



Capital From Rest of The World and Potential Output: An Analysis of Nigeria Business Cycle BY

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Abstract

Developing effective macroeconomic policy framework to manage the Nigeria economy is essential. Several categories of capital resources from rest of the world are used for economic expansion. But in the midst of random shocks and other factors actual outputs deviate from potential domestic capacity to produce. The present paper provides new evidence that Nigeria actual output is below its optimal capacity to produce. It broadly investigates whether specific structures of capital from rest of the world and recorded historical random shocks return downward business cycle to natural long run output trend. Analytical data are sourced from World Bank development indicators while Hodrick-Prescott filter separates potential output from short term fluctuations for the period between 1970 and 2021. Specific data are drawn from External Debt, Foreign Direct Investments, Official Development Assistance and Gross Domestic Product. We employed standard Augmented Dickey-Fuller unit root test for stationary series. Subsequently, baseline Ordinary Least Square and Engle-Granger Cointegrating regression methods estimated the association between capital inflows and potential output. Preliminary result points to the fact that actual output either equated to long run GDP or deviated below aggregate capacity to produce. Our empirical estimation based on commonly used proxies of foreign capital showed positive and significant relationship with potential output. Also, random shocks positively contribute to potential output. Foreign direct investment and official development assistance provide greater contribution in returning output gap to standard equilibrium. Conclusively negative output gap is evident where current production is less than optimal capacity. Finally, capital from rest of the world is essential in adjusting equilibrium position of business cycle and natural long run growth rate in the Nigeria economy.

Keywords: Foreign Capital, Output Gap, Business cycle, FDI, External Debt **JEL Classification:** F3, E32, E21, H6,

Introduction

Existing productive capacity of countries is expected to maintain steady state growth in a sustainable way to achieve potential output level. However, this occasionally is not the norm where multiple macroeconomic dynamics appear to conditionally frustrate the extent an economy is projected to achieve a full scale long run growth. Conditioned by demand and supply shocks economies appear to perform three distinct motions. Global economy oscillates from the state of recovery to boom prior to recession. These states of nature are constant. On the other hand, Nigeria economy and rest of the world can

be on any of the tracks with time. It is an integral nature of business cycle. National income is a standard gauge of economic performance. Policy papers (Popov, 2017) and empirical studies quite often employ aggregate gross domestic product (GDP) for analysis involving the worth of a country's wealth generated by arrays of real sector productivity (Bordo & Meissner, 2007; Prasad *et al.* 2007; Chimobi, 2010; Raza, & Jawaid, 2014; Akeju, & Olanipekun, 2014). Observed cyclical fluctuations challenges longstanding reliance on GDP as precise economic performance proxy. Cyclicity

introduces bias and distortions around real sector information. The impact of the dynamics could either influence current level of outputs in the direction where actual output equates to long run potential GDP or in some instances where productive inputs generate gross national output that is either below the capacity of the economy to produce or widely overshoots it. Any deviation is generally referred to as output gap or business cycle. Output gaps is a fundamental macroeconomic issue engineering the study of economy's outputs relative to its potential at the aggregate level. Therefore, at every instance of time the economy is under three probable possibilities: (1) When short run real GDP is equivalent to long run real GDP (2) The short run real GDP is less than natural real GDP (3) short run real GDP is larger than long run real GDP. The last two states of nature are business cycles commonly responsible for inflationary or deflationary tendencies. Unfortunately, large number of empirical studies and perhaps macroeconomic theories concentrate on discussing factors¹ influencing economic growth of nations (Levine, 2005; Acemoglu, Johnson, & Robinson, 2005; Rousseau & Wachtel, 2005; Badun, 2009). Subsequent empirics- Whiteley (2000); Howitt (2010); Tavani and Zamparelli (2018) in the current decades continued in the tradition of conducting test to validate or falsify economic growth theories.

Output gaps could have lingered in the shadows not until the development of ²Hodrick-Prescott filters provided solution that detrends stochastic cycle from the long run real GDP. Successful decomposition of actual GDP into a detrended series may not imply underlining reasons associated with observed cyclicity in the potential outputs in Nigeria. A fundamental consideration lies in understanding influential factors in the macro environment. Discussions have presented different dimensions of output gap determinants unique to different countries (Abebaw, 2021). Trade openness, FDI and

¹ Numerous groundbreaking studies on conditions for economic growth dominated macroeconomic discussions in the middle and ending part of 20th century. Harrod (1948, 1959) written seminal paper details classical economics insight on causes of growth in different countries. This is captured in what later emerged as Harrod-Domar growth model. Solow (1956) made crucial contributions and other subsequent theoretical papers until alternative endogenous growth model developed in the field of economics to complement exogenous view popularized by classicals. Howitt (2010), Roberts and Setterfield (2007) complemented Romer (1986, 1990) endogenous growth theory and endogenous technological change. Solow (2000) aggregated landmark papers in economic growth theory.

