014); Khatodia and Dhankar (2016); Folawewo and Adeboje (2017); Ogbeide, Kanwanye and Kadiri (2016); Raifu (2017); Johnny, Timipere, Krokeme, and Markjackson
Total External Debt Stocks	Nigeria's External Debt Outstanding (₦' Billion)	Central Bank of Nigeria Annual Statistical Bulletin (2019)	Ali and Mustafa (2012); Maqbool, Mahmood, Sattar and Bhalli (2013); Trimurti and Komalasari (2014); Ogonna, Idenyi, Ifeyinwa, and Gabriel (2016);Nwokoye, Ilechukwu, Uzodigwe and Okonkwo (2016); Folawewo and Adeboje (2017); Ouhibi, Zouidi, and Hammami (2017)
Government Expenditure	Capital and Recurrent Expenditure (₦' Billion)	Central Bank of Nigeria Annual Statistical Bulletin (2019)	Dornbusch, Fischer, and Startz (2011); Ogbeide, Kanwanye, and Kadiri (2015); Matsumae and Hasumi (2016); Chimeziri (2016); Obayori (2016); Abubakar, (2016); Onwachukwu (2016); Folawewo and Adeboje (2017); Onodugo, Obi, Anowor, Nwonye, and Ofoegbu (2017)

Source: Author's computation (2020)

3.2 Econometric Model

This study, takes after the works of Rosen (1972), Berger (1985), Zimmermann (1992), Schmidt (1993), Ahn *et al* (2000), Eguia and Echevarria (2004), adopts and builds on Welch's (1979) career-phase model in which workers follow a given career path independently of cohort size (Schmidt, 1993). Basically, according to this model as postulated by Welch (1979), the simplest view of the way cohort size affects unemployment rate follows from the notion that work careers consist of a series of more or less distinct phases (Welch, 1979) and at any moment in the career, a member of the profession is in transit between two of these (Welch, 1979) phases (often viewed as a convex combination). For simplicity and in line with the objective of the study, following Schmidt (1993), Eguía and Echevarría (2004), and Ahn *et al* (2000), suppose each of these distinct phases is characterized by the age segment to which the individual belongs (that is, aged 15 to 24 years depicted by $j=1$; aged 25 to 34 years depicted by $j=2$; aged 35 to 44 years depicted by $j=3$ and aged 45 to 64 years depicted by $j=4$; for both sexes) and while there is imperfect substitutability across age segments, individuals sharing certain similar characteristics, primarily age, (though, in some studies, the level of education, gender, and/or experience) are perfectly substitutable. Besides, building on Easterlin's (1978) and Welch's (1979) views, suppose each of these three age segments/phases is, as well, associated with distinct degrees of expertise in the labour market. In essence, the older the worker, the greater her/his expertise.

Thus, theoretically, as advanced by Welch (1979), as the worker commences the j^{th} stage at the age of x_j, s/he leaves the previous stage $j-1$ (except when j stage is the first one) behind, and s/he as well begins the transition to the next stage $j+1$ (except when j is the last one). More precisely, as soon as phase j^{th} is entered at age x_j, the worker begins a transition into the phase $j+1$. As such, when in j^{th} stage, the worker is assumed to devote a (decreasing with age x) share $p_j^i(x)$ of her/ his time to this stage; the rest of the time, in an (increasing) share $1-p_j^i(x)$, is devoted to accumulating human capital to access the next stage, $j+1$ (Eguía and Echevarría 2004). Mathematically, $p_j^i(x)$ is such that $\frac{\partial p_j^i(x)}{\partial x}<0$ for $x \in \lfloor x_j, x_{j+1} \rfloor$, $p_j^i(x_j)=1$, and $p_j^i(x_{j+1})=0$. Hence, in line with these assumptions, if $m^i(x)$ depicts the number of active population of age x and sex i, then the number of employees supplying their labour services in group ji is expressed as follows:

$$M_j^i = \int_{x_{j-1}}^{x_j} \{1-p_{j-1}^i(x)\} \bullet m^i(x)dx + \int_{x_j}^{x_{j+1}} \{p_j^i(x)\} \bullet m^i(x)dx \quad (1)$$

where $i = m, w$ (for men and women respectively) and $j = 1, 2, 3$. Notice that both individuals in the j age segment and individuals in the previous age segment $j-1$ offer their labour services to the j^{th} segment. While the former does it in a share $p_j^i(x)$, the latter in a $1 - p_{j-1}^i(x)$ share (Eguía and Echevarría 2004).

For simplicity, suppose the aggregate production function of the economy can be expressed as

$$Q = f(L, R) \tag{2}$$

where L and R depict the total amount of labour supply postulates to be a function of all group of labour in the economy{ i.e. $L = f\left(L_1^M, L_1^W, L_2^M, L_2^W, L_3^M, L_3^W\right)$} and all other factors of production posits to be fixed in the short run (and denotes the state of the economy) respectively. Following Schmidt (1993), Eguia and Echevarria (2004), assume that for given wages $w_j\,(j = 1,2,3)$ and for a given R, firms face the problem of choosing levels of labour inputs corresponding to the six worker groups, L_j^i, that is,

$$Max_{(L_j^i)} f(L, R) - \sum_{j=1}^{j=3} w_j \left(L_j^m + L_j^w\right) \tag{3}$$

subject to

$$L = f\left(L_1^M, L_1^W, L_2^M, L_2^W, L_3^M, L_3^W\right) \tag{4}$$

Solving equations (3) and (4), a system of first-order conditions is obtained. Upon solving the resulting system of first-order conditions, the labour demand functions (i.e. equations 5) for each group are derived.

$$L_j^{i*} = f(w_1, w_2, w_3, R) \quad i = m, w \text{ and } j = 1, 2, 3 \tag{5}$$

Equation 5 implies that the amount of labour demanded by firms depend on the wages for all age cohorts and the level of economic activity. Hence, sequel to the derivation of the supply of and demand for labour functions (i.e. equations 1 and 5 respectively), the overall unemployment rate is then expressed as follows:

$$U_j^i = \frac{M_j^i - L_j^i}{M_j^i}\ , \ i = m, w \quad j = 1,2,3 \tag{6}$$

Equation (6) will thus form the base of our empirical model. According to this equation, the overall unemployment rate is predisposed to be determined by the wages associated with all age cohorts, the level of economic activity and the number of active population of age x and sex i expressed as follows:

$$U_j^i = f_j^i\left(w_1, w_2, w_3, R, m^i(x)\right) \tag{7}$$

Following the previous literature (Berger, 1985; Zimmermann, 1992; Schmidt, 1993; Eguía and Echevarría 2004), suppose there is a large monopoly union that (organizes and represents the labour force of the entire economy) sets wages for all workers. This union maximizes preferences, Z, defined over both wages and employment (Eguía and Echevarría 2004), subject to firms' labour demand for every group, L_j^{i*}, expressed as follows:

$$\begin{aligned} & Max_{(w_j)} Z\left(w_1, L_1^M, L_1^W, w_2, L_2^M, L_{,2}^W, w_3, L_3^M, L_3^W\right) \\ & s.t. L_j^{i*} = f\left(w_1, w_2, w_3, R\right), i = m, w, j = 1,2,3 \end{aligned} \tag{8}$$

Accordingly, the first order conditions obtained from this problem is written as follows:

$$\frac{\partial Z}{\partial w_j} + \sum_{k=1}^{3} \sum_{i=m,m} \frac{\partial Z}{\partial L_k^i} \frac{\partial L_k^i}{\partial w_j} = 0, \ j = 1,2,3 \tag{9}$$

Based on these arguments, thus, optimal wages are functions of the level of economic activity alone. That is:

$$w_j^* = w_j\left(R\right) \qquad j = 1,2,3 \tag{10}$$

Notice that the same result is found in Schmidt (1993) and, Eguía and Echevarría (2004). As such, by substituting equations (7) into (10), the overall unemployment rate can be expressed as follows:

$$U_j^i = f_j^i\left\{m^i\left(x\right), R\right\} \tag{11}$$

The overall unemployment rate (i.e. the unemployment rate for every age segment and sex) is determined by the age structure of active population and level of economic activity.

