Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.3, No.11, 2012

Private Investments in Nigeria and the Manufacturing Sector: A VECM approach

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ABSTRACT

This study examines the determinants of private Investment in Nigeria`s manufacturing sector for 1970-2010. The study adopted the Vector Error Correction Model approach, estimated using the Ordinary Least Square estimator. The results showed that manufacturing output significantly responded to the contemporaneous perturbation in the values of nominal exchange rate, policy lending rate and the corporate income tax. These series also showed a high tendency of recovery from the deviation from their equilibrium values in subsequent periods.

INTRODUCTION

Investment as key to economic growth as it stimulates activities which lead to increased capital formation needed for economic growth. Investment in key sectors such as manufacturing has the ability of transforming economies to a higher level of capacity utilization and productivity. Most macroeconomic objectives have been achieved through programmes and policies promoting investments in the various sectors.

Mindful of the perceived benefits of investments and its determinants, Nigeria embarked on formulation and definition of suitable economic frame works to boost investment opportunities with the intent of achieving economic growth and development, Olusegun, A (2010). The EPS, ISS, SAP and the NIP of the 80's and 90's are policies formulated and implemented as catalyst in the growth and development process, through domestic savings. According to the World Bank report of 1991, level of savings and investment rate has remained inadequate and insufficient to fuel the growth needed to raise living standards and attain full capacity utilization of resources.

Private investment in any economy has the advantage of not been associated with corruption and more associated with efficient and effective resource use.

While the debate continues on the role of capital formation in LDC's development trajectory, one cannot but agree that mildly robust growth rates in key sectors such as manufacturing can be sustained over long periods only when a sizable proportion of the GDP is devoted to investment. Dipo (2008) concluded that private investment in Nigeria within 1970-1995, contributed significantly to the gross domestic product. Though investment typically represents a much smaller component of aggregate demand than does consumption, it determines the rate at which physical capital is accumulated. Amongst the components of aggregate demand, Private investment is identified as having more impact on the economy. Consequently there has been a shift in paradigm, emphasizing Private sector and market led economy and de-emphasizing heavy public sector participation in production. In the light of these policy shifts, the Private sector led development has been encouraged in Nigeria; this study seeks to examine the determinants of Private investment in the manufacturing sector.

Review of the literature

Investment literature abounds with descriptions of the determinants of private investment and the channels through which such variables affect investment. Prominent amongst these are the traditional neoclassical theory, as formulated by Jorgenson (1963, 1971), which postulates the role of the cost of capital; the accelerator model, which postulated

the role of rate of change of output; the Tobin's *q,* which argues a role for the value of the firm; and the financial repression framework due to McKinnon (1973) and Shaw (1973). Over time more variables have been observed to affect corporate investment in one way or the other. This study will not attempt to repeat the literature in this respect. However, interested readers are referred to studies like Greene and Villanueva (1991); DeLong and Summers (1991). During the 1990s, another strand of argument on the determinants of private investment started to gain ground as coherently formulated by Pindyck (1991). This new line of argument in the recent literature on investment interprets a firm as consisting of a portfolio of options, and uses options-based pricing techniques to study the investment decision. We believe that this line of argument is more relevant in the current study and hence attention is focused on it in the following section.

The real options theory of investment

Using options-based pricing techniques to study the investment decision of firms, the real option theory of investment interprets a firm as consisting of a portfolio of options. As argued by Chen and Funke (2003), investment opportunities can be viewed as "option-rights" such that each investment project can be assimilated, in its nature, into the purchase of a financial call option, where the investor pays a premium price in order to get the right to buy an asset for some time at a predetermined price (exercise price), and eventually different from the spot market price of the asset (strike price). In a similar manner, while making investment decisions, a firm pays a price (the cost of setting up the project) giving it the right to use the capital (exercise price), now or in the future, in return for an asset worth a strike price. The basic implication of this analysis is that the wholesale application of the net present value rule to the expected future cash flows of the firm will give suboptimal results (Chen and Funke, 2003). To avoid this suboptimal investment decision rule, it is important to consider the following three characteristics of the firm's investment decision:

• There is uncertainty about future payoffs from the investment;
• The investment does not entail a now-or-never decision; and
• The investment is at least partially irreversible.

