

# THE IMPACT OF FOREIGN PRIVATE INVESTMENT (FPI) ON CAPITAL FORMATION IN NIGERIA, 1980-2004: AN EMPIRICAL ANALYSIS

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## Abstract

*A number of possible determinants of capital formation is investigated using Nigerian data covering 1980-2004 studied. Time-series estimates are obtained using an OLS methodology which included tests for stationarity and cointegration. Empirical results showed a positive influence of cumulative foreign private investment (CFPI), index of energy consumption (INDEXEC) and total banking system credit to the domestic economy (BSTCr), and a negative influence of gross national savings (GNS), domestic inflation rate (INFR), maximum lending rate (MLR), foreign exchange rate EXCHR) and debt service ratio (DSR) on capital formation. We discovered that foreign exchange rate leads capital formation in Nigeria, followed by index of energy consumption and then, debt service ratio. The paper therefore recommends reduction in exchange rate distortions/misalignment; increase in exports of locally manufactured goods and raw materials to raise value of local currency; earn more foreign exchange and allow market forces to fix exchange rate; increase in energy supply by providing constant electricity and infrastructure to boost industrial energy consumption; and continuous minimisation of foreign debts to reduce amount of national income used for debt servicing.*

**Key words:** *Foreign private investment, Capital Formation, Determinants, Impact, Banking system credit, Index of energy consumption*

Classification: Research Paper

## 1. Introduction

In the late 1970s and early 1980s, most developing countries of Africa (including Nigeria) experienced unprecedented and severe economic crisis. These crisis manifested itself in several ways such as persistent macroeconomic imbalances, widening saving-investment gap, high rates of domestic inflation, chronic balance of payment problems and huge budget deficit (Akpokodje, 1998).

Although different reasons have been adduced for the slowdown of these economies, Greene and Villannueva (1991) attribute the problem to the decline in investment rates in the affected economies. In Nigeria, for example, Akpokodje (1998), maintained that domestic investment as a ratio of gross domestic product (GDP) declined from an average of 24.4% during the 1973-1981 period to 13.57% during 1982-1996 period. The average investment rate during the 1982-1996 period implied that the country barely replaced its dwindling capital. In the same vein, private investment rate depreciated from 8.6% in 1973-1981 period to 4.2% in the 1982-1996 era. Due to the fact that investment determines the rate of accumulation of physical capital (otherwise called capital formation), it then becomes a vital factor in the growth of productive capacity of the nation and contributes to growth generally. It is in the light of this that prominence is being attached to increasing the magnitude of real asset investment in the economy.

In particular, central to the less than satisfactory growth registered by countries of sub-

Saharan Africa is low level of investment as a result of low domestic savings. Attracting foreign investment is therefore crucial from a number of standpoints and of course, there is never shortage of theoretical arguments (Chete, 1998). First, consistent and regulated inflow of foreign investment provides an important source of foreign exchange earnings needed to supplement domestic savings and raise investment levels. Second, import substituting investment would serve to reduce the import bills as investment in export industries will directly increase the country's foreign exchange earnings.

Some other benefits might also accrue from increased foreign investment. These include the creation or rather expansion of local industries to supply inputs to the newly established plants; a rise in the overall level of domestic demand to boost incomes and, through taxation, state revenues; and the transference of labour (human capital) skills and technology. Yet another set of benefits arises from the forecasting of efficiency in the domestic economy, an effect that might even occur prior to the anticipated investment flows (Chete, 1998).

Most probably due to these overwhelmingly attractive theoretical arguments in support of foreign investment, government authorities in Nigeria have often articulated a plethora of incentives aimed at attracting foreign investment. For example, the *New Industrial Policy* published in 1988 embodies some Foreign Direct Investment (FDI) provisions which represent a dramatic departure from the past policy (see Chete, 1998, for details)

Besides, the need for external capital inflow arises, when desired investment exceeds actual savings. They are necessary also owing to investments with long gestation periods that generate non-monetary returns; growing government expenditures that are not tax-financed and when actual savings are lower than potential savings owing to repressed financial markets, and even capital market flight (Ogamba, 2003).

Several variables which create dependence on foreign capital have been identified in the literature. They could be classified into fluctuating variables such as exports, imports and invisible; offsetting variables like debt service and reserve creation, and rigid variables which include minimum level of imports, stage of economic development and exportable surplus (Ogamba, 2003).

External capital flows could also be non-debts creating flows (as in official transfers or grant in aids and direct investment flows), debt creating flows (as in official development finance), commercial bank loans and international bond offerings; or could equally be a hybrid, for example, foreign portfolio investments and international equity offerings. Of late, Nigeria has embarked upon several trade liberalisation policies so as to free FDI flows into the country (Adegbite and Owuallah, 2007).

The literature is replete with evidence that private investment in most developing countries is more directly related to growth than public investment (see Akpokadje, 1991; Serven and Salimano, 1991; Khan and Reinhart, 1990). Accordingly, it is now widely accepted that the expansion of private investment should be the added impetus for economic growth in developing economies (Chhibber and Dailami, 1990).

Many developing countries have over the years relied very much on the inflow of financial resources from outside in various forms, official and private capital flows as well as direct foreign investment, as a means of speeding up their economic development (Olaniyi; 1988, Odozi, 1995; Ekpo, 1997 and Uremadu, 2006). However, these countries have shown preference for direct foreign investment because they regard direct foreign investment as a means of counteracting the sluggish trend in official and private portfolio capital flows.