² Hodrick and Prescott (1997) usually referred to as HP filter is a mechanical statistical tool for smoothing macroeconomic cyclicity in gross domestic product. It is rated higher than other competing alternatives in separating permanent component of output from cyclical values with better degree of accuracy.

inflation individually show highest negative or positive correlation with actual output's inconsistent deviation from its potentials in Ethiopia (Gokse & Ozturkler, 2012; Abebaw, 2021). Despite numerous front-line conditions behind the deviation of short run outputs from potential productive capacity, capital flows from rest of the world could give impetus to disequilibrium existing between business cycle and standard capacity to produce. International capital flows have been subject of intense policy discussions since the COVID-19 (Salik, 2019; Djiofack, Dudu & Zeufack 2020; Abiad *et al.* 2020; Noy *et al.* 2020; Bolton *et al.* 2020). It is a common knowledge that Nigerian government and other developing countries' enormous dependence on foreign capital notwithstanding the implication of the intrinsic attributes of each capital variant.

Our research enters this debate by showing that specific structures of foreign capital in combination with historical random shocks could have disproportionate effects in the real output³. In particular, we seek to eliminate fluctuations in GDP which accommodates business cycle information such that we replace traditional aggregate GDP with potential output⁴. We explore whether capital from rest of the world⁵ and several random shock events lead to a deviation of cyclicity back to potential output. Output gap can have serious macroeconomic policy implication. Deviation of long run GDP from its trend values in either upward or downward directions attracts attention of monetary policymakers. Difference in short run real GDP from natural real GDP could either induce inflationary tendencies or recessionary conditions.

The remainder of this paper progresses according to sections. In section 2, it reviews and assesses available literature on output gaps and further discusses conceptual framework of foreign financing and output gaps and theory. Section 3 discusses data issues and econometric techniques aimed at

³ There are series of random shocks in Nigeria at different dates. First, the study's attention is drawn to disorderliness of the civil war (1970); the oil boom that suddenly brightened Nigerian economic fortune with unprecedented inflow of foreign exchange; military regimes toppling each other (1975/76, 1983,1985,1993), IMF entry and Federal Government deregulation, global financial crisis, rebasing, economic recession and COVID-19.

⁴ Ahmad and Sharma (2018) employ output gap as perfect proxy for business cycle in IBSA (India, Brazil, South Africa) and G7 analysis. Evidence concludes that US economic policy uncertainty explains variations in stock returns.

⁵ Capital from rest of the world, foreign financial resources or foreign capital inflow are used interchangeably. The concept involves inflow of resources from other countries' citizens, governments or multilateral agencies or group of governments representing claims, donations or private investments.

estimating foreign capital inflows and output gap relations. Discussion is also expanded to involve Hodrick-Prescott filter technique to detrend GDP series. A progress to sections 4 and 5 presents statistical estimates and evidence-based discussions. First part in section 4 is also dedicated to examining in perspective forms of business cycles prevalent in Nigeria volatile economy. It ends in 5 as conclusion and policy suggestions.

2 Literature and References to Empirical Studies

We conceptualize international capital inflows from the perspectives of foreign direct investments (FDI), sovereign external debts and foreign aids as part of instruments. International capital inflows constitute class of foreign resources invested by citizens, economic institutions or governments of rest of the world into another economy for economic rewards or assistance purposes in advancing diplomatic relations.

External debt can be conceived from official and private standpoints. In presenting conceptual clarification on external debt. There are four possible dimensions: the first focuses on the composition of the debt stock. External debt is the amount of public and publicly guaranteed loans which has been disbursed, net of cancelled loan commitments and repayments of principal. A second definition concentrates on the currency which the debt is issued. External debt is defined as foreign currency debt. As it concerned the current paper external debt is repayable or cancellable financial obligations owed to non-residents abroad or their governments. Broadly, external public debts originate with surplus resources of citizens from other countries received out of bilateral or mutual understanding of two governments. External debts in Nigeria are accumulated as a result of fiscal expansion activities of the government. However, it is a matter of contradiction if huge foreign debts result in output expansion. Panizza and Presbitero (2012) assert that debt-raising fiscal expansions can decline growth in the long-run, and thus partly (or fully) negate positive effect of fiscal stimulus. Mohsin *et al.* (2021) concludes that external debt stock exerts positive influence on growth in some Asian countries but not external debt. Debt has negative and insignificant influence on output growth in Oman (Kharusi & Ada, 2018). On the contrary external debt is positive but not significant in the Nigerian pursuit for stable growth (Sulaiman & Azeez, 2012).

Foreign aid is an official financial or technical assistance from donor governments in OECD or Development Assistant Countries (DAC). It is part of international policy issues beginning from the 1950s and since then United States, Germany and Japan substantially increased their commitments. The aim is to pursue developmental priorities in Low-income countries. An Official Development Assistance (ODA) represents financial transfers of sovereign

governments or group of nations or their multilateral agencies to recipient countries. ODA is a share of gross national product of donors. Such huge financial package is attached with conditionality as regards to the purpose of the funding. It is an aspect of international diplomacy. Following OECD official document, we conceptualize ODA based on structure: bilateral and concessional aids. Concessional aids consist of grants and soft loans. Grants is an aspect of capital transfer, goods or services to a foreign country resulting in incurring neither immediate nor future obligations requiring the making of similar transfer from the recipient government to the donor country. Thus, concessional inflows are international lending on terms more favorable to the borrower than those received through normal market transactions. It is expected that committed act of recipients would foster increase in productivity such that gaps in outputs are streamlined into long-run projected growth.

