THE ROLE OF EQUIPMENT INVESTMENT IN NIGERIA'S GROWTH PROCESS

James Akperan Adam, Ph.D*

And

Oladipo Tajudeen Busari, Ph.D*

Abstract

This paper examines empirically the role of equipment investment in Nigeria's growth process. A growth accounting equation was utilised to analysed the contribution of private capital stock to growth. A Granger-causality test was also employed to explore the relationship between components of domestic fixed investment, productivity growth, labour force growth and economic growth. In addition, regression analysis was employed to complement the other methods. The first conclusion is that for sustainable growth, private capital stock growth need to rise to a level of 9 percent, for fixed investment-GDP ratio to increase by 18 percent. In the second approach, the results do support the view that there is a strong connection between equipment investment and economic growth, there was causal links between equipment investment and productivity growth; and GDP growth and labour force growth in one direction as well. The third approach reveals that equipment investment and other components of fixed investment are positively related to growth, however, aggregate fixed investment has a negative impact on output growth. This unexpected result was due to high GDP volatility in Nigeria. The general conclusion is that equipment investment, as well as other components of investments are necessary for growth process in Nigeria. Therefore, government should increase budgetary allocations to equipment production sectors and increase foreign exchange allocation for importation of fixed assets or capital.

I INTRODUCTION AND PROBLEM STATEMENT

Investment in fixed capital has been accorded several important roles in the economic literature. The role of private fixed investment in fostering growth in industrial countries has been studied in detail, however, few studies on the impact of equipment investment on output growth exists for developing countries[1]. It is important for policy-makers in developing countries to assess how capital stock accumulation responds to growth, in order to design long-term development policies and implement short-term stabilization programmes. The relationship between domestic equipment investment and economic

*Dr. Adam, J. A. & Dr. Busari, O. T. are of Dept. of Economics Universities of Abuja and Ibadan, respectively.

growth is crucial in assessing the impact of macroeconomic demand variables on the real sector. Thus, one of the goals of macroeconomic policy is to stimulate investment and growth over the short- to medium-term.

Nigeria went through the Structural Adjustment Programme (SAP) in the second half of the 1980s up to 1994, in an attempt to correct her deteriorating current account balance. The domestic counterpart of which is to achieve major increases in per capita real GDP, savings, and improving the efficiency of both private sector and public sector investment spending. A significant part of the adjustment effort was directed towards making the private sector take the lead in initiating economic growth and development. Despite structural reforms and changes in the regulatory framework, private investment remains abysmally low at around 6 percent of GDP - insufficient even to cover depreciation of the existing capital stock (Chhibber and Pahwa, 1994). The lack of appreciable investment response after the initiation of the adjustment programme and poor performance of other socio-economic indicators have now raised serious concern about their long-run sustainability (Thomas et al., 1990). Macroeconomic policies in Nigeria cannot be described as particularly stable, in view of the large and growing fiscal deficits exceeding 10 percent and a continuing debt overhang with a debt/GDP ratio of over 100 percent since 1993(Moser et. al., 1997). The weak technological base of the industrial sector is also a contributing factor to the poor economic performance. The poor performance of the capital goods sector in Nigeria has stultified technical progress. Consequently, the obsolete machinery and equipment prevalent in the Nigerian industrial sector has hindered manufacturing efficiency (World Bank, 1990).

This paper considers the role of equipment investment in economic growth in Nigeria. It aims to empirically examine the relationship between the rate of economic growth and equipment investment. We review the arguments that Nigeria can stimulate economic growth through the accumulation of fixed capital, and evaluate different policy options aimed at doing so. The rest of the paper is arranged as follows: part II reviews stylized facts on investment in Nigeria; Part III focuses on literature review , Part IV deals with the empirical analysis and presents the result and findings of the study; finally, Part V gives the summary and concluding remarks.

2. STYLIZED FACTS ON INVESTMENT AND GROWTH

2.1 Investment and Growth Performance in Nigeria The Period Between1960 - 1972

Immediately after independence, the government embarked upon import-substitution industrialization strategy in order to reverse the deteriorating trade balance and hasten industrial development. In this regard, private investment was encouraged, credit to the private sector was increased. During the period between 1960 - 1972, a larger contribution to gross fixed capital formation (GFCF) came from the private sector relative to the public sector. For instance, at the end of 1960, gross capital formation (GCF) in Nigeria stood at 258.2 million Naira of which the private sector accounted for 135.2 million Naira or about 52.0 percent of the total GCF. By 1963, out of the total GCF of 354 million Naira, private sector accounted for about 227.2 million Naira or 64 percent of total (Busari, 1999). Public sector investment was minimal and concentrated on transportation and other infrastructural facilities. In the 1960s, the contribution of the private sector, on the average, was about twice that of the public sector. Real GDP rose by over 14 percent between 1960 and 1963. Available data also shows that real GDP grew by about 8 percent between 1960 and 1966 while total GCF rose from 354 million Naira in 1963 to 485.2 million Naira in 1966. Generally, between 1960 and 1966, the economic and political climate were quite stable and calculable, hence, favourable to growth and capital formation(Emenuga, 1996).