Generally, capital from outside can be very helpful in speeding up the pace of economic development and can act as a catalytic agent in making it possible to harness domestic resources particularly in a developing country. But foreign capital, no matter how large the inflow, cannot absolve a recipient country from the task of mobilising domestic resources. Foreign inflows can,

at best, be complementary to domestic savings. In developing economies experience has shown that foreign capital alone cannot create any permanent basis for a higher standard of living in the future. Rather it complements domestic savings. Therefore greater dependence on internal sources of finance facilitates the successful implementation of any planned economic development in a country (Agu, 1988 and Uremadu, 2006).

But after over two decades of economic adjustment, all relevant indicators have suggested that the recovery of private investment in Nigeria has been sluggish and slow. The figures in Table 1 of Appendix I, for example, show that cumulative foreign private investment as a percentage of GDP, has been fluctuating over the years 1980-2004. It has also followed a downward trend from the position of 7.12% (1980) to a peak of 12.79% (1986) and to its current status of 3.73% in 2004. The same low and fluctuating trend has been exhibited by the gross domestic investment also known as Gross Fixed Capital Formation (GFCF). Certainly, macroeconomic policies: monetary, fiscal and exchange rate, have a bearing on the investment behaviour in a country (Likewelile, 1997, Ghuma and Hadjmichael, 1996; World Bank, 1994 and Akpokodje, 1998), but the impact of these policies on private investment behaviour in Nigeria is still largely unclear.

This paper therefore explores the association existing between capital formation and other macroeconomic indicators of interest in the pursuit of macroeconomic policies in Nigeria. Specifically, it seeks to determine the impact of cumulative foreign private investment on capital formation and growth in Nigeria. It will also highlight the complementary role played by it to gross domestic savings towards filling the existing savings - investment gap in a bid to achieve desired investment goals and/or growth objectives in Nigeria in the years ahead.

## **2. Literature Review and Theoretical Framework**

This section will attempt to review some outstanding existing related studies on the topic of research and finally, review relevant theoretical framework on the main issue of study.

### **2.1 Review of Related Works<sup>1</sup>**

The preponderance of empirical studies that have explored quantitatively the determinants of foreign direct investment have concentrated more on economic than other factors. In particular, each of the authors, in his regression equations included those determinants he or she considered personally appealing. In what follows, we survey some of these empirical investigations.

A leading proponent of the economic approach to the determinants of foreign direct investment is found in (Dunning, 1973). On the strength of studies by scholars based on international production, he identifies three sets of influences on foreign direct investment to include the following;

- i. market factors such as the size and growth of the market measured by the gross national product (GNP) of the recipient country;
- ii. cost factors such as the availability of labour, low labour costs and inflation; and
- iii. the investment climate as measured by the degree of foreign indebtedness and the state of the balance of payments (Chete, 1998).

In another study, Dunning (1981), develops an eclectic theory of international direct investment based on the theories of industrial organisation of location of a firm. Nonetheless, the treatise of this later study does not directly concern the subject in hand (see Chete, 1998, p.4).

Agarwal (1980), clarifies the determinants of foreign direct investments using two political factors of political stability and the threat of nationalisation, in conjunction with a variety

of economic factors such as investment incentives, the size and growth of the recipient's market, its degree of economic development proxied by infrastructure, market distance and economic stability in terms of inflation, growth and balance of payments. In his extensive survey of the literature on the determinants of foreign direct investment, he finds mixed evidence with respect to the impact of political instability.

Lewis (1978), lays emphasis, to some extent, on political factors too. He tested the dual hypotheses that economic considerations are the prime determinants of foreign investment flows and that political variables are of secondary importance. His model uses a step-by-step regression for 25 developing countries from three continents: Africa, Asia and Latin America to establish that economic variables are more important than the political ones.

All the above studies except, Dunning (1981), were pre-occupied with the determinants of foreign direct investment in developing countries. A respectable number of studies have also been conducted for developed countries particularly for the United States and the European Community (eg., see, Scapellanda and Balough, 1983 and Lunn, 1980). The authors established similar findings.

Back home in Nigeria, significant scholarly effort has gone into the study of the role of foreign direct investment in the Nigerian economy. For instance, Oyaide (1979), provides an excellent documentation of works conducted under the umbrella of Nigerian Economic Society (NES). What follows draw substantially from this brilliant summary as reported in (Chete, 1998).

The preoccupation of Edozien (1968), is on the linkages generated by foreign investment and their impact on Nigeria's economic development. Specifically, he contends that foreign investment induces the inflow of capital, technical know-how and managerial capacity which interactively will accelerate the pace of economic development, while attenuating the pains and uncertainties that come with it. Furthermore, he observes that foreign direct investment could be counter-productive if the linkages they spur are neither needed nor affordable by the host country. Conclusively, he suggests that a good test of the impact of such investment on Nigeria's development is how rapidly and effectively it fosters local enterprises to innovation.

In a related study, Largely (1968), posits that foreign direct investment has both benefits and repercussions in the context of Nigeria's economic development. While FDI could accelerate growth through the infusion of new techniques and managerial efficiency, she however warns that it could worsen the balance of payments position. She stopped short though, of elaborating the channels through which this can be actualised. Foremost, Olakampo (1962), has alluded to this negative fall-out of FDI when he argues that foreign aid in the form of direct investment and portfolio investment generally imposes a burden of repayment in form of capital outflows on the recipient country.