A sustained entry of any of the constituents of international capital into a new economy largely reacts to shocks from the global environment. Recent exogenous shocks with global spreads are the COVID-19 pandemic and year 2009 economic meltdown. In the pre financial crisis and COVID-19 periods sequence of breaks are known to have occurred especially during oil booms in Nigeria, but contraction in industrial economies. In the post COVID-19, the unexpected Russian invasion has total impact which appears to be tougher in the US, UK, Canada and Europe (Pereira *et al.* 2022; Mbah & Wasum, 2022). It carries chains of ripple effects spreading to the global economy coupled with instantaneous reaction of the entire financial system of the world (Guenette, Kenworthy & Wheeler, 2022; Izzeldin *et al.* 2023). Sharp economic contraction from random events fueled cyclical dynamics that impacted businesses and the distant economy. COVID-19 exposed the vulnerability of industrial economies and their capitally weak counterparts. Unprecedented contraction in general outputs abroad narrowed capital expectation of foreign aid dependent countries. By affecting international capital measures, a structural break⁶ is induced, likewise long run potential GDP can be distorted.

⁶ Abrupt change due to unexpected international conditions have been reported in the past which carries information in timeseries analysis. In the global environment asymmetric shocks randomly impact on foreign financial resources from source countries but transmitted into recipient productivity. Most random shocks converge to terminate a long run trended series in financial variables. Industrial economies' energy crisis of 1970s negatively disrupted economic deterministic trends. Postali and Picchetti (2006) observe structural breaks in oil prices. Banerjee and Urga (2005) present developments in structural breaks modelling on volatility.

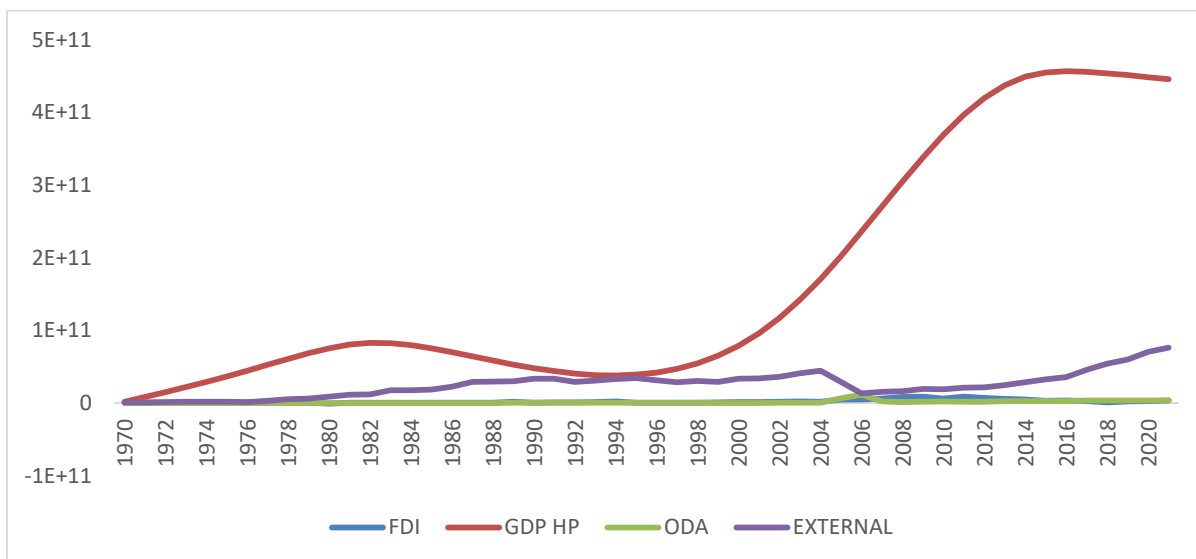


Figure 1: Foreign Financial inflows and Detrended output

In figure 1, we present three measures of foreign financial resources in Nigeria and a out gap corresponding to HP filter calculated for a single degree of smoothness as found in literature ($\lambda = 100$). All variants of foreign resources are far below output. External debt stock exceeds all other categories of foreign resources while development assistance and FDI are quite low. The current level of outputs in an economy and debt level influence inter-temporal decisions of the government. This is as it concerns whether to finance fiscal deficits from debts or raising taxes. It appears on the chart above that Nigeria remains credit-worthy to contract more sovereign debts from international sources. The 1992-96 periods indicate equilibrium position of debt and outputs where intended use of more debts could be for fiscal expansion. Economic theory shows that at certain threshold debt is no longer feasible, thus, a significant factor depressing GDP growth (Reinhart & Rogoff, 2010,2011).