In 1960, out of the 254.4 million Naira investment expenditure, building accounted for 91 million Naira or about 35.2 percent. Other similar civil engineering works accounted for another 22 percent. In sum, building/construction and related activities accounted for over one-half of the total investment expenditure in 1960. Plant and machinery accounted for about 24 percent. In 1966, building construction (and civil engineering) related activities accounted for about 46 percent of investment expenditure while plant, machinery and equipment accounted for about 32 percent. The major reason for the increasing role of plant, machinery and equipment was the vigorous pursuit of the import substitution industrialization strategy, which led to the liberalization of capital importation. Out of 844.9 million Naira spent on GFCF in 1970, 48 percent went to building and construction, 21 percent to plant, machinery and equipment. By 1972, about 63 percent of total GFCF went to construction related activities while 22 per cent went into machinery and equipment. The above situation shows that real estate and plant, machinery and equipment have consistently accounted for over 70 per cent of total GFCF.

The Oil Boom Era: 1973 - 1985

In the early 1970s, the positive external shocks in the form of increased oil prices generated much savings and created investment booms (Ikhide, 1994). Investment expenditure when measured in current prices increased at an annual average rate of 55.9 percent between 1970 and 1975 (see table 1 - appendix).

The highest rate of growth was attained between 1974 and 1975 when capital formation reached a peak growth rate of 74.1 per cent within a single year. The oil windfalls of the 1970s changed the sectoral composition of the GFCF in favour of the government. Since 1974, the public sector has been accounting for a higher proportion of GFCF. In 1976, the public sector accounted for more than three times the share of private sector. As a share of the GDP, the private sector contributed less than an average of 3 percent in the 1980s, as against an annual average of 8.8 percent in the period between 1973 and 1980s (see Chart 1 - appendix). The contribution even grew worse as the private sector could only contribute a paltry 3 percent of the GDP in 1985 in terms of investment-GDP ratio. During this period, economic growth has decelerated markedly since the collapse of international oil prices, this has been associated with corresponding reduction in private investment, whose share of GDP has declined steadily since the 1970s (see Chart 1).

Most of the public sector investment had taken place in industrial core projects (ICP) like the Iron and Steel plants, Fertilizer plants, Liquefied Natural Gas (LNG) and other projects. Building and Construction continued to contribute the largest to GCF. In 1973, building and construction had attained a share of 72.7 percent of the GCF with a value of 4976.6 million Naira. The contribution of plant, machinery and equipment was the second largest on the average, its proportion fell to about 18 per cent in the 1980s as against the over 20 percent of the 1970s. The direct implication of this was a slow growth in the nation's industrial and manufacturing sector (Oyejide, 1986). In fact, the poor performance of the manufacturing sector had been identified as one of the causes of the nation's economic woes (Chete and Adenikinju, 1995). The manufacturing sector recorded a negative growth rate of -0.057 percent in total factor productivity growth (TFPG) between 1962-1985, however, obtained a positive but low coefficient of 0.599 for TFPG during the period 1988-90. Many significant events before 1985 affected the economy and most especially investment spending, none more important than the management of the oil revenues (Omoruyi, 1995).

The Reform Era: 1986 - 1998

The introduction of SAP in 1986 brought some drastic trade and exchange rate reforms, among several other measures. The desired effect of the reform was to restore the incentives to export and increase the profitability of private investment. Import licenses and the agricultural marketing boards were eliminated, price controls were lifted, and the deregulation of the financial system was initiated. In 1988, the government issued an industrial policy statement outlining a major liberalization of the rules governing foreign participation in new enterprises in Nigeria with up to 100 per cent permitted in most manufacturing activities. Similarly, an inter-ministerial committee, the Industrial Development Coordinating Committee (IDCC) was set up as a one-stop approval center for new ventures in order to reduce delays in receiving approval for establishing an industry.

The restructuring of domestic production and the liberalization of the incentive regime led to resurgence of agriculture and manufacturing, hence real GDP started an upward trend again. The nominal tariff level was lowered from 33 to 23 percent, and the tariff structure was simplified. Gross investment fell over the SAP period from 22 percent of GDP in 1986 to 14 percent in 1990 largely as a result of the government's efforts to reduce extra-budgetary expenditures and inefficient capital outlays in 1987-89 (Moser et al., 1997). Public investment reduced from an average of 16 percent of GDP in 1981-85 to 10.5 percent during 1986-90, however, the decline did not hinder the resurgence of growth, as a large share of public investment was in unproductive projects. On the other hand, private investment rose from an average of 4 percent of GDP during 1982-85 to an average of 7 percent during the SAP period (1986-94). Chart I shows that private investment rose marginally since 1988, it recovered to over 8 billion Naira (9% of GDP) by 1990, although it fell again in 1993 to 4.5 percent. Between 1994 and 1996, the ratio ranged between 9.6 percent and 13 percent. The current private investment level (between 7-10 percent of GDP) is less than the depreciation rate (between 10 -15 percent) in the existing private capital stock. The combination of high inflation, high interest rates and persistent depreciation of the Naira during this period constituted a serious disincentive to new investments (Chhibber and Pahwa, 1994).