To close the model, there is the need for covariate variables in equation (11) to be well-defined. In the literature, re the specification of the age structure of active population, numerous studies have used different proxies to measure this variable. The key reason for this, other than the difference in conceptualizing the age structure of active population, has been the lack of reliable data, especially for developing countries. Usually, however, four distinct variables have been the most commonly used proxies to measure the age structure of active population, viz.: the relative size of adult population {often defined as the ratio of the size of the population between aged 40 and 65 to the population between aged 16 and 39 years; see Bailén and Gil (1997)}, the relative mean age of adult population {defined as the ratio of the mean age among adults to the mean age among the young; see Eguía and Echevarría (2004)}, the relative cohort size {defined as a share of the population size of youngsters aged 16-24 to the population size of individuals aged 16-64; see Simion (2015)}, and cohort size {which, by far the most widely-used measure in the literature, is the one adopted and incorporated as proxy for the age structure of active population in this study, as it denotes the size of a group of individuals that fall into a specified age range.

Regarding the specification of economic activity level, (R), as observed in the literature, typical variables usually included in the vector R are gross fixed capital formation, total external debt stocks, average years of secondary schooling, measures of trade openness and institutional quality, economic growth, foreign direct investment (FDI hereafter) inflow, labour productivity growth, government expenditure, inflation and population growth rates. For comprehensive analysis, this paper takes after the works of Adachi (2007), Dornbusch, Fischer and Startz (2011), Folawewo and Adeboje (2017), and (Raifu, 2017) in the selection of the covariate variables included in R. These variables are economic growth, inflation rate, FDI, external debt stocks, and government expenditure. Vis-à-vis the relationship between economic growth and unemployment rate, theoretically, as postulated by Okun's (1962) law, there is a widespread consensus that when an economy is growing at a certain percentage, unemployment rate is expected to reduce by a certain percentage (Raifu, 2017). There exists a negative relationship between real GDP and unemployment rate. Contrary to the theoretical prediction, recent empirical findings have been mixed (Oladipo, 2010), with one strand of the literature finding evidence consistent with the inverse relationship as posited by Okun's law, while the other found contrary evidence (Folawewo and Adeboje, 2017) and, as a result, the debate on the nature of the relationship real GDP and unemployment rate remains, at best, inconclusive.

On inflation-unemployment nexus, Phillips (1958), in his path breaking work, "the relationship between unemployment and the rate of change of money wages in the UK" published in 1958, posits that there exists a trade-off between inflation and unemployment rates. In other words, there is an inverse relationship between the level of unemployment and rate of inflation. Following the Phillips' (1958) pioneering work, a substantial number of studies have also attempted to examine the predictions and macroeconomic implications of this proposition. However, while some studies have found evidence consistent with this hypothesis, several others have refuted it. Hence, following Adachi (2007), Dornbusch *et al*, (2011), and Folawewo and Adeboje (2017), an attempt is made to explain the variation (Jamal, 2006) in unemployment rate with the help of Okun's (1962) law and Phillips' (1958) curve hypotheses.

Re the unemployment effects of FDI inflow, there is an intense debate in development economics discourse. Different studies have come up with diverse and varied conclusions (see Balcerzak and Zurek, 2011). Central issues in the unemployment-FDI relationship debate refer to the questions whether FDI replace local investment in the host country, are the investments from abroad export oriented, what are the specific sectors targeted by the foreign investors (Zdravković, Đukić, and Bradić-Martinović, 2017), and whether investments have been oriented to the construction of new plants (greenfield) or acquisition of the existing facilities (Baldwin, 1995; Ernst, 2005; Zdravković *et al*, 2017). While most of the extant studies found strong evidence of positive effects of the FDI inflow, especially to the GDP growth, however, the effects on unemployment are questionable depending on the observed sector of the economy, form of the attracted FDI, characteristics of the host economy and other factors (Zdravković *et al*, 2017). In order to shed more light on the relationship between cohort size, its labour market prospects and the related policy issues, it is included in equation (11).

There are two contrasting views on the impact of public debts on unemployment. The first holds the notion that the two are inversely related. Advocates of this view asserts that, during periods of unemployment, borrowing can be considered as a substitute to money creation and by implication as tool of fiscal policy (Ogonna, Idenyi, Ifeyinwa, and Gabriel, 2016). If funds are borrowed and appropriately channeled into productive ventures, not only will this create employment in the economy, the profit generated from such investments can also be used to service such debt (Ogonna *et al*, 2016). Contrary to the first strand of literature, proponents of the second view avow that public debt in contrast to tax finance transfers the cost of collective activity onto future generations (Ogonna *et al*, 2016). Present tax payers had their taxes reduced through debt finance, and that lowering of taxes was offset by higher taxes paid by tax payers in the future to pay back the debt (Buchanan, Congleton, Brennan, Tullock, and Wagner, 1999; Wagner, 2012; Ogonna *et al*, 2016). In essence, according to this strand of literature, the real burden of public debt is indeed shifted to the future generation (Ogonna *et al*, 2016).

On the effects on unemployment of government expenditure, the failure of the Classical economists' exposition in resolving the macroeconomic problems of the great depression of the 1930s has been pointed at for the emergence of the Keynesian economists' doctrine of demand management in the economy (Dornbusch, Fischer, and Startz, 2002; Nwosa, 2014). Ever since the emergence of Keynes, government both in developed and developing economies has assumed a pivotal role (Nwosa, 2014). Premised on the above discussions, hence, an econometric representation of equation (11) is then specified as follows:

$$\partial \ln ump_t = \beta_0 + \beta_1 \ln csi_t + \beta_2(\partial \ln gdp_t) + \beta_3(\partial \ln \inf_t) + \beta_4 \ln fdi_t + \beta_5 \ln eds_t + \beta_6 \ln gve_t + \varepsilon_{1t} \qquad (12)$$

where $\partial \ln ump_t, \ln csi_t, (\partial \ln gdp_t), (\partial \ln \inf_t), \ln fdi_t, \ln eds_t, \ln gve,$ and ε_{1t} denote aggregate unemployment rate, cohort size, economic growth, inflation rate, FDI inflow, total external debt stocks, government expenditure and white-noise error term respectively. While β_i (for $i = 1,...,6$) depict the long run numerical estimates (elasticities) of the model, β_0 is the drift component, t denotes time, $\ln$ is the natural logarithm operator. The variables are transformed to their natural logarithm form (except the aggregate unemployment rate, economic growth and inflation rates) to remove or lessen considerably any heteroskedasticity in the residuals of the estimated model. It is expected *a priori* that real GDP growth rate and government expenditure will lessen aggregate unemployment rate. Expectedly, the relationship between these covariates and aggregate unemployment rate is negative, while total external debt stocks is detrimental to aggregate unemployment rate, thus, the expected *a priori* is positive. Cohort-size, inflation rate and FDI inflow may or may not benefit aggregate unemployment rate, thus the expected *a priori* is either negative or positive respectively.

To retain simplicity, four (4) model versions of equation (12), as specified above, were considered. These model versions are hereafter referred to as versions A, B, C and D. In model A, log of youth-aged group 15-24 was proxied as cohort size. In model B, the exercise was repeated using log of middle (aged 25-34) population as measure for cohort size. The key reason for defining cohort this way is based on the assumption of potential endogeneity of schooling/education decision {i.e. the fact that an individual's investments in education is endogenous and can be one of the channels through which individuals manage their timing of entry into the labour market, due to the larger sizes of the cohort (Simion, 2015)}. By considering individuals between 25-34 years (aged by which most of people with less than an undergraduate degree and those with at least an undergraduate degree would have finished their education), this issue of endogeneity is addressed. In model versions C and D respectively, growth rates of the "youth" (aged 15-24) and "middle" (aged 25-34) population are incorporated as proxies for flow of cohort size. The main motivation for this has been that from an economic intuition growth rate of "youth- and middle-aged" labour force is probably more important than the absolute size, since it is rapid entry of young workers that is most likely to put pressure on the labour market.

4. Estimation Techniques and Empirical Analysis

4.1 Unit Root, Optimal Lag Length Selection and Bounds Test Results

Prior to detailed analysis and estimation of model (12), in order to ascertain the stationarity properties of the variables employed, the study applied two types of formal tests, namely: the conventional Augmented Dickey-Fuller (ADF hereafter) advanced by Dickey and Fuller (1979, 1981) and the Phillips Perron (PP hereafter) developed by Philips and Perron (1988) tests. Both tests statistics were done for two alternative specifications at 1%, 5% and 10% level of significance. To begin with, it was tested with intercept but no trend, and then it was tested with both intercept and trend. The results of level and first difference tests are presented in tables 3 and 4 below. As can be seen from the tables both tests consistently suggest that apart from real GDP growth and inflation rates, as well as the growth rates of "youth- and middle-aged groups" which are stationary at level, all other variables became stationary when converted to first differences, signifying that each is integrated of order one, denoted as I (1) at 5 percent level of significance.