2.1.2 Foreign Direct Investments and Size of Nigerian GDP

According to World Bank (2020) direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Multinational Corporations (MNCs for short) with superior technology and advanced management technique spread foreign direct investments (FDI) to host economies for motives ranging from resource-seeking, efficiency-seeking FDI in Nigeria especially in the oil and gas industry and market seeking motivations. Energy companies have huge investments into crude oil development and generation. Beyond the oil industry the open economy of Nigeria means that several other corporations have investments in different sectors. With economic liberalization, resource-rich developing countries, economies in transition,

emerging markets are reaping desirable advantages of hosting FDI as a source of economic development and modernization, income growth and employment under such structural policy development. The relationship between FDI and growth builds on vast theoretical foundations. Host-country effect of FDI has given clue on empirical understanding of FDI and growth. According to the UN (2003) FDI has enormous potential to create jobs, raise productivity, enhance exports and transfer technology, foreign direct investment is a vital factor in the long-term economic development of the developing countries". The views are consistent with evidence that FDI correlates with growth (Alfaro *et al.* 2010; Seetanah & Khadaroo, 2007; Hamid *et al.* 2021). FDI advances the course of globalization by way of integrating backward nations into global economy.

2.1.3 Theoretical and Empirical evidence on finance and output gaps

The theoretical foundation of output gap is embedded in production function. Cobb-Douglas A gap in output is a slack from potential output level driven by strong or weak demand. Common assumption is that slack in actual output from potential are caused by demand conditions (positive or negative demand shocks), although temporary disruptions on the supply side may also be involved (IMF, 2014). A potential output is consistent with current stable rate of inflation. Production function analyzes the technical relationship between inputs and output. Conventional understanding is that actual level of output (or income) can be below the potential level, if for some reasons there is a high degree of unemployment of labor and low utilization of the capital stock. Conversely, in times of very strong demand, factors of production may be employed in quantities in excess of their normal intensities, pushing total output above its potential

level for a limited time. The mathematical expression is written as:

$$Y = AF(K, L) \quad (1)$$

The relation states that real output (Y) grows with increases in the availability of capital (K) and labor (L) and with technological and other improvements (A) as Total Factor Productivity (TFP). The TFP brings together all other implicit factors (technology institutions and human capital) that are important for the transformation of capital and labor inputs into outputs. Foreign financial resources have large share of capital stock financing. Availability of financial resources improves hiring of labour by economic agents. Labour manipulates physical capital stock in the production function.

Considering the different mathematical methods of arriving at output gap, Mink *et al.* (2011) research application of measurement of output gap in Euro area. The paper proposed that adoption of differences in the signs and/or amplitudes of the output gaps to be more coherent than correlation coefficient. Bernhofer *et al.* (2014) applied a novel concept of finance-neutral and finance-augmented output gaps on four advanced and four Central, Eastern and Southeastern Europe. The results are found to considerably strengthen the case for considering the financial sector in business cycle measurement. Bhatti *et al.* (2021) conducted vast comparison of (low, lower- middle, and upper-middle-income countries). The panel GMM estimates show output gap impedes inflation. A second model of the study foreign globalization and the foreign output gap are found to boost overall low-income, middle-income, and upper-middle-income groups. Osman *et al.* (2011) estimated output gap of UAE using production function and proceed to examine extent fluctuations in output is an indicator of inflation. The backward-looking Phillips curve equation observed that output gap profile produced by the production function method strongly fits well with the UAE's recent economic history of peaks and troughs. But despite having expected sign it did not translate to significance. Ahmad and Sharma (2018) conclude that output

gap and US economic uncertainty can explain variations in stock market returns of IBSA and G7 (India, Brazil and South Africa). Goksel and Ozturkler (2012) analyze the crises and the boom periods of Turkey in terms of output gap. The study concludes that according to the length of downturn and recovery periods, the worst crisis is the 2001 but after recovering from 2008 financial crisis actual real GDP remains higher than the potential GDP for 5 successive quarters.

3 Data and Econometric Techniques

For clarity this paper analyzes output gap association with variations in foreign financial inflow in the midst of asymmetric shocks. World Bank institutional archives facilitates data availability published in World Development Indicators. External Debt stock, foreign direct investments, GDP at current USD and Official development assistance are foreign financial capitals in dollar denomination. Data period covers 1970 to 2021. A detailed description of dataset can be found in the metadata series definition in the World Bank. To extract output gaps, it is an accepted practice to use non-parametric filtering methods such as the pioneer high-pass filter developed by Hodrick and Prescott (1997). The HP belongs to univariate non-structural methodological approach of studying univariate properties of real GDP. An example include peak to peak method and linear trending. There are methodological diversities and estimates in arriving at the output gap computation. HP-filter in particular is a notable detrending formula. We use HP filter (with smoothing parameter $\lambda = 100$ for annual data) in the body of analysis and configure it to extract all cycles with duration of 1970-2021 years. HP filter has enjoyed extensive attention in explicitly receiving cyclical component from the model. HP implemented by software packages is probably the best-known and most used statistical filter to obtain a smooth nonlinear representation of a time series.