At the end of 1985, building/construction and similar related activities constituted about 60 percent of total GFCF with plant, machinery and equipment constituting about 26 percent. Similarly, the public sector contributed over 75 percent of total GFCF. By 1988,

building and construction accounted for over 90 percent of total GFCF. Between 1988 and 1989, the share of plant and machinery fell from 21 percent to 14 percent before rising to 20 percent in 1991. Between 1989 and 1991, the share of transport equipment also rose, this was mainly due to the Urban Mass Transit Programme embarked upon. In 1993, the political climate was particularly unstable such that the public sector contributed 98 percent of GFCF. As usual, building and construction topped the list as plant, machinery and equipment followed at about 19 per cent. Over the years, a key factor to the erratic economic performance of the economy had been the behaviour of aggregate investment expenditures (Uchendu, 1993). Investment have been an important source of macroeconomic instability in Nigeria.

Chart II shows the trends in gross fixed investment in Nigeria, as a share of GDP. It fell sharply in the mid -1980s, however, started rising again in the early 1990s. It has remained below 6 percent since 1995. While chart III shows that equipment investment to GDP ratio trend fluctuated over the period under review, but stabilized in the late1990s. It averaged 7.59 percent between 1996 and2000 after reaching a peak of 12 percent in 1995.

2.2 Nigeria's Growth Performance

Between 1970 and 1972, real GDP grew by about 19 per cent that is from 4219 million Naira to 4892.8 million Naira. During the 1970s real GDP growth were positive and high except in 1975 and 1978 (see Chart IV). Between 1980 and 1997, real GDP grew, on the average minimally. In fact, between 1980 and 1984, real GDP declined from N96,186.6m in 1980 to N83006.4m in 1984, representing a fall of -13.7 per cent. Looking at sectoral performance, the index of mining declined from 138.5 in 1980 to 120.4 in 1993, representing a fall in output. The index of manufacturing production rose from 102.4 in 1980 to 132.8 in 1982 then declined to 83.4 in 1984. Between 1987 and 1992, it rose continuously before declining in 1993. The index of agricultural production more than doubled between 1980 and 1983 from 92.5 to 192(CBN, 1998).

Aggregate domestic output (GDP) at 1984 factor cost increased by 2.4 per cent in 1998 compared with 3.2 per cent in 1997 and giving an average growth rate of 2.85 per cent between 1996 and 2000 (Chart IV). Agricultural production continued to record modest growth in 1998, although lower than in 1997, explained mainly as in the past by favourable

weather conditions. Output in the industrial sector contracted by 4.7 per cent, in contrast to the modest increases recorded in the preceding two years. Output in the manufacturing sector declined reflecting the effect of the persisting low consumer demand, high cost of operations, acute shortages of fuel, and frequent outages in electricity. This review illustrates the main features of the Nigerian investment and growth profile that provides a useful background to the paper.

2.3 Conceptual Issues

It is important to discuss some concepts that are germane and would help to understand the paper. Total factor productivity is the relationship between the output and the input in terms of labour, materials, capital etc.(Spiegel and Stiegeler, 1982). The productive potential of a country will be the amount that a country is capable of producing if full use is made of all factors of production. It is dependent on the size of the working population and the average level of productivity. This in turn depends upon the state of technology and the amount of capital equipment per worker(Solow, 1957). The main reason for the growth of the advanced or developed economies in the post-war era has been a continual increase in productivity(Robello, 1991).

Equipment investment refers to expenditure on productive capital goods usually physical capital such as machinery or plant (Spiegel and Stiegeler, 1982). Equipment investment can be regarded as fixed or concrete capital investment. They are those goods that lose comparatively little of their value during each cycle of production. Examples are plant, machinery, and tools. Investment may be divided into net investment and gross investment. Net investment is the amount by which the total physical capital stock is increased and the gross investment is the total spending on physical capital including depreciation(Spiegel and Stiegeler, 1982). In a Keynesian model, investment is a major source of fluctuation in the economy (Jorgenson, 1963). The investment sector encompasses all investment in durable capital goods.

Capital Output ratio (ICOR) is the proportion of capital to output in an aggregate economy(Spiegel and Stiegeler, 1982). It is most important in an economy with two factors of production and a constant-returns-to-scale production function. In this case production per head may be regarded as a function of the ratio of capital to labour only, not of their absolute values(Solow,1963). The use of capital in the productive process increases efficiency and output and this increase is the reward for abstention from

consumption. However, capital saturation point is reached when capital reaches its intensive margin relative to labour. At this point the marginal productivity of capital has fallen to zero. That is, the capital-labour ratio is so high that further increases of it do not lead to an increase in output per head(Hall, 1977).

3 LITERATURE REVIEW

The early literature on aggregate investment tried to make a distinction between the desired capital stock and the rate of investment, associated with the flexible accelerator models(Abel, 1980). The most popular of these studies is the neoclassical investment theory associated with Jorgenson (1963), Hall (1977) and Clark (1979). The desired capital stock is explained as the outcome of firms profit maximization behaviour. Here, the desired capital stock is derived as a function of the demand for output and the rental cost of capital. The Keynesian accelerator, on the other hand, argues that the rate of investment spending is determined by the rate of change of output. Montiel (1995) view that the link between growth and investment is through capital stock because financial development may exact positive effect on growth by increasing the efficiency of the capital stock as well as by reducing the cost of operating the financial system.