Oyaide (1977), concludes, using indices of dependence and development as mirror of Nigeria's economic performance, that direct foreign private investment (DFPI) engenders both economic dependence and economic development. In his view, DFPI continuously causes and catalyses a level of development that would have been impossible without such investment albeit, at the cost of economic dependence. Olopoenia (1983), explores the role of foreign capital inflow in the development processes of underdeveloped countries via its impact on savings. He fails, however, to reach unambiguous conclusion, contending that the effect of foreign investment on saving depends on the savings hypothesis used.

Additionally, Oseghae and Amenkhienan (1987), examines the relationship between oil exports, foreign borrowing and direct foreign investment in Nigeria, on the one hand, and the impact of these on sectoral performance, on the other hand. They surmise that foreign borrowing and FDI impacted negatively on overall GDP but positively on three main sectors (manufacturing, transport and communication, and finance and insurance).

Elsewhere, Olaniyi (1988) investigates the impact of direct foreign capital on domestic investment to ascertain its overall contribution to the enhancement of the domestic savings capacity in Nigeria. His model of domestic savings and investment financing in Nigeria empirically tested the impact of FDI on the level of domestic savings and investment. His results conform that domestic savings is by far more relevant in determining investment growth than foreign capital inflows in Nigeria. At best, the latter complements the former. This view has also been confirmed by the works of both Uremadu, (2006) and Adegbite and Owuallah, (2007).

Evidently, from the Nigerian studies reviewed so far, there seems to be a dearth of research explicitly devoted to the impact of foreign private investment neither on capital formation nor on the determinants of foreign private investment in the Nigerian scene proper thereby re-enforcing the need for this current effort.

With respect to the foreign studies surveyed earlier, it is apparent that, in general, empirical exploration of the determinants of foreign direct investment has not been definitive on what are the main factors. In particular, it is largely inexplicit what role the economic factors play relative to political factors. Curiously, the less than satisfactory state of research on this theme can be traced to issues of content and of statistical methodology. In relation to content, the studies show wide variance of economic and political factors used as arguments. And no convincing reason rooted in the theory is advanced for the inclusion or exclusion of particular variables (Chete, 1998). Thus, a drawback in most of these works is that their empirical estimation and the variables used as causal factors are not guided by theoretical considerations but mere *ad-hoc* as postulated in (Chete, 1998). The conclusion therefore is trite that the existing state of research shows serious conceptual and statistical weaknesses, providing further impetus for this study.

## **2.2 Theoretical Framework: A Review of Investment Theories<sup>2</sup>**

Keynes (1936), pioneered the discovery of an independent investment in the economy, in contrast to, the widespread belief (that is, the Wicksellian loan market) that all available saving is automatically invested so far as the interest rate is attractive. Keynes' main contention was that investment is a function of the prospective marginal efficiency of capital relative to some interest rate which reflects the shadow cost of the invested funds. According to Keynes (1936), because of incomplete and uncertain information about private investment volatility in the future, potential investors would depend on their "animal spirits" in making their investment decisions rather than a rational calculation of an inherently intermediate distant future (Chete, 1998).

Investment theories that followed the tradition of the Harod Domar growth models emerged in the 1950s and 1960s. This was the precursor to the familiar accelerator theory. This theory posits investment as a linear function of changes in output derived from a fixed proportion of production technology. Thus, given an incremental capital-output ratio, it is easy to compute the investment requirements needed to achieve a given output growth target. In his model, profitability expectations and cost of capital considerations are ignored in the determination of investment.

The Neo Classical Approach to investment was next in line. Mainly spurred by the desire to obviate the shortcomings of the Harod Domar formulation, particularly in its simplistic assumptions, this approach introduces factor substitution in the derivation of the demand for capital from the firm's cost minimisation problems. Consequently, the desired capital stock is shown to depend on the rental cost of capital (which, in turn, depends on the price of capital goods, the real interest rate and the depreciation rate) and the level of output. This approach too has been attacked on account of inconsistency of the assumptions of perfect competition and exogenous output, the inappropriateness of static expectations and the introduction of delivery lags in an *ad hoc* manner.

Tobin's "Q" theory of investment of 1969 is an alternate formulation of the investment function. The theory postulates that the ratio of the market value of the existing stock of capital to its replacement cost (otherwise termed Q ratio) is the force driving investment. Tobin, subsequently elaborated two reasons why Q may differ from unity which include delivery lags and increasing marginal costs of investment.

Abel (1981) and Hayashi (1982), both, in separate studies, attempt a reconciliation of the Neo-Classical and Q approaches to investment. By showing that the latter follows from the firm's optimal capital accumulation problems under adjustment costs, they proved that what drives investment is marginal Q, that is, the ratio between the increase in the value of the firm due to the installation of an additional unit of capital and its replacement costs. However, marginal Q may not be observable as it will generally diverge from the observed average Q (which essentially is the market value of existing capital in terms of new capital), except under competitive equilibrium and constant returns to scale. Both will also diverge if firms confront quantity constraints in real asset or financial markets. In such a situation, average Q will, at best, provide some and not all of the information required to make investment decisions.