The general mathematical notation of HP containing both growth and cyclical components is expressed as:

$$y_t = \text{Min } g_t \left\{ \sum_{t=1}^T C^2 + \lambda \sum_{t=2}^{T-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2 \right\} \quad (1)$$

The relation is interpreted as sum of the squared deviations of the economic series, y_t (log of actual output) from underlying trend value, g_t (log of trend real output). Our focus is to provide structural model showing association between explanatory variables and detrended GDP. We use it to analyze foreign financial inflow as a lead macroeconomic indicator that can predict changes in economic activity – external debt stock, official development assistance and foreign direct investments. We summarize the relationship in the expression:

$$\text{LnGDP}_{HP-filter} = f(\text{ODA}, \text{EXTERNAL DEBT}, \text{FDI}) \quad (2)$$

We further illustrate our argument by building econometric specification following Abebaw (2021) determinant model. The baseline regression equation takes logs of both sides expressed as:

$$\text{LnGDP}_{HP} = \beta_0 + \beta_1 \text{FDI}_1 + \beta_2 \text{ODA}_2 + \beta_3 \text{EXTERNAL DEBT}_3 + \mu_t \quad (3)$$

Where the subscript t runs over observations $i = 1, \dots, T$ (T is the sum of the series observations). We augment the baseline regression by accounting multiple random shock variable. The robustness check model takes log of both sides of the following linear regression equation:

$$\text{LnGDP}_{HP} = \beta_0 + \beta_1 \text{FDI}_1 + \beta_2 \text{ODA}_2 + \beta_3 \text{EXTERNAL DEBT}_3 + \beta_4 \text{SHOCKDUM}_4 + \mu_t \quad (4)$$

where; LnGDP_{HP} logarithm of detrended GDP free from short-term fluctuations; FDI represents foreign direct investments; ODA implies official development assistance; SHOCKDUM stands for multiple random shock dummy given unique events peculiar to certain periods; μ_t is error term; $\beta_1 - \beta_4$ depicts unknown slope parameters and are expected to yield slope of the regression line. The signs of the betas would have implication to potential output in Nigeria. Historical observation on graph plots (fig. 3) indicates downward deviation of the business cycle portion in actual output to the negative direction. An empirical expectation would imply that positive betas in capital resources from rest of the world and shocks counteract downward drifts and resultantly forces a return to potential output. It is otherwise if betas are negative.

We employ Engle-Granger (or EG) residual-based single equation model of long-run test to detect the presence of unit root in the residuals of cointegrating regression among the levels of economic series⁷. The residual is estimated to establish cointegration between foreign financial variables and detrended GDP. EG cointegrating method uses a parametric ADF approach. The generating mechanism of Engle-Granger model in this study follows the estimation of long-run equilibrium OLS as:

$$Y_t = \beta_0 + \beta_1 Z_t + \mu_t \quad (5)$$

Equation (3) generates residuals from linear combination of regressors. To test if the residuals are stationary, we recreate equation (5) into a single model into:

$$\mu_t = Y_t - \beta_0 - \beta_1 Z_t \quad (6)$$

Engle and Granger (1987) then recommend the use of ADF as part of procedures for cointegration test and computed various critical values. Where; μ_t is $I(0)$ in the ADF $Z(t)$ is significant if the variables are cointegrated; has unit root if otherwise.

4 Statistical Estimates and Interpretation

4.1 Output Gaps in the Nigerian Economy and Sources of Shocks

The Nigerian economy and its productive activities present visualize possibilities for fluctuation. Output gap is a general measure to track the extent an economy is operating at an unsustainable level of resource utilization, but this is often empirically expressed as the deviation of actual output from trend⁸. A look at the HP-filter graph in figure 2 and 3 shows cyclical events over time. It specifically detected the gap in outputs. It occurs in phases where real output is different from natural real outputs (figure 3). The short run business cycle situation in figure 3 became very wide from year 2000. However, the natural long run output equated to short run GDP around 1970 before the gap existing between 1972 to 1980. Equilibrium was re-established in 1982 marked by intersection of the detrended series and its cyclical component. At that point short run actual real outputs equated to long run possible outputs. Beyond 1981, the two trends widened from each other such that the gaps between detrended GDP and HP cycle sustained a narrow difference. From year 2000 the

⁷ Philips and Ouliaris (1987) formulated alternative to ADF τ -ratio test recommended in Engle-Granger and further develop asymptotic theory covering the null of no cointegration and the alternate of a cointegrated system. The authors argue that residual based cointegrating test is convenient to apply and intuitively clear to test what it set out to test compared to Likelihood ratio test considered by Johansen (1988) in VAR context. See also for example MacKinnon (1990).

⁸ Fisher *et al.* (1997) reveals that at ad hoc analyses the output gap is often measured as positive when output is below trend. But alternatively, the gap measures how near the economy is to maximum capacity ceiling; thus logically bounded at zero and always defined as positive.