Most growth models agree that the rate of growth of output is determined by the accumulation of physical and human capital and/or technical progress. The new (endogenous) growth model differs from the neoclassical view in that it endogenises technical progress. Another major difference between the neoclassicals and the new growth theories relates to the role of capital stock (and investment in physical capital) in the growth process. With the neoclassicals, countries with lower stock of capital would have higher returns per unit of capital, thus higher investment would mean higher growth. The new growth models also lays emphasis on the linear growth-investment relationship, however, they differ in their views about the constituent of capital, and its dynamic relationship with growth. Rebello's (1991) definition of capital includes not just physical capital, but also human capital, organisational capital, and technological knowledge. Romer (1993) distinguished between what he termed "object gap" i.e., lack of physical capital, and "idea gap" i.e., lack of technology/human capital. He noted that developing countries suffer from idea gap and not much from object gap.

The new growth theorist argue that scarcity of capital implies low returns, that is, capital has a higher return where it is already abundant because of various externalities to capital

accumulation. Consequently, growth will be a virtuous cycle of more capital accumulation attracting further accumulation (Rebelo, 1991; Romer, 1994; and Soludo, 1998). Despite the innovations from the new growth theorist, the traditional growth model (Harrod-Domar) still remains the simple tool-kit used by most policy analysts and advisers (Easterly, 1997).

Assessments of the contribution of investment to growth have followed two approaches. The first approach, in the tradition of Jorgenson (1963), is to work with the "fundamental accounting identity" in which the total value of outputs equals the total value of inputs. The later approach attempts to whittle down the residual, since Solow's studies have amounted to accounting for the growth of real wages. Associated for instance, with changes in educational, age, and skill compositions of the labour force, and with the redeployment of labour from low to higher wage sector. In the later approach, Solow (1957) first derived this relationship by estimating a production function where technical progress or the "residual" was included and accorded greater importance. This approach suggests that capital accumulation accounts for only a relatively small fraction of productivity growth. Easterly (1997) in his study of 146 countries, Nigeria inclusive, find in most cases a negative relationship between growth and investment. In support, Soludo (1998) also find investment/GDP ratio impacts negatively on output growth in Nigeria. Although, he warned that the result should be interpreted with caution, because of the problems associated with regression analysis and Nigerian data. Ariyo (1998) find GDP growth to be positively related to private and public investment in Nigeria, with only private investment being significant. In contrast, Obaseki and Onwioduokit (1998) find that public investment contributed more to output growth in Nigeria between 1970 to 1995.

In analyzing how investment contribute to growth, Scott (1989) and Anderson (1990) draws on vintage theories of investment-embodied technical progress to show how the gains from redeployment of labour can be linked to investment and growth. Solow (1957), shows that technological change as may be reflected in total factor productivity growth, was a major source of growth in the United States economy during the period 1909-47. Auerbach (1992) argued that domestic assets do increase labour productivity and wages through the growth accounting connection. Romer (1990) stressed external economies or "linkages" as causes of growth. Spillover may well be in some sectors than in others. For instance, manufacturing accounts for 95 percent of private-sector research and development in USA, and within manufacturing, the equipment sector accounts for more

than half of research and development according to Summers (1990). Hence, it is plausible that equipment investment will give rise to especially important external economies (De Long and Summers, 1990). De Long and Summers (1993) disaggregate investments into 'structures' (construction) and equipment components for a sample of both developing and industrial countries, and found that equipment investment contributes much more to per capita GDP growth than does the structures. This conclusion agrees with the notion that technological progress is largely embodied in new machinery.

The direct application of some of the investment-growth models to developing countries may be inappropriate due to institutional and structural rigidities present in developing countries' economies. For instance, the absence of well functioning financial markets, the relative larger role of government in investment projects, severe data limitations and other imperfections pose a serious problem (Blejer and Khan, 1984). The main link between growth of real (per capita) GDP and investment is via the capital stock, unfortunately, the data for this variable for Nigeria is scanty and unreliable (Busari, 1999). Similarly, the neo-classical growth model assumes that the financial sector knows the marginal product of capital in alternative economic activities. But this is not true for most developing countries.

In Nigeria, some studies have been carried out on the need for equipment investment in growth process. Poloamina (1990) argue that capital goods acquisition constitute the missing link between technology and economic development in Nigeria. According to him, the main ingredient of economic development is technological change and capital goods production or acquisition is what leads to it. In support, UNIDO (1989) and Aigbokhan (1990) views that capital goods acquisition are essential elements of any industrialisation plan. Aigbokhan (1990) concludes that from the experience of advanced economies, it is more growth enhancing to produce or acquire capital goods than consumer goods in Nigeria. Inuwa (1990) argue that emphasis on short-term economic gains is often detrimental to growth in technological development in Nigeria. The emphasis on short-term cost efficiency (profitability) rather than long-run benefits such as technology acquisition, economies of scale, affordability, international competitivessness, multiplier effects on other sector, etc. is the major bane to capital goods and technological development in Nigeria.

4. EMPIRICAL ANALYSIS

4.1 Methodology

This paper employs econometrics approach in its methodology. This involves the use of growth accounting equation, granger causality and regression models. The approaches help to examine the role of equipment investment including other components of investment in growth process. This is because the relationship between investment and growth is better examined from both short-run and long-run perspectives. Moreover, from the literature, growth accounting, granger causality and Vector Error-Correction Model(VECM) techniques have been widely applied in recent studies. The regression was done in both level and first difference forms. The first difference form regression involves the use of error-correction model. Modern studies focus on cointegration/error correction models(ECM) of estimating economic functions. In this paper ECM is used because it captures both the static long-run economic theory and permits a more flexible approach to modeling of short-run dynamics. Granger(1988) has demonstrated that the importance of ECM is derived from its usefulness in explaining the long-run equilibrium relationship through the process of short-run dynamics of economic data.