This disequilibrium approach to investment is associated with Malinvaud (1980, 1982) and Sneessens (1987). In this respect, investment is a function of both profitability and output demand considerations. Malinvaud (1982), splits investment decision into two stages: the decision to expand the level of productive capacity, and the decision about the capital intensity of that additional capacity. The latter depends on profitability variables like the relative cost of capital and labour. By contrast, the capacity decision relates to the degree of capacity utilisation in the economy as an indicator of demand conditions. In Sneessens (1987), net investment is a positive function of the gap between actual and long-run equilibrium capacities. This, in turn, is a reflection of differences between actual and equilibrium rates of capacity utilisation and between actual and equilibrium mark-up rates. Therefore, investment depends on both profitability (discrepancies between actual and equilibrium mark-up rates) and on sales constraints (discrepancies in rates of capacity utilisation). By implication, investment decisions may be reached in a setting in which some firms confront current and expected future sales constraints, a crucial departure from both the Neo-Classical (Jorgenson) and the Q (Tobin) models.

There exists an expanding literature on the effects of financial constraints on investment, for example, as seen in (Fazzari, Hubbard and Peterson, 1988a, 1988b; Caloris and Hubbard, 1989; Mayer, 1989 and Mackie and Mason, 1989). The central argument here is that internal finance (retained earnings) and external finance (bonds, equity or bank credit) are not perfect substitutes. The discrepancy in the cost of different sources of financing is due to asymmetric information where bankers in the capital market cannot evaluate accurately the quality of firm's investment opportunities; thereby leading to existence of opportunity cost of internal finance generated from cash flows and retained earnings. According to this view, investment will be very sensitive to financial factors such as the availability of internal finance or the access to capital markets (Chete, 1998).

Finally, another feature of investment in developing countries of sub-Saharan Africa (SSA) is the high import content of capital goods. This buttresses the contention in the two gap model (Chenery and Bruno, 1962 and Bacha, 1982), that the lack of foreign exchange may constitute a major constraint to sustain high rates of investment and growth in developing economies. Therefore in countries like Nigeria where domestic and foreign capital goods are highly complementary, the lack of foreign resource to import machinery and equipment will always constitute an impediment to growth. In other word, foreign exchange is a crucial determinant factor in capital formation among developing countries of Africa. This is a serious issue when viewed from the current perspective of our study.

### 3. Analytical Underpinning and Model Building

Here, we discuss analytical issues behind the model to be used in this study.

#### 3.1 Analytical Issues

The decision to invest by an enterprise domiciled in an industrialised country in developing countries is often motivated by higher expected profits in comparison to the alternative investment possibilities at home or in other industrialised countries (Chete, 1998 and Olaniyi, 1988). The relative advantage of such investment is a function of both economic and political influences (Ogamba, 2003). Even if prevailing economic conditions seem favourable and the outlook for the future promising, it is entirely possible that investment may not materialise due to prevailing unstable political conditions. Hence, the need to consider foreign direct investment decisions which will impact on domestic capital formation would be brought into sharp focus in the present study.

There is therefore the need to briefly elucidate herein the analytical framework underlying the macroeconomic determinants of capital formation in a developing country like Nigeria taking a leaf from (Agarwal, 1980). This is carried out hereunder.

##### 1. *Gross Fixed Capital Formation (GFCF)*

It is defined as an addition to stock of capital assets set aside for future productive endeavours in real sector which will lead to more growth in physical capital assets of the country. Capital formation captures all the real-value-added to the economy in real-asset-terms which will lead to further enhancement of savings, investment and generation of more wealth in future. Capital formation derives from savings accumulation. It has a positive impact on private savings accumulation in the sense that increase in capital formation will lead to more savings. When savings accumulate it will lead to an increase in gross domestic investment (GDI) and income generated as a result of the investment projects made will, in turn, lead to GDP growth (Uremadu, 2006).

##### 2. *Cumulative Foreign Private Investment (CFPI)*

There is a growing consensus that an increase in cumulative foreign private investment, in addition to, inflow of foreign direct investment would complement domestic savings to meet investment needs in a particular LDC country (Olaniyi, 1988 and Uremadu, 2006). Expectedly, foreign investments should contribute to the development needs of the host economies hence substantial flows of CFPI are usually desired. Therefore the benefits derivable from CFPI is good but they neither substitute for the aids of official development assistance flows (Aremu, 1997). Thus, a high inflow of CFPI would lead to rise in gross domestic investment (which will, in turn, lead to growth).

##### 3. *Gross National Savings (GNS)*

Drawing inferentially from (2) above, increases in gross domestic savings would lead to increases in gross domestic investment thereby engendering growth in the real sector. For CFPI to have desired positive impact on the capital formation for desired investment in a host country, the gross domestic savings must accumulate to a reasonable extent. This is one of the reasons why McKinnon (1973), hypothesizes that private investors in LDCs must accumulate money balances before undertaking projects because of limited access to credit and underdeveloped equity markets in the LDCs.

##### 4. *Domestic Inflation Rate (INFR)*

A high rate of inflation is an indication that government lacks the ability to manage the economy (Fisher, 1993). Hence, high rates of inflation are expected to lead to a contraction of private investment. The empirical findings of Greene and Villannueva (1991), Oshikoya (1994) and Hadjimichael et al (1995) attest to the negative impact of high inflation rate on private investment in developing economies. Secondly, accelerating inflation rates impinge adversely on foreign investment activity by raising the risk of longer-term investment projects, lowering the average maturity of commercial bank loans, and distorting price signals in the economy. As a rule therefore, the higher the rate of inflation, the less are foreign investors inclined to engage in the country. A negative relationship is therefore hypothesised.