Nigerian real output has not caught up with natural real output (real GDP in the long run). The two components- actual and possible outputs rather deviate significantly. The period 2014 till 2021 show extreme deviation.

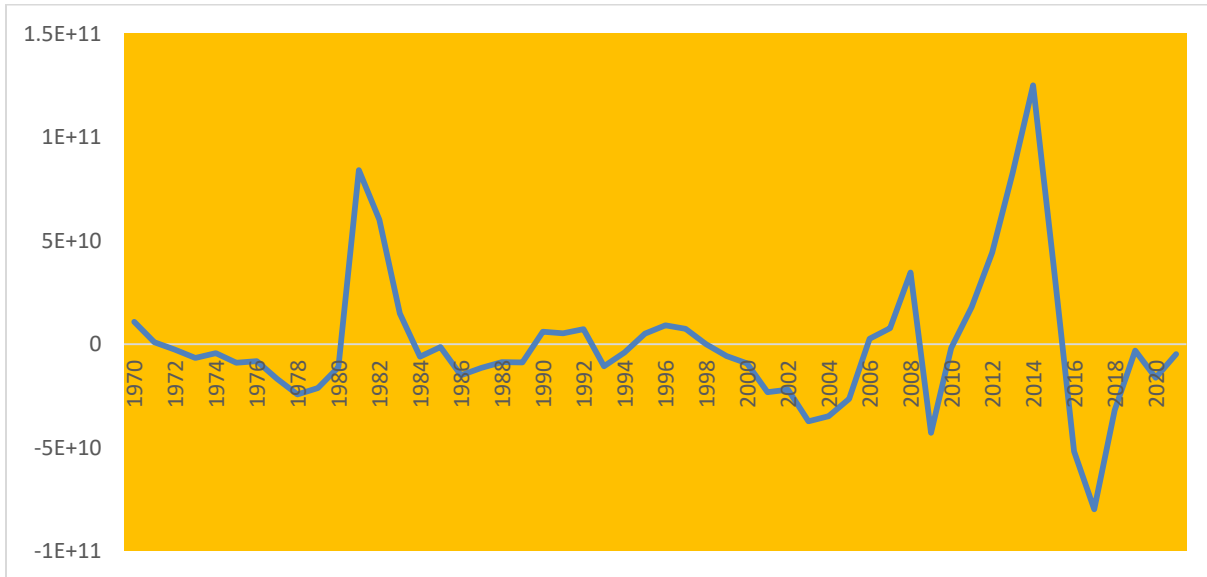


Figure 2: GDP cyclical component production function approach

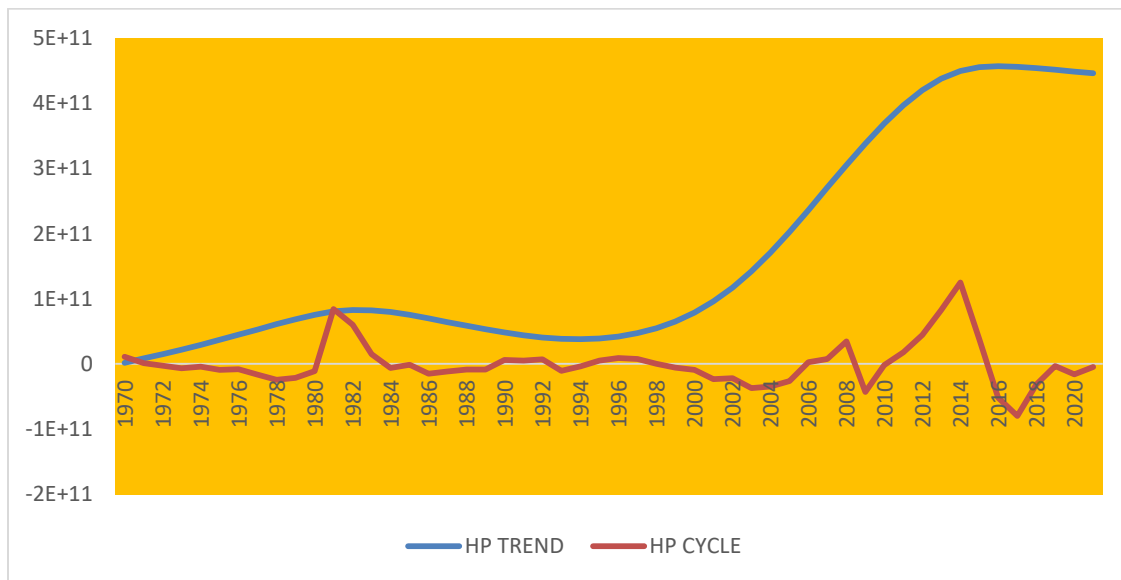


Figure 3: Comparison of detrended GDP and cyclical fluctuations Hodrick-Prescott filter

Our graphical information further shows that Nigerian economy exhibits 2 of the 3 possibilities (figure 3). The first is equality of short run actual outputs to long run possible outputs (1970 and 1981 business phase). It means there is no gap. Second, short run real output is less than natural long run output or business cycle is lower than natural productive capacity of Nigeria. Actual output is far worse than possible outputs. It implied Nigeria is generally producing less goods and services compared to available domestic capacity to produce. Thus, it can be inferred that Nigeria has recessionary gap which became more prominent in 2016. Consequently, there is higher rate of unemployment in a prevailing low or negative economic growth (see figure 2).