We first utilize the method of ***growth accounting*** to identify the connection between domestic investment and growth. We attempt to find the rate of private capital growth[1] that would be required to get 6 percent GDP growth in the economy. As demonstrated by Auerbach (1992), equation (1) is our basic growth accounting identity.

$$g_y = \alpha g_k + (1-\alpha) g_l + e \;\; ; \;\; 0 < \alpha < 1 \qquad \ldots\ldots 1$$

Here g_y is the real income or GDP growth, g_k is capital stock growth, a is capital's share in production, g_l is labour force growth, (1-a) is labours share in production and e is technical progress. Equation (1) implies that assuming other variables are constant (labour force growth and technology), an increase in the capital stock growth rate of one percentage point per year would increase the output growth rate by a. Similarly, an increase in the rate of growth of output of one percentage point would require an increase in the capital-stock growth rate of 0.01/a.

The second approach is the ***Granger-Causality***. The hypotheses it tries to test can be explained thus, that equipment investment causes growth rather than growth causing equipment investment. Similarly, equipment investment do increase labour productivity,

that is, capital deepening domestic investment will tend to raise productivity growth. One would also expect that increases in GDP growth should lead to increases in labour force or real wage growth.

The relationship between growth, equipment investment, labour force growth, wage growth, productivity growth and the share of GDP devoted to other fixed investment can be put thus:

$$GDPG = EI + PG + LG + SGDPI + WG \quad \text{.....} \quad 2$$

where GDPG is GDP growth, EI is equipment investment, PG is productivity growth, LG is labour force growth, WG is growth in average wage rate and SGDPI is the share of GDP devoted to other fixed investment. All the explanatory variables are assumed to be positively related to GDP growth. Instead of estimating the model, we first focus on the causal relationships between these variables and GDP growth[1]. The idea is to determine the direction of causality and then state the policy implications of such findings. For example, if equipment investment causes growth then the policy lesson is clear. The analysis is based on Granger's (1969) and Sims' (1972) causal models. We write the general autoregressive distributed lag (ADL) representation of equation 2 as

$$A(L)\, GDPG_t = B(L)\, N_t + e_t \quad \text{.....} \quad 3$$

where $GDPG_t$ is the endogenous variable; N_t the set of the explanatory variables(equipment investment, productivity growth, etc.) and A(L) and B(L) are appropriately dimensioned polynomial coefficients in the now familiar manner. All variables are in real level-form and stationary time series. The error terms are uncorrelated. The idea is to conduct a series of F tests on all the coefficients in the Auto-Regressive (AR) model, that is, to test the null hypotheses that the sum of each of the coefficients is equal to zero or that X does not Granger cause Y. The number of lag is set equal to two[iv]. The model was estimated using the E-Views econometric software.

Finally, a ***regression analysis*** was carried out in both levels and first differences. The reason for estimating for first difference is that regressions based on levels of the variables may be producing spurious results. If the level variables possess a single unit root and are co-integrated, then first-differencing would render them stationary, and regressions based on changes would not exhibit the spurious correlation problem(Engle and Granger, 1987). Following from Easterly(1997) and Soludo(1998) we regress GDP growth on

equipment investment and other components of investment. The relationship can be specified thus:

$$\underset{+}{} \quad \underset{+}{} \quad \underset{+}{}$$
$$\mathbf{GDPG = f\,(EI/GDP + RFI/GDP + SGD/GDP + u)} \ldots\ldots\ldots\ldots \quad \mathbf{4}$$

where GDPG – GDP growth, EI/GDP – Equipment investment to GDP ratio; RFI/GDP – fixed investment to GDP ratio; SGD/GDP – other components of fixed investment to GDP ratio. The signs at the top are the a priori expectation. It is postulated that GDP growth is positively related to all forms of investment components. The regression analysis tests the hypothesis that domestic fixed investment is important for growth. In other words, we test the hypothesis that capital accumulation is a prime determinant of growth.

4.2 Model Estimation and Interpretations of Result

This section presents findings of the quantitative empirical tests between economic growth and domestic investment in Nigeria during the period 1970 -2000. The data used for the analysis were derived from various issues of FOS Digest of Statistics and Abstract of Statistics, CBN Statement of Accounts and Annual Reports and other relevant sources. In most cases, more recent years' data were taken from the CBN and FOS recent reports.

Growth Accounting Model

The results of the model are presented in Table 2 using actual data on Nigeria, this may be useful to illustrate the order of magnitude involved. Estimates for the table were calculated based on a GDP growth target of 6 percent and assuming that labour force growth rates continue at the current average rate of 2.75 percent per annum (FOS Digest of Statistics-Various Issues), then we calculate by how much private capital stock should grow.