5. *Interest Rate on Lending or Maximum Lending Rate (MLR)*

A maximum lending rates (MLR) would raise the cost of capital and therefore dampens foreign private investment especially those requiring some infusion of domestic capital (Chete, 1998). Aremu (1997), stresses the need that the host country of foreign investment (either CFDI or CFPI) should make credit available to domestic investors in form of subsidised loans, loan guarantees as well as guaranteed export credits. These credits are provided directly to both foreign and domestic investors for their operations particularly for the purpose of defraying some investible costs which invariably have an immediate impact on cash-flow and liquidity. Nigeria has instituted such facilities presently through the Bank of Industry (BOI).

6. *Foreign Exchange Rate (EXCHR)*

Obadan (1994) traces the importance of exchange rate on inflow of foreign private investment and notes that its importance as the centrepiece of the investment environment derives from the argument that a sustained exchange rate misalignment in terms of over-valuation or under-valuation, is a major source of macroeconomic disequilibria in developing countries. Consequently, an over-valued exchange rate or highly distorted foreign exchange rate will discourage exports and negatively affect foreign private investment environment.

The theoretical literature is ambiguous about the direction of the effect of real exchange rate on the rate of investment. On the one hand, a real depreciation raises the cost of imported capital goods, and since a large chunk of investment goods in developing countries is imported, domestic investment would be expected to fall on account of significant depreciation. On the other hand, a significant depreciation, by raising the profitability of activity in the tradable goods sector, would be expected to stimulate private investment in this sector but it depresses investment in the non-tradable goods sector. For low-income African countries, Oshikoya (1994), for instance, *negative*, ascertains a *negative* impact of the real exchange rate on private investment. Chete and Akpokodje (1997) in Akpokodje (1998), also report a relationship between the real exchange rate and private investment in Nigeria.

7. *Index of Energy Consumption (INDEXEC)*

Pfeffermann and Madarassy (1992) identify, among other macroeconomic factors, that capacity utilisation relies much on efficiency of industrial or energy production, that are major determinans of foreign direct investment. They discover that the size of the domestic market and improved capacity utilisation are positively related to direct foreign investment, while inflation and volatile exchange rates have negative effects on foreign investment. Efficient infrastructural development proxied here by index of energy consumption (INDEXEC) will create conducive environment for high foreign private capital inflows and increased domestic investment. Hence, a positive relationship is hereby expected.

8. *Financial Intermediation proxied by Total Banking System Credit to the Economy (BSTCr)*



McKinnon (1973) and Shaw (1973) argue that financial deepening increases the rate of domestic savings, and this lowers the cost of borrowing and *Statistical* stimulating investment. The core of this argument rests on the claim that developing countries suffer from financial repression. It posits therefore that the liberation of these countries from their repressive conditions would induce savings, investment and growth. In this view, investment is positively related to the real rate of interest, in contrast to, the neoclassical theory. The reason for this is that a rise in interest rate increases the volume of financial saving through the financial intermediaries and as such increases investible funds, a phenomenon that McKinnon (1973) calls the "conduct effect". Conceptually efficient financial intermediation allows a given amount of savings or bank credit to finance a greater amount of investment via efficient money creation by banks than could occur without intermediation (see Greenwood and Javanovic, 1990 and Uremadu, 2006). Recently the endogenous growth literature has also emphasised the important role that financial intermediation plays in improving the efficiency of investment (King and Levine, 1993).

9. *External Debt Burden Proxied by Debt Service Ratio (DSR)*

This is expressed by either debt service ratio (DSR) or the ratio of external debt to GDP. DSR is defined as the external debt services measured as ratio of actual debt services to total exports. The external debt burden negatively impacts on savings and CFPI. A higher ratio of external debt to GDP, indicates that the country is experiencing a large debt "overhang" and this discourages savings and gross domestic investment or capital formation. The reason is that a significant portion of future returns from investment will be used to repay current debt obligations. Similarly, if huge debts cause difficulties in meeting debt service obligations, relations with external creditors may deteriorate thereby inducing a cut-back (in) to resource inflow into the country. Therefore DSR impacts negatively on capital formation.

**3.2 Model Specification, Data Requirements and Estimation Methods**

We shall adapt Chete (1998)'s model which equally emanates from the foregoing analytical considerations of the study. It is stated as follows:

$$GFCF = f(GNS, CFPI, INFR, MLR, EXCHR, INDEXEC, BSTCr, DSR) \quad 3.1$$

(+    +)    (-)    (-)    (-)    (+)    (+)    (-)

Hence, the multivariate specification of the equation for estimation in our model is as follows:

$$GFCF = b_0 + b_1GNS + b_2CFPI - b_3INFR - b_4MLR - b_5EXCHR + b_6INDEXEC + b_7BSTCr - b_8DSR + e \quad 3.2$$

where:

- GFCF = gross fixed capital formation as % of GDP
- GNS = gross national savings as % of GDP
- CFPI = cumulative foreign private investment
- INFR = domestic inflation rate
- MLR = maximum lending rate
- EXCHR = foreign exchange rate expressed as naira per \$1 US dollar
- INDEXEC = index of energy supply expressed in tonnes
- BSTCr = total banking system credit to domestic economy as % of GDP
- DSR = debt service ratio (%)
- e = random error term

### 3.3 Data Source

Data for the study were sourced from *World Bank Database* (various, *CBN Bulletin* Vol. 15 (Dec. 2004) and *Annual Report and Statement of Accounts* (Various) which spans the period 1980-2004. These were supplemented with data from the Federal Ministry of Mines, Power and Steel, Nigerian National Petroleum Corporation, National Electric Power Authority.