Next, the possible existence of long-run relationship among the variables was also established. There are three main techniques of conducting cointegration relationship among time series variables, specifically: the residual-based technique advanced by Engle and Granger (1987), maximum likelihood-based procedure developed by Johansen and Julius (1990) and Johansen (1992), and recently proposed ARDL (Auto Regressive Distributed Lag) bounds testing approach, originally advanced by Pesaran and Shin (1998) and further extended by Pesaran, Shin, and Smith (2001). This study adopts the bounds testing approach to cointegration premised on ARDL framework. The paper considered the framework apposite for its empirical exercise because of the following reasons. Firstly, unlike other methods, the technique does not require symmetry of lag lengths (i.e. each variable can have a different number of lag terms). Secondly, it allows a mixture of I(1) and I(0) variables as regressors, as the order of integration of appropriate variables may not necessarily be the same. Thirdly, it is more robust and performs better for small sample sizes. Fourth, the short- and long-run parameters of the model can be estimated simultaneously since it takes into account the error correction term in its lagged period (Hundie, 2014), removing problems associated with omitted variables and autocorrelation (Palamalai and Kalaivani, 2013). Fifth, this technique generally provides unbiased estimates of the long-run model and valid t-statistic even when some of the regressors are endogenous (Harris and Sollis, 2003). Lastly, given the nature of interrelation between aggregate unemployment, real GDP growth and inflation rates, included in the model, this technique appears suitable to address any possible endogeneity issue. In view of the above advantages, the augmented ARDL version of the model (12) specified earlier is expressed as follows:

$$\Delta(\partial \ln ump_t) = \alpha_0 + \sum_{i=1}^{a} \alpha_{1i} \Delta(\partial \ln ump_{t-i}) + \sum_{i=0}^{b} \alpha_{2i} \Delta \ln csi_{t-i} + \sum_{i=0}^{c} \alpha_{3i} \Delta(\partial \ln gdp_{t-i}) + \sum_{i=0}^{d} \alpha_{4i} \Delta(\partial \ln \inf_{t-i}) + \sum_{i=0}^{e} \alpha_{5i} \Delta \ln fdi_{t-i}$$
$$+ \sum_{i=0}^{f} \alpha_{6i} \Delta \ln eds_{t-i} + \sum_{i=0}^{g} \alpha_{7i} \Delta \ln gve_{t-i} + \delta_1 (\partial \ln ump)_{t-1} + \delta_2 (\ln csi)_{t-1} + \delta_3 (\partial \ln gdp)_{t-1} + \delta_4 (\partial \ln \inf)_{t-1} + \delta_5 (\ln fdi)_{t-1} +$$
$$\delta_6 (\ln eds)_{t-1} + \delta_7 (\ln gve)_{t-1} + \varepsilon_{2t} \tag{13}$$

where, Δ represents the first difference operator, α_0 is the drift component, a,b,c,d,e,f,g are the maximum number of lags in the models and, ε_{2t} is white noise residual. The $\delta's$ correspond to the long run parameters whereas $\alpha's$ capture the short-run dynamics of the model. Notice that the terms with summation signs are used to model the short-run dynamics structure. Thus, in applying cointegration tests the study tested the null hypothesis of no cointegration $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$ against the alternative hypothesis $H_1 : \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq 0$. Nonetheless, before the test was applied, in order to avert the problem of misspecification and loss of the degrees of freedom, the optimal lag length incorporated for each variable in the model was first ascertained. To this end, VAR lag order selection criteria was considered and the optimal lag order one was carefully chosen. The results are presented in table 5 below.

With this lag length setting, during the analysis: 64 different ARDL specifications for models A, B, C and D respectively were considered and the most suitable models ARDL (1,0,0,1,1,00), ARDL (1,0,1,1,0,0,0), ARDL (1,0,0,1,0,0,0) and ARDL (1,0,0,1,0,0,1) for models A, B, C and D respectively were selected for this study. Figures 1, 2, 3 and 4 below which provide graphs of the AIC of the top twenty models depict the relative superiority of the selected models against alternatives. Having obtained the appropriate lag length, "bounds test" of cointegration was performed to check the joint significance of the estimated long-run coefficients by imposing zero restrictions. The results obtained are depicted in table 6 below. All the tests were conducted at 5 percent level of significance. As evinced in the table, in each case, the computed (F-statistics) is greater than upper bond values at 5 percent level of significance. As such, the null hypotheses of no cointegrating relationship among the variables of interest were rejected.

Table 3: Stationarity Tests of Variables: Augmented Dickey-Fuller (ADF) Test

Augmented Dickey-Fuller (ADF) Test with Intercept only

Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
$\partial \ln ump$	1.268205	-3.57131	-2.92245	-2.599224	0.6370	NS	-8.782513	-3.57445	-2.92378	-2.599925	0.0000	I(1)
$\ln csi_{1524}$	-1.60281	-3.581152	-2.92662	-2.601424	0.4731	NS	-8.897158	-3.58115	-2.92662	-2.601424	0.0000	I(1)
$\ln csi_{2534}$	-1.686209	-3.57131	-2.92245	-2.599224	0.4318	NS	-7.030354	-3.57445	-2.92378	-2.599925	0.0000	I(1)
$\partial \ln csi_{1524}$	-8.887057	-3.581152	-2.92662	-2.601424	0.0000	I(0)	***	***	***	***	***	I(0)
$\partial \ln csi_{2534}$	-7.044723	-3.574446	-2.92378	-2.599925	0.0000	I(0)	***	***	***	***	***	I(0)
$\ln gdp$	-5.613105	-3.57131	-2.92245	-2.599224	0.0000	I(0)	***	***	***	***	***	I(0)
$\partial \ln \inf$	-3.689276	-3.57131	-2.92245	-2.599224	0.0073	I(0)	***	***	***	***	***	I(0)
$\ln fdi$	-1.318943	-3.574446	-2.92378	-2.599925	0.6134	NS	-12.86312	-3.57445	-2.92378	-2.599925	0.0000	I(1)
$\ln eds$	-1.750278	-3.57131	-2.92245	-2.599224	0.4003	NS	-5.202749	-3.57445	-2.92378	-2.599925	0.0001	I(1)
$\ln gve$	-1.460032	-3.57131	-2.92245	-2.599224	0.5452	NS	-7.715189	-3.57445	-2.92378	-2.599925	0.0000	I(1)

Augmented Dickey-Fuller (ADF) Test with Trend and Intercept

Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
$\partial \ln ump$	-2.633837	-4.156734	-3.50433	-3.181826	0.2679	NS	-8.713368	-4.16114	-3.506374	-3.1830020	0.0000	I(1)
$\ln csi_{1524}$	-1.628179	-4.170583	-3.51074	-3.185512	0.7662	NS	-8.794514	-4.170583	-3.51074	-3.185512	0.0000	I(1)
$\ln csi_{2534}$	0.743637	-4.161144	-3.506374	-3.183002	0.9996	NS	-8.628209	-4.16114	-3.506374	-3.183002	0.0000	I(1)
$\partial \ln csi_{1524}$	-8.784655	-4.170583	-3.51074	-3.185512	0.0000	I(0)	***	***	***	***	***	I(0)
$\partial \ln csi_{2534}$	-8.657251	-4.161144	-3.50637	-3.183002	0.0000	I(0)	***	***	***	***	***	I(0)
$\ln gdp$	-5.628813	-4.156734	-3.50433	-3.181826	0.0001	I(0)	***	***	***	***	***	I(0)
$\partial \ln \inf$	-3.678228	-4.156734	-3.50433	-3.181826	0.0334	I(0)	***	***	***	***	***	I(0)
$\ln fdi$	-0.957247	-4.161144	-3.506374	-3.183002	0.9403	NS	-12.91117	-4.161144	-3.506374	-3.183002	0.0000	I(1)
$\ln eds$	-0.982394	-4.156734	-3.50433	-3.181826	0.9371	NS	-5.402570	-4.16114	-3.50637	-3.183002	0.0003	I(1)
$\ln gve$	-1.544681	-4.156734	-3.50433	-3.181826	0.8001	NS	-7.967699	-4.16114	-3.506374	-3.183002	0.0000	I(1)

Note: NS denotes non-stationary at level.