Table II shows that private capital must grow at a rate of at least 9 per cent per annum in order to generate economic growth of about 6 per cent per annum. Given a capital-output ratio of about 2 (a fairly productive economy is assumed), this would translate to an increase in the fixed investment-GDP ratio of 18 percentage points. This is over 100 per cent increase over the current levels of the increase in the fixed investment-GDP ratio. Such an increase would be unprecedented even for a single year, not to mention a

much longer period. If the fixed investment-GDP ratio continues to grow at around its current average rate of between 5 - 7 per cent, then capital stock would decline as well as growth rate of output. This result is consistent with the findings of Chhibber and Pahwa (1994).

The Granger-Causality Model

The results of the Granger-Causality tests are reported in table III. From table III, we find statistically significant causal relationships between equipment investment and GDP growth; GDP growth and labour force growth; share of other fixed investment in GDP and GDP growth; and equipment investment and productivity growth that run only in one direction. Thus, GDP growth causes changes in labour force growth; equipment investment causes changes in GDP growth and productivity growth and; share of other fixed investment in GDP causes changes in GDP growth. No causality is detected between GDP growth and equipment investment; GDP growth and productivity growth; productivity growth and GDP growth; labour force growth and GDP growth; and so forth. The result implies that past values of domestic fixed investment should be able to help predict future values of GDP growth and productivity growth. Similarly, past values of GDP growth should enable us predict future values of labour force growth, but past values of labour force growth should not be helpful in forecasting GDP growth.

The evidence confirms our alternative hypothesis that equipment investment causes growth rather than growth causes equipment investment. Similarly, the share of other fixed investment in GDP increases GDP growth. Furthermore, equipment investment does increase productivity growth. Also, GDP growth leads to increases in labour force growth. Capital accumulation may have accounted for a large portion of GDP and productivity growth in Nigeria. The findings suggest that the connection between domestic fixed investment and GDP growth does provide strong argument for promoting domestic fixed investment in Nigeria. The result supports the arguments of Auerbach (1992) that domestic assets do increase labour productivity. Similar conclusions have been reached by De Long and Summer (1990; 1993) that equipment investment will give rise to positive economic growth.

Beyond the Causality Model: The Regression Analysis

We regress GDP growth on equipment investment and other components of investment on Nigeria's data for the period 1970-2001. Apart from examining the linkage between

growth and equipment investment, we attempt to find out which type of investment matter most for growth in Nigeria. Table IV presents the estimation results.

Interpretation of Results

Table IV shows that the estimates from both regressions form differ from each other, the reason for the difference is that regressions based on levels of the variables may be producing spurious results, hence the use of VEC model to correct for the spurious correction problem. The result reveals that under level-form regression, equipment investment, fixed investment and other share of fixed investment have statistically significant positive impact on growth, except the fixed investment coefficient that was not significant. The coefficient of determination is high at 63 percent and there is near absence of serial correlation from the Durbin-Watson statistics. All the coefficients of the variables are elastic. On the other hand, under the first difference regression, in column three, only equipment investment and share of other fixed investment have positive impact on growth. Moreover, they are not statistically significant. Unlike the fixed investment coefficient in level-form regression that has positive impact, here fixed investment coefficient has negative impact on growth. The coefficient of determination (61%) is satisfactory and okay. Only the share of other fixed investment has inelastic coefficient among the dependent variables. The conclusion from the results is that equipment investment and other share of fixed investment are positively related to economic growth but not significant under VEC model. Fixed investment becomes negatively related to growth under VEC model.

4.3 Policy Implications of Results

The policy implications of the findings is that equipment investment is relevant to growth and should be encouraged because we find that in all cases it is positively related to growth. However, its non-significance in the VEC model implies that in the long-run, equipment investment may not be as important as in the short-run. Consequently, government policy, in terms of deciding on budgetary allocations to the equipment sector should be reviewed upward. In the early or initial stages of growth, equipment investment is important for industrialisation to take-place, particularly in capital-scarce countries like Nigeria(Adam, 2001). Therefore, foreign exchange allocations for import of machinery and fixed assets should be stepped–up to facilitate rapid industrial development and technological progress.

In addition, the negative relationship between fixed investment and growth under VEC model may suggest fixed investment is harmful to growth in Nigeria. The unexpected result may be due to high volatility of GDP growth in Nigeria and not that fixed investment is contributing negatively to growth. Although, similar findings have been reported for Nigeria by Easterly (1997) and Soludo (1998) with respect to the relationship between investment and growth. On the other hand, our findings with respect to other components of fixed investments exhibits a positive relationships with growth. This contradictory results imply that we may have to draw from the results of other methods to arrive at a definite conclusion. The contradictory results also support Blejer and Khan's (1984) view that it is difficult to apply investment-growth models to LDCs economy due to structural and institutional rigidities, absence of well functioning financial market and data limitations. Moreover, GDP growth is highly volatile in developing countries, particularly, in Africa where marginal and negative growth are prevalent. Furthermore, the major source of GDP volatility may be due to fluctuations in the fixed investment variable. John Keynes consider investment among the components of GDP to be the most volatile and main source of volatility of GDP.