### 3.4 The Concept of Cointegration<sup>3</sup>

The task in empirical study based on the error correction methodology is to ascertain if there is a static long-run equilibrium relationship as suggested by theory and subsequently derive on adequate dynamic modelling of the short-run relationships (Chete, 1998). Hence, the emphasis on the existence of long-run equilibrium relationships implies that in any empirical enquiry, a useful starting point is to conduct a specification search to ascertain that there exists an equilibrium relationships among the levels of the variables in the model. To Granger (1986), co-integration is the statistical equivalence of the economic theoretical notion of stable long-run equilibrium. Consequently, co-integration is a useful approach in this perspective. The existence of the concept among the variables of the model provides somewhat conclusive evidence on the existence of stable equilibrium relationships among them. Inferentially the variables have a common trend and would not drift far apart for long.

Co-integration is based on the properties of the residuals from regression analyses when the series are individually non-stationary. A series is stationary if it has a constant mean and constant finite variance. Thus a time series  $X_t$  is stationary if its mean  $E(X_t)$  is independent of time and its variance,  $E[X_t - E(X_t)]$  is bounded by some finite number and does not vary systematically with time. It tends to return to its mean with the fluctuation around its mean having a constant amplitude. In contrast, a non-stationary series has a time varying mean (or variance) and cannot normally be referred to without reference to some particular time period. Non-stationary series are referred to as integrated variables.

A series  $X_t$  is said to be integrated of order  $d$ , denoted  $X_t-I(d)$ , if it must be differenced  $d$  times before it becomes stationary. Series  $X_t$  is  $I(d)$  if it is non-stationary but  $dX_t$  is stationary. A stationary series is thus integrated of order zero,  $I(0)$ , while a  $I(2)$  series will need to be differenced twice to become stationary and so on.  $I(0)$  series will usually return to the mean often while  $I(1)$  series will rarely return to any particular value, including its starting value. Most macro-economic variables seem to be  $I(1)$ , a few are  $I(0)$  and a few are integrated of orders higher than 1.

Testing for co-integration is parallel to testing for the stationarity of the residuals from a linear regression of the vector of non-stationary time series. It is necessary that co-integration tests to be preceded with tests for the orders of integration of the individual series in the vector. Similar tests are used for stationarity of the residuals from the OLS regression and time series variables.

The Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) statistics and the Sargan Bargava Durbin Watson (DW) statistics are the three most commonly used tests for stationarity for both individual time series, and residuals from OLS regression.

The ADF test is based on the following regression:

$$\Delta X_t = b_0 + b_1 \Delta X_{t-1} + b_2 \Delta X_{t-2} + \dots + b_n \Delta X_{t-n} + e_t \quad 3.3$$

where  $(e_t)$  is a stationary error term. The null hypothesis that  $X_t$  is non-stationary is rejected if  $b_1$  is significantly negative. The number of lags ( $n$ ) of  $\Delta X_t$  is usually chosen to ensure that the regression is approximately white noise. It is simply referred to as the DF test if no such lags are

required in which case  $b_i=0(i=1,2,\dots,n)$ . However, the "t-ratio" from the regression does not have a limiting normal distribution. It follows the Dickey Fuller distribution, the critical values of which are available in the Computer Microfit 3.0 software.

The Sargan Bhargava Durbin Watson (SBDW) test (after Sargan and Bhargava, 1983), is based on the variable itself when applied to individual time series, and not on the residuals as in the Standard Durbin Watson test in regression analysis. The null is that the series is  $I(0)$ . SBDW would then be expected to tend towards 2. A low value close to zero is indicative of non-stationarity.

In testing for co-integration, therefore, the same tests are employed but the series of the tested are the residuals from the OLS regression. The null of non-cointegration being that the residuals are non-cointegrated. The "t-ratio" for the Dickey Fuller-test follows an Engle-Granger distribution rather than the Dickey-Fuller distribution. The critical value for this is also now available in Microfit 3.0.

### 3.5 Data Nature and Characteristics

Following are data employed in this analysis:

1. GFCF=gross fixed capital formation as a (% of GDP). GFCF is mirror of gross domestic investment in Nigeria.
2. GNS=gross national savings as a (% of GDP). GNS is proxy for total savings/GDP ratio at current market prices ratio. It is the total institutional savings mobilised by both private and public sector financial institutions in the country. Positive impact is expected.
3. CFPI=cumulative foreign private investment in Nigeria as (% of GDP). It is mirror of foreign private investment in Nigeria. Positive impact is expected.
4. INFR=domestic inflation rate (%), defined as the annual percentage change in the CPI.
5. MLR=maximum lending rate (%), the rate at which the small business entrepreneurs borrow in Nigeria. Negative impact is thus expected
6. EXCHR= monthly average official exchange rate of naira vis-à-vis the United States Dollar (N,=/\$1.00) computed into annualised value. Negative impact is therefore expected.
7. INDEXEC= Index of energy consumption (tonnes of coal equivalent) (1985 =100). Positive impact is expected in this case.
8. BSTCr= total banking system credit (ie. total demand deposit liabilities plus banking system investments) to the national economy. Positive impact is also expected.
9. DSR= ratio of debt servicing to total exports, defined as the external Debt services measured as ratio of actual debt services to total exports. Negative impact is expected here.