Source: Author's computation using E-view 10 (2020)

Table 4: Stationarity Tests of Variables: Philips-Peron (PP) Test

Philips-Peron (PP) Test with Intercept only												
Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
$\partial \ln ump$	-1.100237	-3.57131	-2.922449	-2.599224	0.7086	NS	-8.853510	-3.574446	-2.92378	-2.599925	0.0000	I(1)
$\ln csi_{1524}$	-1.320309	-3.57131	-2.92245	-2.599224	0.6129	NS	-5.493822	-3.57445	-2.92378	-2.599925	0.0000	I(1)
$\ln csi_{2534}$	-1.695911	-3.57131	-2.92245	-2.599224	0.4270	NS	-7.233592	-3.57445	-2.92378	-2.599925	0.0000	I(1)
$\partial \ln csi_{1524}$	-5.466353	-3.574446	-2.92378	-2.599925	0.0000	I(0)	***	***	***	***	***	I(0)
$\partial \ln csi_{2534}$	-7.246629	-3.574446	-2.92378	-2.599925	0.0000	I(0)	***	***	***	***	***	I(0)
$\ln gdp$	-5.6257410	-3.57131	-2.92245	-2.599224	0.0000	I(0)	***	***	***	***	***	I(0)
$\partial \ln \inf$	-3.569265	-3.57131	-2.92245	-2.599224	0.0101	I(0)	***	***	***	***	***	I(0)
$\ln fdi$	-1.822673	-3.57131	-2.92245	-2.599224	0.3655	NS	-12.58604	-3.57445	-2.92378	-2.599925	0.0000	I(1)
$\ln eds$	-1.680866	-3.57131	-2.92245	-2.599224	0.4345	NS	-5.194501	-3.57445	-2.92378	-2.599925	0.0001	I(1)
$\ln gve$	-1.542945	-3.57131	-2.92245	-2.599224	0.5037	NS	-7.66886	-3.57445	-2.92378	-2.599925	0.0001	I(1)
Philips-Peron (PP) Test with Trend and Intercept												
Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
$\partial \ln ump$	-2.505727	-4.156734	-3.50433	-3.181826	0.3242	NS	-8.791549	-4.161144	-3.506374	-3.183002	0.0000	I(1)
$\ln csi_{1524}$	-1.155488	-4.156734	-3.50433	-3.181826	0.9084	NS	-5.579641	-4.16114	-3.506374	-3.183002	0.0002	I(1)
$\ln csi_{2544}$	0.559237	-4.156734	-3.50433	-3.181826	0.9992	NS	-8.478618	-4.16114	-3.506374	-3.183002	0.0000	I(1)
$\partial \ln csi_{1524}$	-5.550501	-4.161144	-3.506374	-3.183002	0.0002	I(0)	***	***	***	***	***	I(0)
$\partial \ln csi_{2544}$	-8.504491	-4.161144	-3.506374	-3.183002	0.0000	I(0)	***	***	***	***	***	I(0)
$\ln gdp$	-5.628830	-4.15673	-3.50433	-3.181826	0.0001	I(0)	***	***	***	***	***	I(0)
$\partial \ln \inf$	-3.511477	-4.15673	-3.50433	-3.181826	0.0492	I(0)	***	***	***	***	***	I(0)
$\ln fdi$	-3.133785	-4.15673	-3.50433	-3.181826	0.1101	NS	-12.63208	-4.16114	-3.506374	-3.183002	0.0000	I(1)
$\ln eds$	-1.10175	-4.156734	-3.50433	-3.181826	0.9183	NS	-5.35002	-4.161144	-3.506374	-3.183002	0.0003	I(1)
$\ln gve$	-1.602534	-4.15673	-3.50433	-3.181826	0.7776	NS	-7.92061	-4.16114	-3.506374	-3.183002	0.0000	I(1)

Note: NS denotes non-stationary at level.

Source: Author's computation using E-view 10 (2020)

Table 5: Optimal Lag Length Selection Criteria Results

Lag	LR	FPE	AIC	SC	HQ
Lag Length Selection Criteria Results for Model A (First Specification)					
Lag	LR	FPE	AIC	SC	HQ
0	NA	1.34E+02	24.76205	25.03493	24.86517
1	489.2257*	0.005143*	14.57307*	16.75614*	15.39806*
2	61.56094	6.98E-03	14.74925	18.84251	16.29610
Lag Length Selection Criteria Results for Model B (Second Specification)					
Lag	LR	FPE	AIC	SC	HQ
0	NA	4.50E+01	23.67202	23.94491	23.77515
1	455.8556	3.98E-03	14.31730	16.50037*	15.14229*
2	82.28018*	0.002885*	13.86563*	17.95888	15.41247
Lag Length Selection Criteria Results for Model C (Third Specification)					
Lag	LR	FPE	AIC	SC	HQ
0	NA	1.21E+01	22.3584	22.63395	22.46209
1	371.2067*	0.007326*	14.92538*	17.12981*	15.75492*
2	63.33507	0.009352	15.03127	19.16458	16.58666
Lag Length Selection Criteria Results for Model D (Fourth Specification)					
Lag	LR	FPE	AIC	SC	HQ
0	NA	1.12E+01	22.28105	22.5566	22.38474
1	383.9565	0.004890*	14.52112*	16.72555*	15.35066*
2	68.16957*	0.005367	14.47592	18.60923	16.03131

Table 6: Results of Bound Test Approach to Cointegration

Significance	Critical Value Bonds		Computed F-Statistic
Results of Bound Test Approach to Cointegration for Model A (First Specifcation)			
	Lower Bound I(0)	Upper Bond I(1)	
10%	1.99	2.94	3.631971
5%	2.27	3.28	
2.5%	2.55	3.61	
1%	2.88	3.99	
Results of Bound Test Approach to Cointegration for Model B (Second Specification)			
Significance	Critical Value Bonds		Computed F-Statistic
	Lower Bound I(0)	Upper Bond I(1)	
10%	1.99	2.94	3.533808
5%	2.27	3.28	
2.5%	2.55	3.61	
1%	2.88	3.99	
Results of Bound Test Approach to Cointegration for Model C (Third Specification)			
Significance	Critical Value Bonds		Computed F-Statistic
	Lower Bound I(0)	Upper Bond I(1)	
10%	1.99	2.94	3.508894
5%	2.27	3.28	
2.5%	2.55	3.61	
1%	2.88	3.99	
Results of Bound Test Approach to Cointegration for Model D (Fourth Specification)			
Significance	Critical Value Bonds		Computed F-Statistic
	Lower Bound I(0)	Upper Bond I(1)	
10%	1.99	2.94	3.405950
5%	2.27	3.28	
2.5%	2.55	3.61	
1%	2.88	3.99	

Source: Author's computation using E-view 10 (2020)

Figure 1: Model Selection Graph for Baseline Specification (Model 13)

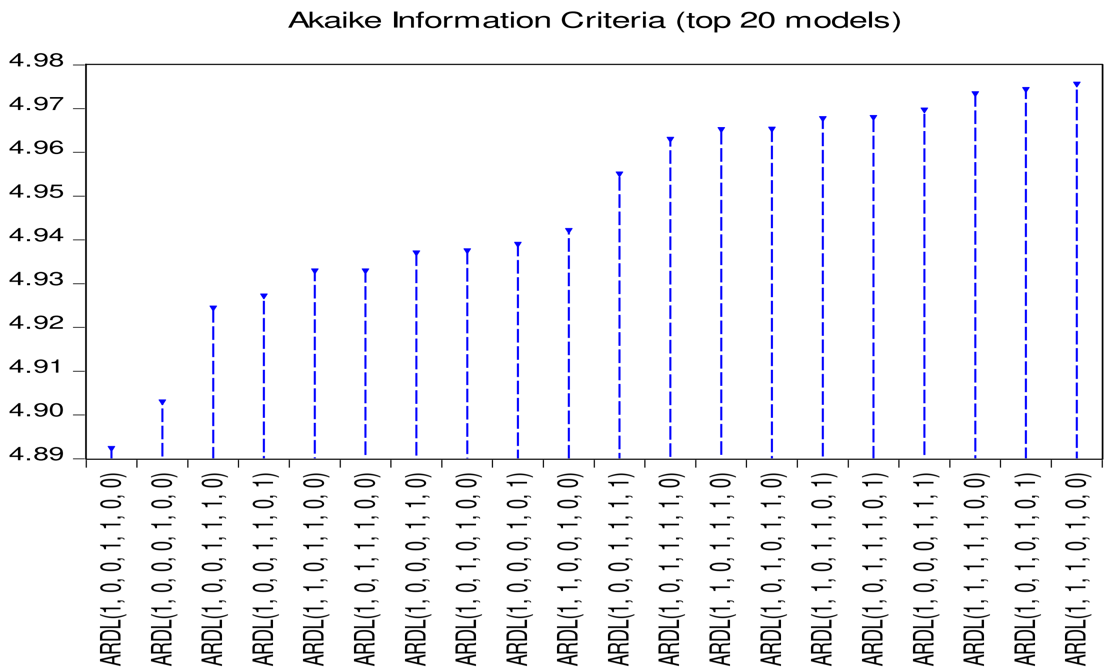


Figure 2: Model Selection Graph for Model 13 (Second Specification)