Some unexpected events are known to trigger cyclical combinations. In the recent times political and asymmetric shocks impact on the business sector and the wider economy. Global financial crisis and consequent economic meltdown disrupted the US economy even distant countries fell victim. Global financial crisis caused an immense instability in markets (Ozturk & Sozdemir, 2015). Dominant opinion among macroeconomists is that financial crisis causes real economic activity to collapse (Adamu, 2009; Gros & Alcidi, 2010).

BIG and small economies struggle to rebound in the aftermath⁹. Random shocks from local and international origins creates economy uncertainty. Hall (2010) asserts that financial frictions that occurred in the crisis of late 2008 generate declines in real GDP and employment.

Lockdown on Corona virus outbreak produced one of the worst economic emergencies across industries. Nigerian economy seemed momentarily insulated during financial crisis of 2008. Globalization helped transfer the economic crisis to Nigeria. It occurred in the midst of declining oil prices and fall in demand in the energy market (Ozili, 2021). Businesses hit by the pandemic relied on government bailout. The effect may be more destructively profound in some countries than others in death rate and economic costs (Feyisa, 2020). China had promising economy before COVID-19 struck (Dhar, 2020). Businesses already operating high-risk environment losses investments that further deteriorates national outputs. COVID-19 posed biggest threat to international economy (Bagchi,2020) and worsens poverty situation (Kanu, 2020; Kabir *et al.* 2020; Buheji *et al.* 2020; Yoosefi, *et al.* 2021). The consequence is that economies' recovery process would pass through cyclical phases where major macro-variables have been impacted.

Table 1: Correlation Estimates

		(1)	(2)	(3)	(4)
External Debt	(1)	1.0000			
Foreign Direct Investments	(2)	0.4854	1.0000		
HP-filter Detrended GDP	(3)	0.6471	0.7712	1.0000	
Official Development Assistance	(4)	0.5028	0.8518	0.7387	1.0000

The estimates in table 1 above compares degree of association between variables. The foreign capital proxies all have positive correlation at varying degrees. On an individual level correlation coefficient ranges between 0.4854 for FDI and strong 0.8518 for Official development assistance. FDI and external debts have weak correlation coefficient ($r = 0.485$) which is below average. Conversely, it is not the same in other variables. There is high correlation between detrended GDP and external debt ($r = 0.7712$); between development assistance and FDI ($r = 0.8518$) which is close to unity. Lower coefficient might indicate that sources of foreign capital inflows are not similar or related. In principle, one would fairly expect that all the financial variables originating with foreign sources would logically yield endogenous association.

Table 2: ADF stationarity result

	<i>Test statistics</i>	<i>1% Critical value</i>	<i>5% Critical value</i>	<i>10% Critical value</i>
	<i>Z(t)</i>			
Δ (External Debt)	-4.336656[0.0061]	-4.152511	-3.502373	-3.180699
Δ (Foreign direct investment)	-8.490799 [0.0000]	-4.152511	-3.502373	-3.180699
Δ (Gross domestic product)	-4.151976 [0.0014]	-4.165756	-3.508508	-3.184230
Δ (Official Development Assistance)	-7.625757 [0.0000]	-4.156734	-3.504330	-3.181826

⁹ Financial Crisis Inquiry Commission comprising 10-member panel setup by the United State government reports that for more than two years after the crisis, families and communities across the country continues to experience aftershock. Millions of Americans lost their jobs and homes, and the economy struggles to rebound. Please see- financial crisis inquiry report: The final report of National Commission on the causes of the financial and economic crisis in the United States...

[] represents MacKinnon approximate p -value for $Z(t)$; Δ first difference operator

Estimating the unit root of each series explains conditions to which further empirical long-run association is possible and choice of method. Table 2 presents first-difference order of integration for all series. The principle leading up to confirming a first-order difference is the rejection of null of unit root and an acceptance of the alternate. This is on comparison between ADF $Z(t)$ each series against corresponding 1%, 5% and 10% critical values. The ADF absolute values exceed all critical values, hence rejection of the null hypothesis.

4.2 Baseline OLS Estimation Result

It is a standard practice to take log of the explanatory and dependent variables in the econometric specification. We do this to conveniently interpret coefficients as elasticities. Before taking the result seriously, however, we need to check if the regression result has all the desirable properties. Some of the summary statistics of this regression are as follows: Adjusted- $R^2 = 0.694948$, D.W. = 0.412351; F -statistic (p -value = 0.0000); Chi-square (p -value = 0.0000); VIF = 1.446143. In the reported diagnostic parameters, the adjusted R-squared is high. The F -statistics in the Wald test is significant while the Variance Inflation factor shows no multicollinearity in the coefficient despite high degree of serial correlation in the residual.