## 4. Model Estimation and Interpretation of Results

### 4.1 Presentation and Analysis of Results of Stationary Tests

Tests for the stationarity of the variables are presented in Table 1 below. For the ADF statistics (the 95% critical values are shown after each t-statistic at next column), the null of non-

stationarity is accepted if the reported statistic is greater than (One Tail Test) the critical values. The results shows that when expressed in levels, four of the variables are non-stationary (MLR, INDEXEC, BSTCr, DSR) and four, are stationary (GNS, CFPI, INFR, EXCHR). Differencing once however induced stationarity in three (MLR, INDEXEC, DSR) while BSTCr was differenced twice before it attained stationarity.

**Table 1:** Unit Root Test Results for Stationarity(at various levels)

Variable	DF	ADF (Test Critical Values)	t-Statistic	P- Values	Order of Interpretation
C	1%	-3.752946**	-4.264501	0.0031	I(0)
	5%	-2.998064***			
$\Delta$ GNS	5%	-3.065585***	-3.880203	0.0108	I(0)
$\Delta$ CFPI	5%	-3.73853	-1.544395	0.4946	I(0)
$\Delta$ INFR	10%	-2.635542****	-2.764418	0.0784	I(0)
$\Delta$ MLR(1)	1%	-3.752946**	-9.192626	0.0000	I(1)
	5%	-2.998064***			
$\Delta$ EXCHR	1%	-3.886751	0.623647	0.9858	I(0)
	5%	-3.052169			
$\Delta$ INDEXEC (1)	1%	-3.752946**	-5.193765	0.0004	I(1)
	5%	-2.998064***			
$\Delta$ BSTCr (2)	10%	-2.638752****	-2.726706	0.0849	I(2)
$\Delta$ DSR (1)	10%	-2.650413****	-2.983390	0.0537	I(1)

Source: Author's Calculation

Key: \*MacKinnon (1996) one-sided p-values

\*\*Significant at 1%

\*\*\*Significant at 5%

\*\*\*\*Significant at 10%

To determine if there is a co-integrating relationship between the independent variables, the model was estimated with the variables at their levels. The residuals from the regression were tested for stationarity using ADF test. The residuals were found to be stationary indicating the existence of a co-integrating relationship. Using the MacKinnon (1996) critical values for co-integration test, we reject the null hypothesis of no co-integration and conclude that the variables are co-integrated at 5% level of significance. This motivated the development of an OLS regression model with an inbuilt ( $\epsilon$ ), the random error term. Specifically, we used the E-Views Computer package for the purpose of our programming which yielded results for the regression coefficients and associated statistics.

#### 4.2 Analysis of Regression Results

After normalising the structural equation on change in GFCF in vector autoregression of the current and lagged first differenced of all the variables, and then starting with an over-parameterised model based on the general-to-specific methodology, regression analysis was conducted. Table 2 is the empirical results for the OLS modelling of determinants of capital formation in Nigeria.

**Table 2:** Modelling: GFCF Function by OLS

Variable	Coefficien t	Stad. Error	t-Statistic	Prob.
b <sub>0</sub> (Constant)	9.232819	8.423148	1.096125	0.2915
GNS	-0.060633	0.098048	-0.618398	0.5462
CFPI	0.009660	0.387160	0.024950	0.9804
INFR	-0.030202	0.038851	-0.777378	0.4499
MLR(1)	-0.166878	0.219533	-0.760149	0.4598
EXCHR	-0.105467	0.03.651	-3.440893*	0.0040
INDEXEC(1)	0.096731	0.037896	2.557522**	0.0230
BSTCr (2)	0.044344	0.148359	0.298900	0.7694
DSR (1)	-0.139496	0.059433	-2.347087**	0.0342
R <sup>2</sup> = 0.763336		76.33%		
R <sup>2</sup> Adjusted = 0.628100		62.81%		
DW Stat = 1.639969		1.64		
F-Statistics = 5.644464		5.644464		
Sum squared resid = 140.9570		140.9570		
S.E of regression = 3.173067		3.173067		
Prob(F-Stat) = 0.002496		0.002496		

Source: Author's Calculation

Key: \*Significant at 1% level

\*\*Significant at 5% level

A close inspection of the results shows that foreign exchange rate had the most significant and negative impact on capital formation and therefore lead gross domestic investment, followed by index of energy consumption and then, debt service ratio (both at 5% levels of significant). Results also reveal that all the variables except one, gross national savings, maintained right direction of sign. In general, the descriptive statistics for this model (R<sup>2</sup>, F-Stat and DW-Stat) are within acceptable bounds. Further, the results of the diagnostic tests indicate the absence of error of auto-correlation and conditional heteroscedasticity as value of DW test is tending to 2, hence the errors are normally distributed.

Specifically, the negative sign and insignificant impact of gross national savings coefficient on capital formation is very instructive. The negative effect suggests that cumulative foreign private investment (CFPI) in real terms has crowded out gross domestic savings since the latter is so low and distorted that it cannot positively and significantly impact on capital formation (CF) or gross

domestic investment (GDI) as at its present low status profile. Gross national savings (GNS) low rating has not formed a good base to attract more cumulative foreign private investments into the country to adequately complement savings in order to raise domestic capital formation. Hence, inadequate cumulative foreign private investment results and the size of both gross national

savings and cumulative foreign private investment as they presently stand in Nigeria cannot make the desired significant impact on capital formation. Nigeria's gross national saving rate does not command good leverage to attract adequate cumulative foreign private investments into the national economy. However, CFPI is correctly signed is suggestive that higher cumulative foreign private investment induces greater capital formation.