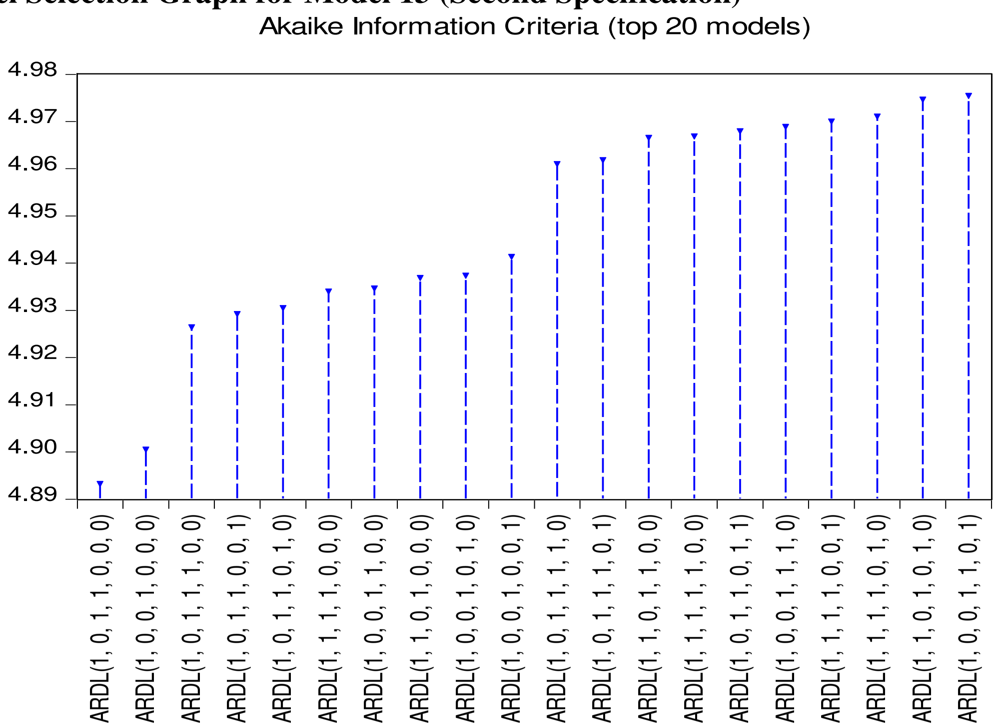


Figure 3: Model Selection Graph for Model 13 (Third Specification)

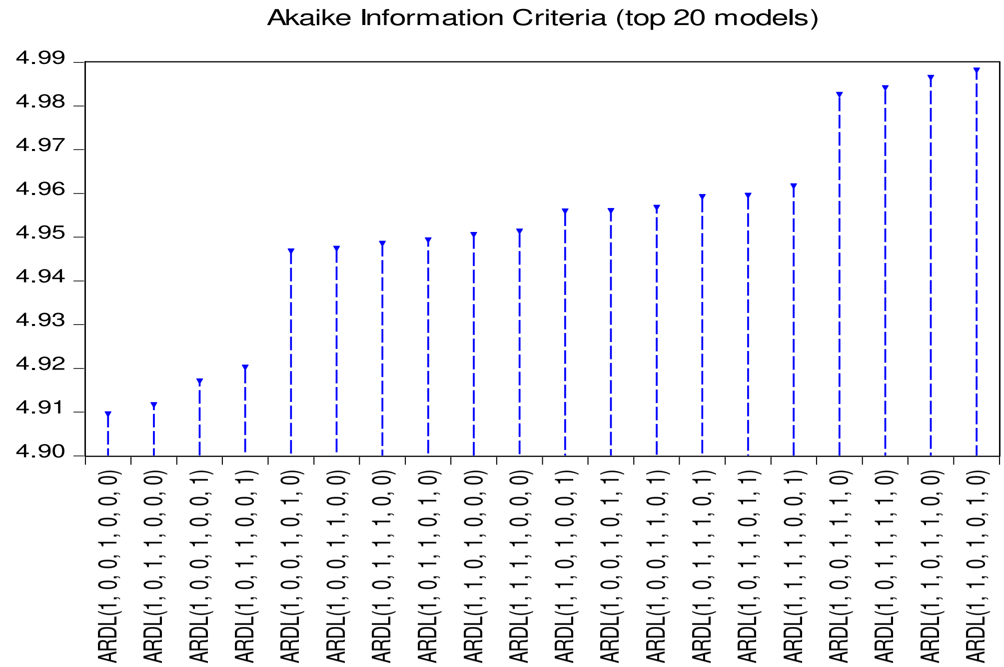
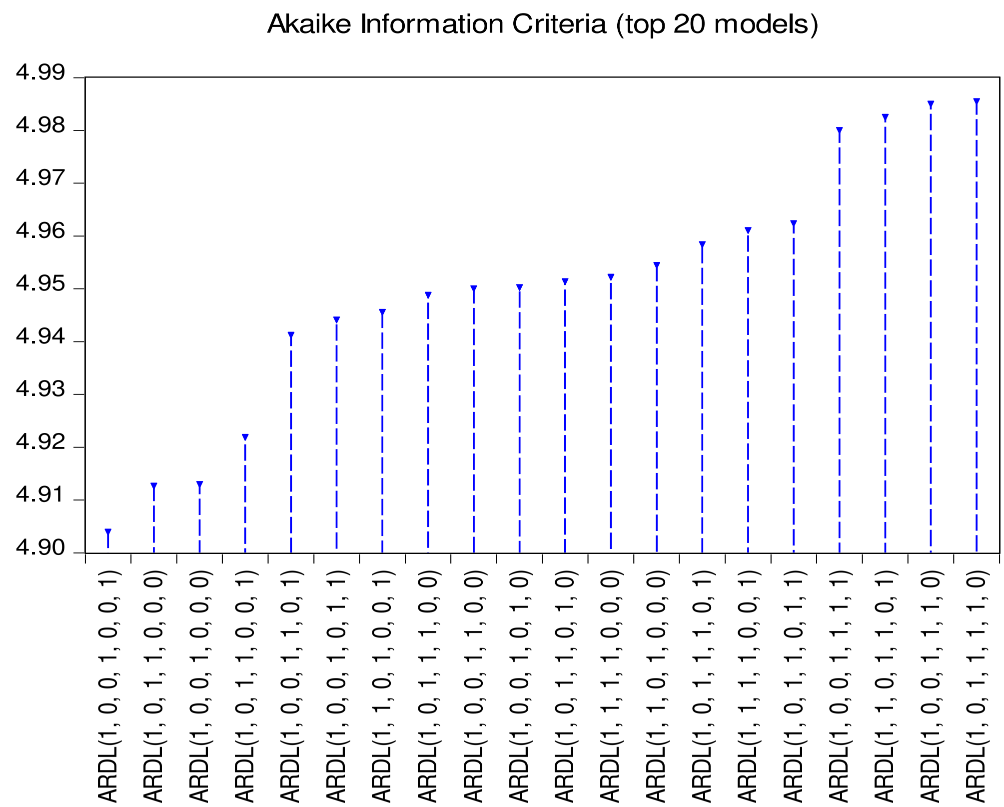


Figure 4: Model Selection Graph for Model 13 (Fourth Specification)



Source: Author's computation using E-view 10 (2020)

4.2 Long- and Short-Run Estimates

Sequel to the establishment of the existence of cointegration relationship, the numerical parameters associated with the selected ARDL models were ascertained. The estimated long- and short-run coefficients obtained {presented in tables 7 and 8 respectively below} are broadly similar, albeit with different magnitudes. For the purpose of comprehension, columns (I-IV) of the tables 7 and 8 respectively depict the long- and short-run estimates. Beginning with the error correction estimates, in all the four specifications, the coefficients of the error correction term, ECT (-1), follows a priori expectation. Consistent with theoretical explanations, as anticipated, they were all negative and statistically significant at 5 percent level suggesting that short-run disequilibrium is corrected in the long-run equilibrium.