5. SUMMARY AND CONCLUSION

In this paper, we have attempted an analysis of the role of equipment investment in economic growth, and examined the relationship between aggregate and components of domestic fixed investment, labour force growth, productivity growth and economic growth. Empirical evidence from the growth accounting equation has shown that investment-GDP ratio must grow at around 18 percent per annum and private capital stock must grow at around 9 percent, in order for the country to generate economic growth of about 6 percent per annum. The Granger-Causality test does provide robust result, in that there is strong connection between GDP growth, components of domestic fixed investment, productivity growth, and labour force growth. There was causal link between components of fixed investment, productivity growth and GDP growth in one direction. Equipment investment seems to have accounted for a significant portion of productivity growth and GDP growth in Nigeria. Similarly, GDP growth have contributed to a large portion of labour force growth. Lastly, the regression analysis reveals that equipment investment, fixed investment and other share of fixed investment are positively related to growth, except, fixed investment that has negative sign under VEC model.

The general conclusion that can be drawn is that equipment investment as well as other components of investments are necessary for growth in Nigeria. The negative impact of fixed investment on growth is due to high volatility of GDP growth as well as fixed investment fluctuations in Nigeria.

The lessons one draws from the Nigerian experience is that the sustainability of economic growth depends on acquisition of equipment investment, as well as other components of fixed investment and recovery of private investment. If private investment growth continues at current levels, private capital stock would decline and growth rate would fall as well. Government should give priority to increasing equipment investment in the country by given more foreign exchange allocation to importation of machinery and fixed assets and allocate more funds for domestic production of equipment or fixed assets.

ENDNOTES

[i] For detailed discussion see Blejer and Khan (1984)

[ii] Private capital stock was estimated or used because the returns to public capital in Nigeria have been negative(i.e. -0.05) for several years. see Chhibber and Pahwa(1994. pp. 123) for details.

[iii] The fact that two variables are highly correlated does not indicate whether causality (changes in one variable cause changes in other variable) exists between them.

[iv] We use the Akaike (1974) Information Criterion (AIC) and Hall's(1992) general-to-specific method to determine the optimal lag length.

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APPENDIX

Table 1: Compound Annual Growth Rate of Gross Domestic Investment (GDI) in Nigeria, 1960 – 2000).

Period	Current GDI	Real GDI	Real GDP
1960-69	10	5	3
1970-75	55.9	18.4	7.9
1976-80	6.7	-0.3	1.7
1981-85	-13.2	-15.1	-0.4
1985-90	60.5	4	5.4
1991-95	130.4	2.5	1.9
1996-00	86.6	2.7	2.5

Source: FOS. Digest of Statistics (Various Issues)

Table II : Growth Accounting Model

Growth in	Percentages	Contribution to Growth
Labour	2.75	1 percent
Private Capital	9	4 percent
TFPG	0.00599	0.6 percent
TOTAL		5.6 percent

Based on coefficients obtained from Chhibber and Pahwa(1994) and Adenikinju(1996)[IV]

Table III: Summary of Causal Inferences for Nigeria, 1970- 2000

Serial No.	Null Hypothesis	Estimates	Causal Inference
1	GDPG does not Granger cause ⊟	F = 0.5095 (0.6083)	No Causality
2	EI does not Granger cause GDPG	F = 7.8899 (0.0029)*	Causality
3	GDPG does not Granger cause PG	F = 0.6475 (0.5339)	No Causality
4	PG does not granger cause GDPG	F = 2.1186 (0.1463)*	Causality
5	GDPG does not granger cause LG	F = 0.2276 (0.7984)	No Causality
6	LG does not Granger cause GDPG	F = 0.4027 (0.6738)	No Causality
7	GDPG does not Granger cause SGDPI	F = 0.0817 (0.9218)	No Causality
8	SGDPI does not granger cause GDPG	F = 2.5124 (0.1063)*	Causality
9	GDPG does not Granger cause WG	F = 0.0560 (0.9456)	No Causality
10	WG does not Granger cause GDPG	F = 0.1379 (0.8719)*	No Causality
11	⊟ does not Granger cause PG	F = 8.4475 (0.0020)	Causality
12	PG does not Granger cause ⊟	F = 0.0197 (0.9804)	No Causality
13	⊟ does not Granger cause LG	F = 0.1718 (0.8433)	No Causality
14	LG does not Granger cause ⊟	F = 0.0634 (0.9387)	No Causality
15	⊟ does not Granger cause WG	F = 0.6900 (0.9335)	No Causality
16	WG does not Granger cause ⊟	F = 0.1650 (0.8489)	No Causality

P-Values in parentheses.

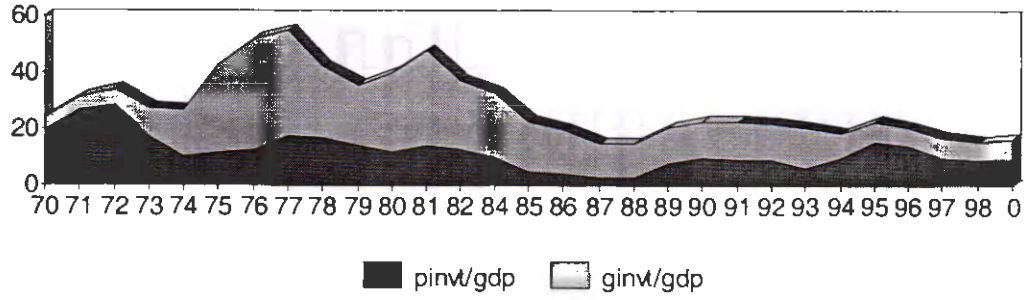
* Statistically significant at the 5% level.