Capital formation is also sensitive to the domestic inflation rate, and external debt burden proxied by debt service ratio (DSR). The negative coefficient on inflation rate and high negative coefficient on debt service ratio indicate that accelerating inflation and huge debt overhang are serious disincentive to raising high gross domestic product or capital formation for the national economy.

Similarly, the coefficient of the level of maximum lending rate is also correctly signed indicating that high rate of interest on lending or banking system credit to the domestic economy discourages capital formation growth for the national economy. On the other hand, total banking system credit to the domestic economy exhibited positive and insignificant impact on capital formation growth supporting the argument that increasing banking system credit to the domestic economy would boost gross domestic investments gross or capital formation (GDI).

The coefficient of the level of foreign exchange rate (EXCHR) on capital formation (CF) is correctly signed. High EXCHR exhibits negative impact on capital formation. The international real exchange rate is inversely related to CF giving support to the thesis that rise in real cost of imported capital goods engendered by escalating real exchange rate would tend to dampen domestic capital formation. This, in turn, will decrease GDP. But lower exchange rate will make possible importation of huge industrial goods and raw materials will raise production of productive goods which will raise increase capital formation in real terms.

Finally, the coefficient of the level of index of energy consumption is also significant and correctly signed suggesting that increased supply of energy induces greater capital formation or gross domestic product (GDI). Energy is vital to the working production of real industrial goods, hence it exhibited a positive and significant impact on CF or GDI.

## **5. Discussion of Findings, Recommendations and Conclusion**

### **5.1 Discussion of Findings**

A set of policy lessons can be deduced from the results reported in the preceding section, chief among which is the need to moderate, through a combination of a carefully thought out and assiduously implemented monetary and fiscal policies, the rate of foreign exchange. The relative impact of exchange rate alignment in inducing foreign capital inflow and in discouraging same by triggering or exacerbating inflation cannot be undermined. Depending on which dominates the other, the effect of exchange rate depreciation on foreign private investment and by extension, on gross domestic investment which is capital formation would have been clarified. This is in line with (Chete, 1998). Results of the empirical analysis outstandingly revealed that exchange rate variable leads capital formation in Nigeria and it maintains its expected negative sign. It is so because of the following reasons: (1) we import significant portion of virtually all our inputs that go into real goods manufacturing or physical industrial goods production. (2) Our source of generating foreign exchange is oil, Nigeria being a mono-product or rentier economy and (3) virtually all the machinery that go into our industrial production or process is imported.

Secondly, the need to raise volume of energy consumed by Nigerian industries comes to the fore. Index of energy consumption proxied by index of industrial production is very critical to our productive sector or environment in abide to raise gross domestic investment or capital formation. Energy infrastructure, power, capacity utilisation and all worth not that matter in

boosting capital formation for the domestic economy are very critical to our industrial growth. Hence, index of energy consumption impacts positively and significantly on quantum of capital formation formed or achieved in Nigeria.

Third, the negative sign and significant impact of debt service ratio (DSR) on capital formation as evidenced by the results from our regression analysis, portrayed that external debt burden is a very strong disincentive to capital formation growth in Nigeria. Money that would have been used to inject into production of new physical capital assets (goods) which aid productive activity is now being used to service foreign debts. Huge debt service payments will always reduce capital formation in a developing economy like Nigeria.

Finally, the negative and insignificant impact of gross national savings (GNS) in impacting on capital formation has the plausible reason that we have not mobilised enough domestic savings that will attract desired foreign private investment into the country which will complement gross national savings to positively and significantly influence capital formation. CFPI, though, has positive effect on CF is not yet enough to raise capital formation in Nigeria.

## **5.2 Recommendations and Conclusion**

Based on the findings of this research which have been above stated and implications emanating there from, we therefore proffer the following matching recommendations put down hereunder for urgent policy action:

1. That efforts should be geared by government to reduce exchange rate distortions and or misalignment, increase export of locally manufactured goods and raw materials in a bid to raise value of the local currency, the naira; earn more foreign exchange and allow market forces to properly fix exchange rate. This policy thrust will most likely result into increased capital formation in Nigeria needed for our real sector investments and industrial growth.
2. The policy recommendation with respect to our number two findings is that to optimally raise the level of capital formation in Nigeria, government has to maintain a steady supply of energy (power) and other infrastructural supplies. We cannot raise gross domestic investment (i.e. capital formation) and national productivity level without maintaining adequate supply of energy to all facets of our industrial machinery.
3. Thirdly, we thus recommend continuous minimisation of foreign debts to reduce amount of national income used for debt servicing so as to invest greater proportion of our annual national income into productive capital goods that will raise capital formation to boost GDP.
4. The paper therefore finally recommends that adequate efforts be made to mobilise desired gross national savings which would be big enough to attract direct foreign private investment that will complement domestic savings towards rising capital formation to a level needed for industrial growth and development that will raise GDP growth in Nigeria.

In concluding this paper, we make quick to say that these above recommended views are the right policy action goals to pursue in these times in Nigeria by the government and or monetary authorities to raise our desired gross domestic investment (GDI) or rather the capital formation (CF) in our country. These are our convinced conclusions in this 21st century emerging Nigerian economy.

## **Notes**

1. Work profited elaborately from L.N. Chete (1998)'s "Determinants of Foreign Direct Investment in Nigeria". *NISER MONOGRAPH SERIES* No. 7
2. Same as reported in (1) above.
3. The exposition in this section benefited elaborately from L.N. Chete's treatise of the

concept of cointegration.

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