On the relationship between cohort size and unemployment rate in Nigeria, as shown in the tables, in all the four specifications, it is evident that cohort size has an overwhelming positive and statistically significant impact on unemployment rate both in the short- and long-run, albeit with distinct magnitudes. In more specific terms, as anticipated, as regards model C, holding other things constant, a one percent increase in growth rate of youth-aged group 15-24 will bring about 15.879460 and 18.88026 percent increase in overall unemployment rate in the short- and long-run respectively, suggesting that the size of one's generation, has repercussions not only on (un-)employment outcomes of that particular group but also on other age groups in the country. By implication, in line with the Easterlin (1961) proposition, an increase in the percentage of youth in the working-age population raises the overall unemployment rate since the level of the unemployment rate is generally higher for younger workers (Ochsen, 2011). Similar findings were also observed in Barwell (2000); Fuchs and Weyh (2014); Simion (2015); Moffat and Roth (2014, 2017).

With regard to the control variables, an examination of the results presented in tables 7 and 8 below revealed that economic growth has a negative but statistically insignificant effect on unemployment rate as evidenced by the t-statistics and p-values both in the short- and long-run. As can be observed, according to model A, ceteris paribus, a one percent increase in RGDP growth rate will bring about 0.024688 and 0.189367 percent decrease in unemployment rate in the short- and long-run respectively. This negative but insignificant effect of real GDP growth rate on overall unemployment rate suggests low employment elasticities of economic growth in Nigeria. A plausible explanation of this reducing but statistically insignificant effect growth is that output growth in Nigeria is insensitive to the unemployment situation in the economy. Also, the high growth rate and a high unemployment level depicts the country over dependence on oil as its major source of revenue. A few proportion of the country labour force is captured in this sector thereby promoting the nation with its high unemployment growth. This result is in line with the study's expectation and consistent with economic theory as postulated by Okun's (1962) law and the findings of Lee (2000); Knotek (2007); Marinkov and Geldenhuys (2007); Noor, Nor, and Ghani (2007); Villaverde and Maza (2009); Oloni (2013); Hutengs and Stadtmann (2013); Doğru (2013);

Akeju and Olanipekun (2014); Ogbeide, Kanwanye, and Kadiri (2015, 2016); Onwachukwu (2017); Folawewo and Adeboje (2017).

As expected, a careful look at tables 7 and 8 below revealed that the elasticity coefficients of inflation rate both in the short- and long-run have the expected signs and are statistically significant. To be more specific, all other things being equal, with respect to model A, the results revealed that for a one-percentage point decrease in inflation rate, 2.022803 and 0.113977 percentage point increase in unemployment rate is induced in the short- and long-run respectively, suggesting that the so called "Phillips (1958) curve hypothesis" of an inflation-unemployment rates trade-off is validated in Nigeria. This result is in line with the empirical findings of Haug and King (2011); Furuoka and Munir (2014) for the case of Malaysia; and Raifu (2017) for the case of Nigeria. But it contradicts the findings of Umoru and Anyiwe (2013); Elliot (2015); and Folawewo and Adeboje (2017).

An insight from the estimated short- and long-run parameters suggests that impact of FDI inflow on unemployment rate in Nigeria most likely depends on its greenfield (whether the investments have been oriented towards the construction of new plants) and brownfield (transnational mergers and acquisitions of the existing facilities) structure. As anticipated, according to the four specifications, that the elasticity coefficients of inflation rate have the expected sign but statistically insignificant as shown by the t-statistics and p-values. With respect to model A, holding other things constant, a one percent increase in FDI inflow will bring about 1.470129 and 0.272431 percent decrease in unemployment in the short- and long-run respectively. Similar findings were also observed in other studies (see for instance, Chang, 2007; Ogbeide *et al,* 2015, 2016; Bayar, 2017; Zdravković *et al*, 2017)

On unemployment effects of external debt stocks, the empirical results not only validate the Keynesian's proposition but also invalidate the Monetarist and New Classical economists' expositions. As it were, in line with the study's expectation, in the long-run, the elasticity coefficients of external debt stocks were negative and statistically significant as shown by the t-statistics and p-values. To be specific, vis-à-vis model A, holding other things constant, a one percent increase in external debt stocks will bring about 1.953352 percent decrease in unemployment rate in the long run. By implication, an increase in unemployment arising out of lack of demand or recession may be prevented by means of the fiscal policies of the state aimed at employment boost (Topal, Bölükbaş, and Bostan, 2017). This result corroborates the empirical findings of Okonjo-Iweala, Soludo and Muhtar (2003); Folawewo and Adeboje (2017). Unlike its long-run negative significant impact, however, in all the four specifications, external debt stocks had a negative but statistically insignificant short-run impact on unemployment rate in Nigeria, suggesting that public borrowing should strictly be for capital projects that have the capacity to create jobs only (Ogonna *et al*, 2016).

Contrary to the predictions and expositions of the Keynesian economists' doctrine of demand management in the economy (Dornbusch *et al*, 2016), an insight from the results depicted in the tables 7 and 8 suggests that government expenditure seems to worsen and aggravate unemployment problem in the country, reflecting prolonged deficit-financing and rent seeking behaviour of Nigeria's economic and political elites. As evidenced in the tables, in contrast with the study's expectation, keeping other variables constant, in the long-run, with respect to the baseline model, it is observed that the elasticity coefficient of government expenditure is positive (4.966168) and statistically significant with probability value p = 0.0003 which is less than 0.05 (5%) level of significance and t-statistic t = 4.000028. This evidence of positive unemployment impact of government spending undoubtedly depicts the Nigerian economy where government workers and elected officials believe they have a right to a share of government revenues and use them to benefit their supporters, co-religionists and members of their ethnic group. Unlike its long-run significant impact, it has a negative but insignificant short-run impact on unemployment rate, still suggesting that government is spending a considerable portion of its revenue on defense, war against terrorism, and political expenditures. A variety of post-estimation diagnostics (autocorrelation, non-normality, heteroscedasticity and stability) tests were conducted to check the adequacy of the selected ARD models. As can be seen from the results presented in the lower segment of table 8 above and graphs depicted in figures 5-12 below, all the tests disclosed that the selected ARDL models possess the desirable BLUE properties.