Table IV: Estimation Results on the Relationship Between Growth and Investment Components, 1970-01

Variables	OLS - Levels	OLS–1st Difference(VECM)	Error Correction
Dependent Var.(RGDPG)	-	-	-
Constant	13.017 (3.710)	-	-
EI/GDP Ratio	1.307 (1.534)	0.976 (1.221)	0.218
FI/GDP Ratio	0.827 (1.337)	-0 534 (-1.312)	0.006
SGD/GDP Ratio	0.617 (1.558)	0.412 (1.219)	0.018
RGDPG(-1)	-2.021 (0.321)	-1.867 (-0.112)	0.023
R-SQUARE	0.631	0.611	-
Adj. R-SQUARE	0.572	0.587	-
SER	4.842	3 213	-
D.W. STATISTICS	2.094		-

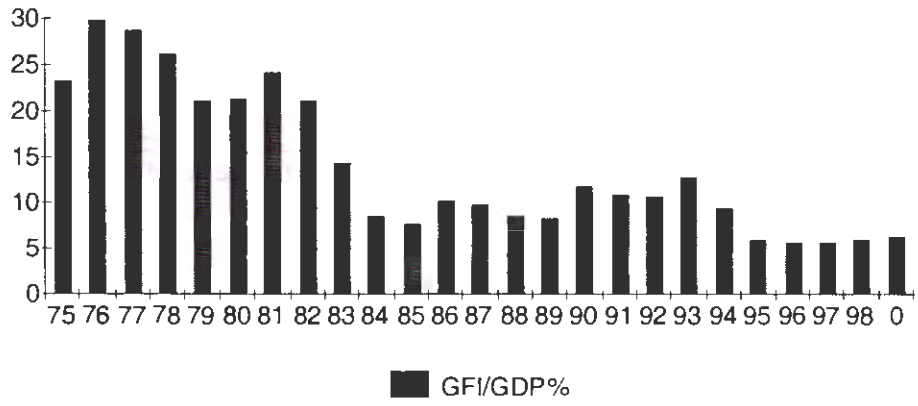
Note 1. t – values in parenthesis. 2. Estimated at 5% level of Significance.

Chart 1: Nigeria's Private and Public Investment as a Share of GDP(1970-2000).



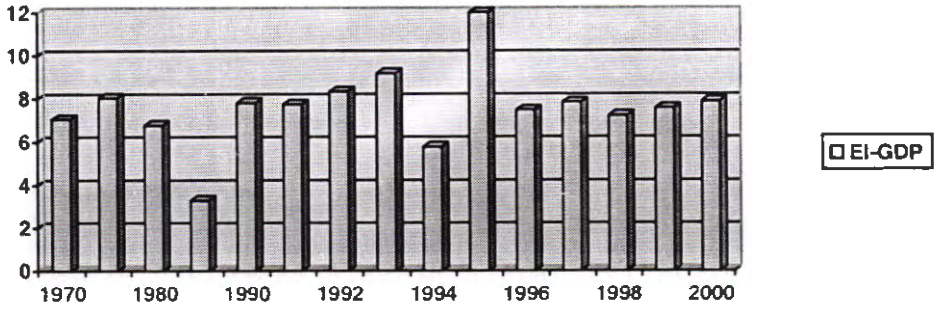
Source: 1. Central Bank of Nigeria, Statistical Bulletin (Various Issues).
2. FOS, Abstract of Statistics(Various Issues)

Chart II: Nigeria's Gross Fixed Investment as a Share of GDP (1975 - 2000)



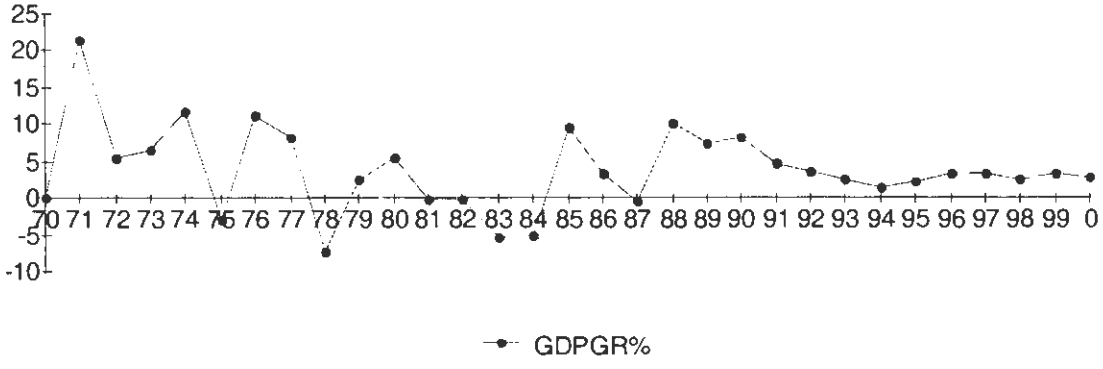
Source: Central Bank of Nigeria, Statistical Bulletin (Various Issues)

Chart III: Relationship Between Equipment Investment and Growth: 1970 – 2000



Source: FOS Abstract of Statistics (Various Issues)

Chart IV. Percentage Annual Growth Rate of Real GDP for Nigeria. 1970 - 2000



Source: CBN, Statistical Bulletin, (Various Issues)