Table 3: Foreign Capital and Potential Output

<i>Gross Domestic Product</i>	Model 1			Model 2		
	Beta	<i>S. E</i>	<i>P> t </i>	Beta	<i>S. E</i>	<i>P> t </i>
External Debt	3.753651	0.772167	0.0000	3.808214	0.748937	0.0000
Foreign Direct Investment	36.75317	6.074988	0.0000	35.29727	5.932240	0.0000
Official Development Assistance	17.10874	7.703641	0.0013	17.86361	7.476352	0.0209
Random Shock Dummy	-	-	-	5.13E+10	2.54E+10	0.0488
Model 1 Adj. $R^2 = 0.694948$						
Model 2 Adj. $R^2 = 0.712296$						
Residual ADF = -2.946497	Engle-Granger Cointegrating Estimate					
Test Critical Values:				Value	<i>P</i> -value	
1% -2.612033	Engle-Granger tau-statistic			-2.391395	0.8563	
5% -1.947520	Engle-Granger z-statistic			-10.50891	0.8660	
10% -1.612650						

() signifies p -Value at 5%

$$\ln GDP_{HP} = \beta_0 + 36.75 FDI_1 + 17.10 ODA_2 + 3.753 EXTERNAL DEBT_3 + \mu_t \quad (1)$$

(0.0000) (0.0000) (0.0013)

From model 1 the coefficient of external debt and other variables are positive. Likewise, the null of no significant relationship could not hold at 5% significant level. Specifically, a marginal change in external debts, ODA and FDI generates approximately 3.753; 17.1 and 3.753 percent change in potential outputs. Thus, capital components from the rest of the world contribute significantly to real GDP in restoring deviated business cycle output to potential GDP. However, FDI and ODA possess the greatest contributions (model 1 and 2 column 1 and 4).

The two scenarios represented by the models shows positive and significant effects on potential output. Model 2 is a cross-check on the baseline regression result. It has extra explanatory power ($\text{Adj. } R^2 = 0.694948 < 0.712296$) in explaining foreign capital inflows and potential output. It shows that random shocks prevalent in the macro environment can have large predictive influence. The signs of the coefficients did not change even with the entry of random shock variable into the model. Random shock statistic exerts positive effect on detrended GDP. The null is hypothetically rejected in the two models. The structural equation model appeared to be reasonably well-specified. As confirmed by unit root test in the residual ($-2.391395 > -1.947381$) at 5% critical value. The null of no cointegrating relationship could not be rejected with Engle-Granger z -statistic of 0.8660. It is no coincidence to record cointegrating relationship in our variables. Foreign capital inflows to Nigeria could be collected impacted by a common shock that diffuses into the productive capacity of the country. This is often worsened by a combination of factors impacting the global economy, including investors outlook about wider macroeconomic fundamentals involving dollar appreciation, trade tensions, and general concerns about a slowdown in growth.

5 Conclusion and Policy Suggestions

This empirical analysis conducted descriptive and inferential statistical assessment of foreign capital entry into Nigeria as it influences output gap conditioned by cyclical movements. Interestingly, we obtained three main results. First, linearly observing detrended GDP and business cycle component reveals three standard motions any economy undergoes-recovery, boom and recession. These fundamental phases suggest that actual output could surpass potential output; or the same actual output could go below the natural GDP or both are at equality with time. Our assessment confirmed two period equilibrium between cyclical GDP and potential output. Evidently Nigeria is yet to record excess of business cycle above natural capacity to produce. Observed downward negative displacement massively deviated from potential output across the periods. Thus, recorded GDP over the years does not mirror Nigeria's true capacity to produce goods and services. The reason could be availability of excess spare capacity accumulated from idle capital stock while labour is unemployed. As shown in multilateral policy papers the result implicitly concludes that growth in capital input (such as labor and capital) in a richly endowed Nigeria has been faster than growth in actual output. Large scale inflow of foreign capital could have contributed to the situation combining with surplus idle labour wherein Cobb-Douglas production function provides relevant perspective.

Second, the empirical regression shows FDI and ODA as highest contributor to size of potential output, therefore, possess more potential in correcting disequilibrium between business cycle GDP and natural long-run capacity to produce. Third, our evidence indicates that in the long run capital resources from rest of the world vis-à-vis potential output have no long-run cointegrating relationship as shown in residual-based cointegrating result.

Our theoretical conclusion and findings are vital for policy development. The designers of macroeconomic policy of the government may consider re-evaluating prevailing structural policy. It is important to make Nigeria a producing economy to match with current large consumption or helping it produce what it consumes domestically. Institutional efficiency and technology should be forefront factors to be given strong consideration within the policy circle. Capacity underutilization is a cost to the economy and the government losses revenue given unemployment of labour. This implies that running an implicit monopoly economy is a risk, rather competition should be encouraged in every sector. The various institutions of the government should help provide good business climate for FDI to thrive. Guaranteeing investment safety is needed and development of reliable security network can improve foreigners' confidence that investment is safe.

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