Table 7: Estimated Long-Run Coefficients for the Selected ARDL Models

Explanatory Variables	Column I **Model A** **ARDL** **(1, 0, 0, 1, 1, 0, 0)** **Baseline Specification**	Column II **Model B** **ARDL** **(1, 0, 1, 1, 0, 0, 0)** **Second Specfication**	Column III **Model C** **ARDL** **(1, 0, 0, 1, 0, 0, 0)** **Third Specification**	Column IV **Model D** **ARDL** **(1, 0, 0, 1, 0, 0, 1)** **Fourth Specification**
$\ln csi_{1524}$	23.99040*			
	{4.463030}			
	[5.375361]			
	{{0.0441}}			
$\ln csi_{2534}$		16.409300*		
		{3.024087}		
		[5.426200]		
		{{0.0113}}		
$\partial \ln csi_{1524}$			18.88026*	
			{4.502100}	
			[4.193656]	
			{{0.0069}}	
$\partial \ln csi_{2534}$				27.8233*
				{9.120300}
				[3.050700]
				{{0.0307}}
$\ln gdp$	-0.189367*	-0.178517*	-0.179998*	-0.081764*
	{0.164725}	{0.162383}	{0.188597}	{0.182300}
	[-1.14959]	[-1.099358]	[-0.954406]	[-0.448516]
	{{0.2573}}	{{0.2784}}	{{0.3456}}	{{0.6563}}
$\partial \ln inf$	-0.113977*	-0.111869*	-1.059953*	-1.067065*
	{0.065916}	{0.065377}	{0.068145}	{0.662914}
	[-1.729131]	[-1.711147]	[-15.554377]	[-1.609658]
	{{0.0317}}	{{0.0359}}	{{0.0342}}	{{0.0232}}
$\ln fdi$	-0.272431*	-0.018643*	-0.595141*	-1.336572*
	{1.717478}	{1.856649}	{1.988249}	{1.870098}
	[-0.158623]	[-0.010041]	[-0.299329]	[-0.714707]
	{{0.8748}}	{{0.9920}}	{{0.7662}}	{{0.4792}}
$\ln eds$	-1.953352*	-1.733975*	-2.158214*	-1.996951*
	{0.702453}	{1.146939}	{0.883863}	{0.755582}
	[-2.780757]	[-1.5118284]	[-2.441798]	[-2.642932]
	{{0.0083}}	{{0.0088}}	{{0.0191}}	{{0.0119}}
$\ln gve$	4.966168*	4.363641*	5.123552*	5.03754*
	{1.241533}	{1.524973}	{1.52042}	{1.349261}
	[4.000028]	[2.861455]	[3.369827]	[3.733553]
	{{0.0003}}	{{0.0067}}	{{0.0017}}	{{0.0006}}
C	8.23235*	-17.3838*	6.443218*	22.21302*
	{6.5613}	{5.4592}	{3.33782}	{12.41655}
	[1.254683]	[3.184312]	[1.930367]	[0.627193]
	{{0.0482}}	{{0.0207}}	{{0.0439}}	{{0.0343}}
Goodness of fit Measures				
R^2	0.912792	0.912706	0.908313	0.913447
Adjusted R^2	0.892668	0.892561	0.889975	0.892948
F-statistic	45.35655	45.30731	49.53309	44.55975
Prob (F-statistic)	0.000000	0.000000	0.000000	0.000000
Durbin-Watson Stat	2.068726	2.025808	2.072917	2.091101
Diagnostic Statistical Checking				
Breusch- Godfrey serial correlation LM test	10.99259*** {{0.4100}}	12.03501*** {{0.2400}}	9.966404*** {{0.6900}}	3.891425*** {{0.1429}}
Breusch-Pagan-Godfrey test for heteroskedasticity	11.96902*** {{0.2151}}	10.26331*** {{0.3296}}	11.27995*** {{0.1863}}	10.56287*** {{0.3069}}
ARCH test for heteroskedasticity	0.954973*** {{0.3285}}	0.640474*** {{0.4235}}	0.43783*** {{0.8061}}	0.066623*** {{0.7963}}
Jacque-Bera normality test	0.263311** {{0.876634}}	0.625596** {{0.731398}}	0.578815*** {{0.748707}}	0.092244** {{0.954926}}
Ramsey RESET specification test	[0.987219] {{0.3372}}	[0.972033] {{0.3298}}	[0.705861] {{0.4845}}	[0.667836] {{0.5084}}

Notes:

1. { }, [ ] and {{ }} denote Std. Error, t-Statistic, Probability respectively
2. ***, ** and * depict Obs R-squared, Jacque-Bera Statistic and Coefficient respectively

Source: Author's computation using E-view 10 (2020)

Table 8: Estimated Short-Run Coefficients for the Selected ARDL Models

Explanatory Variables	Column I **Model A ARDL (1, 0, 0, 1, 1, 0, 0) Baseline Specification**	Column II **Model B ARDL (1, 0, 1, 1, 0, 0, 0) Second Specfication**	Column III **Model C ARDL (1, 0, 0, 1, 0, 0, 0) Third Specification**	Column IV **Model D ARDL (1, 0, 0, 1, 0, 0, 1) Fourth Specification**
ECM(-1)	-0.460594*	-0.526963*	-0.520422*	-0.512832*
	{0.081777}	{0.148522}	{0.117132}	{0.11381}
	[-5.632336]	[-3.548054]	[-4.44305]	[-4.506028]
	{{0.0000}}	{{0.0012}}	{{0.0001}}	{{0.0001}}
$\ln csi_{1524}$	3.710830*			
	{0.7369507}			
	[5.035384]			
	{{0.0001}}			
$\ln csi_{2534}$		24.437990*		
		{7.628616}		
		[3.203463]		
		{{0.0007}}		
$\partial \ln csi_{1524}$			15.879460*	
			{5.494869}	
			[2.889871]	
			{{0.0018}}	
$\partial \ln csi_{2534}$				7.923061*
				{5.09616}
				[1.554712]
				{{0.0003}}
$\ln gdp$	-0.024688*	-0.070888*	-0.047399*	-0.042289*
	{0.09602}	{0.079095}	{0.077004}	{0.076052}
	[-0.257112]	[-0.896243]	[-0.615536]	[-0.55605]
	{{0.7987}}	{{0.3764}}	{{0.5424}}	{{0.5819}}
$\partial \ln \inf$	-2.022803*	-1.303093*	-1.019746*	-1.025797*
	{0.202984}	{0.334306}	{0.206076}	{0.205883}
	[-9.965332]	[-3.897905]	[-4.948397]	[-4.982427]
	{{0.0017}}	{{0.0098}}	{{0.0043}}	{{0.0062}}
$\ln fdi$	-1.470129*	-0.806372*	-1.516774*	-1.201958*
	{1.2868}	{1.163112}	{0.922206}	{0.924366}
	[-1.142469]	[-0.693289]	[-1.644724]	[-1.300306]
	{{0.2615}}	{{0.4928}}	{{0.1095}}	{{0.2025}}
$\ln eds$	-1.861800*	-2.385280*	-1.306004*	-1.300639*
	{1.139123}	{0.991967}	{0.886521}	{0.873408}
	[-1.634415]	[2.404596]	[-1.473179]	[-1.489154]
	{{0.1117}}	{{0.2018}}	{{0.1502}}	{{0.1459}}
$\ln gve$	-1.223486*	-0.876647*	-1.301397*	-2.037968*
	{2.392718}	{2.024611}	{1.738788}	{1.755221}
	[-0.511337]	[-0.432995]	[-0.748451]	[-1.161089]
	{{0.6125}}	{{0.6678}}	{{0.4595}}	{{0.2539}}

Notes: *, { }, [ ] and {{ }} denote Coefficient, Std. Error, t-Statistic, Probability respectively

Source: Author's computation using E-view 10 (2020)

Figure 5: Plot of Cumulative Sum of Recursive Residuals CUSUM (Stability Test) for Model A

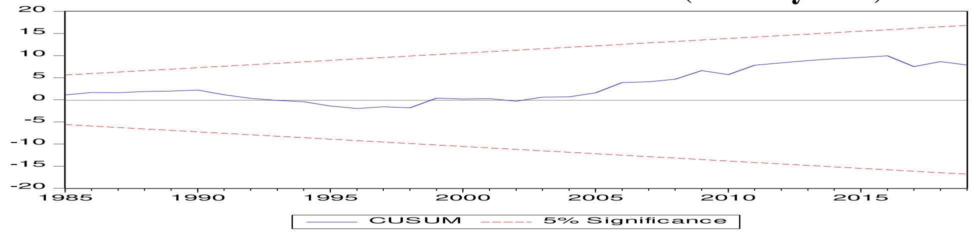


Figure 6: Plot of Cumulative Sum of Squares of Recursive Residuals CUSUMQ Model A

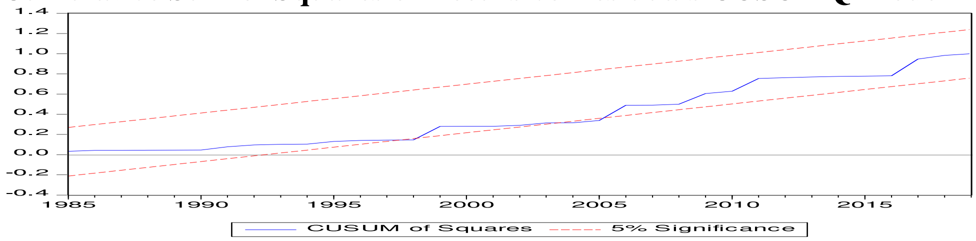


Figure 7: Plot of Cumulative Sum of Recursive Residuals CUSUM (Stability Test) for Model B

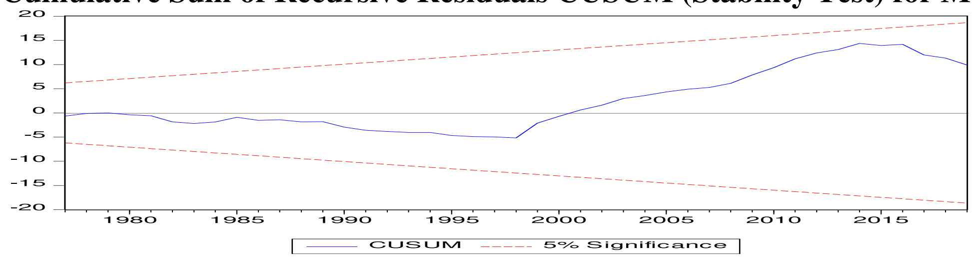


Figure 8: Plot of Cumulative Sum of Squares of Recursive Residuals CUSUMQ(Stability Test) Model B

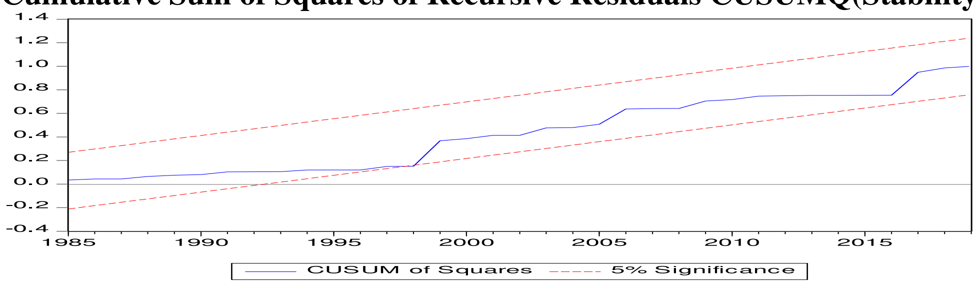


Figure 9: Plot of Cumulative Sum of Recursive Residuals CUSUM (Stability Test) for Model C

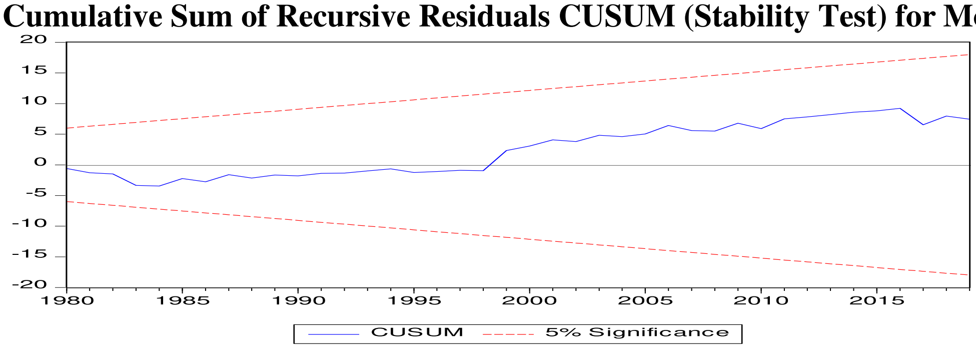


Figure 10: Plot of Cumulative Sum of Squares of Recursive Residuals CUSUMQ (Stability Test) for Model C

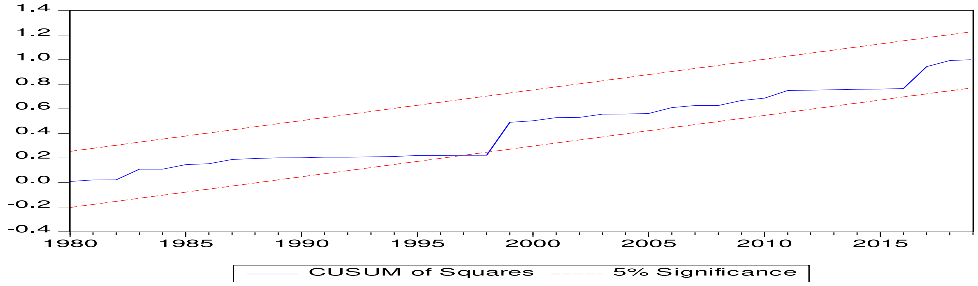


Figure 11: Plot of Cumulative Sum of Recursive Residuals CUSUM (Stability Test) for Model D

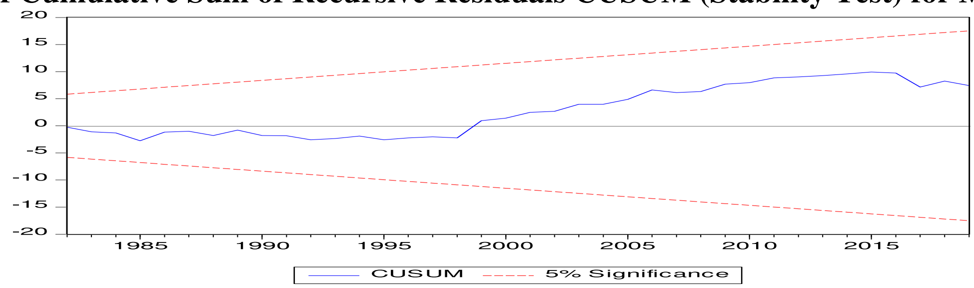
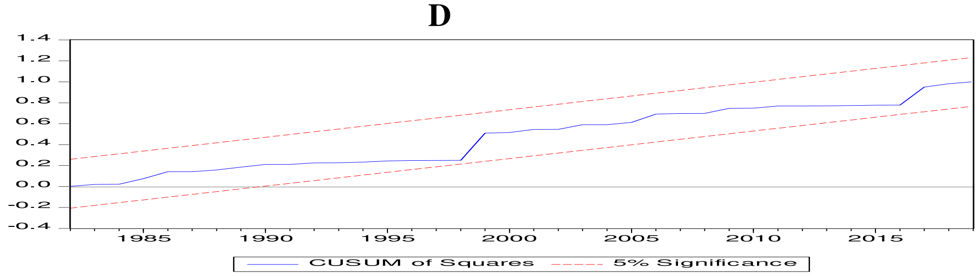


Figure 12: Plot of Cumulative Sum of Squares of Recursive Residuals CUSUMQ (Stability Test) for Model D



Source: Author's computation using E-view 10 (2020)

5. Conclusion and Policy Recommendation

The nature of the relationship between unemployment rate and the size of a specifically defined age group, or cohort, notably the young workers in the working-age population, has been a subject of an intense debate, widely studied and generated a sizable body of literature. However, while the debate is still inconclusive, an in-depth reading of these expansive extant and crescive literatures suggests that besides the contradictory findings, one of the major drawbacks with these literatures is that hardly any studies have been reported exclusively for African countries, particularly, Sub-Saharan Africa, as most of the extant literature principally focused on European, Asian, and American economies. Moreover, generalized studies across countries employing pooled data appears to dominate the literature. Using time series data spanning between the period 1970 and 2019, this study employs bounds testing approach to co-integration to examine the nature of the aforesaid relationship in Nigeria. Empirical results revealed that, in line with the Easterlin (1961) proposition, the size of one's generation, has repercussions not only on (un)employment outcomes of that particular group but also on other age groups in the country. In view of this finding, government should initiate and collaborate with the private sector to develop a functional microcredit scheme for the poor, especially the unemployed youths. Such a microcredit scheme should be robustly organized to enhance transparency and accountability in its management and flexibly structured to avoid unnecessary institutional bottlenecks and measures that prevent youths from accessing such credit facility.

Abbreviations

ARDL: Auto Regressive Distributed Lag; OECD: Organization for Economic Co-operation and Development; UNDESA: United Nations Department of Economic and Social Affairs; SSA: Sub-Saharan Africa; FDI: Foreign Direct Investment; GDP: Gross Domestic Product; RGDP: Real Gross Domestic Product; VAR: Vector Auto-Regressive; AIC: Akaike information criteria; HC: Hannan-Quinn criteria; LL: Log Likelihood; SIC: Schwarz information criteria; FPE: Final Prediction Error; ADF: Augmented Dickey-Fuller; PP: Philips-Peron; CUSUM: Cumulative Sum; CUSUMSQ: Cumulative Sum of Squares; ECT: Error Correction Term.

Author's contributions

The author read and approved the final manuscript.

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Availability of data and materials

The datasets for the study are available electronically and publicly. Data on real GDP growth rate and FDI inflow were sourced from World Bank Development Indicator. Data related to cohort, inflation rate, External debts, and government expenditure were compiled from the publication of Central Bank of Nigeria Statistical Bulletin (2019). Data for cohort size are obtained from the Africa Development Indicator.

Competing interests

The author declares no competing interests.

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