As argued in the literature, the direct implication of the foregoing characteristics of fixed corporate investment for optimal investment decision making is that the opportunity cost of investment will necessarily include the value of the option to wait when an investment decision is taken (Abel and Eberly, 1994; Abel et al., 1996).

Hence, Chen and Funke (2003) argue that the investment decision is affected by the determinants of the value of the option; consequently, an appropriate identification of the optimal exercise strategies for real options plays a crucial role in the maximization of a firm's value. The real options studied in the literature include, among others, operating options; the option to wait and undertake an investment later (McDonald and Siegel, 1986), and uncertainty from future interest rates (Ingersoll and Ross, 1992). Other contributions to the literature are Abel and Eberly (1994, 1997) and Abel et al. (1996). The general focus in the literature has been the effect of demand, price and/or exchange rate uncertainty upon investment decisions of firms. On the basis of the objective and focus of this study, we now review the relevant aspects of the real option theory to the macro-policy environment.

Trade policy reform, investment and economic performance

Many reasons why trade liberalization might encourage investment are illuminated in the literature. Corden (1974) pointed out that protection could reduce the rate of capital accumulation because, in the absence of capital flows, investment is determined by the amount of domestic savings out of total income. Hence, as long as protection lowers real income, especially for small countries that lack international market power, investment and the rate of capital accumulation will decline. The new literature on economic growth argues that countries that take advantage of international trade might enjoy higher growth because of

faster absorption of foreign technical knowledge (Aizenman, 1992). In other words, if investment is linked to changes in output (say through the accelerator effect), any policy measure that promotes growth will be a stimulus for an increase in capital accumulation. In an indirect manner, it is argued that in as much as economic growth is linked to faster capital accumulation and growth is associated with openness, then effective trade policy reform will be investment inducing (see OECD, 2001). There is a preponderance of cross-country evidence that trade liberalization and openness to trade increases capital accumulation, the growth rate of income and output (Frankel and Romer, 1999). In addition, numerous individual country studies over the past three decades suggest that "trade does seem to create, even sustain higher growth" (Bhagwati and Srinivasan, 1999).

Macroeconomic policy reforms: Credibility, reversal, and investment behaviour

From the policy viewpoint, an extremely important form of uncertainty faced by investors is the imperfect credibility of policy reforms. Investment-friendly reforms typically raise expected returns, but may also increase uncertainty if investors believe that the reform measures could be reversed. In such a context, investors' perceptions about the probability of policy reversal become a key determinant of the investment response. These issues are explored by Rodrik (1991) using a model in which investment involves sunk costs of entry and exit. He shows that a reform favourable to capital, but regarded as less than fully credible, will fail to trigger an investment response unless the return on capital becomes high enough to compensate investors for the losses they would incur should the reversal take place. Similar qualitative conclusions are reached by van Wijnbergen (1985) who considers the case of a trade reform suspected to be only temporary. An economic (reform) policy enjoys credibility to the extent that relevant actors such as domestic and foreign investors, believe that government will implement and sustain the programme of reforms that it has announced.

The identity of relevant factors may vary across time and space, but the issue of credibility seems inescapable, given the sequential nature of economic decision making. At least in principle, a government that dismantles protectionism today can restore it tomorrow, just as a government that cuts taxes now can escalate them later. The record of trade liberalization in developing countries is replete with examples of governments that promised one policy but delivered another, or implemented reforms that were subsequently retracted. If investors doubt the longevity of free trade, for example, they may decide not to shift resources from inefficient, import-competing industries to more dynamic, export oriented ones. The deterrence to investment arises because exporting involves costs that would be difficult to recover if the government reinstated protectionism. For example, physical capital is typically expensive to install and uniquely appropriate to a particular industry. Likewise, investments in human capital (hiring and training) perform best in the activity for which they were designed.

Model and Data description

The literature proposes several theories that explain the behaviour of investment in an economy. Broadly, the earliest strands of investment behaviour include; the accelerator theory, the neoclassical theory, the Tobin q theory and the cash flow theory Tobin (1969). However, these theoretical models of investment were formulated to analyze investment behavior of firms in industrial economies. The model used in this study is specified in equation (1) below. The dependent variable is private investment. Additionally, the equation incorporates the dynamic nature of investment, thus a lagged dependent variable is also part of the explanatory variables. The dynamic approach captures the slow adjustment of the actual capital stock to the desired capital stock. The selected variables are; *index of manufacturing production* (*imp), exchange rate (exr*) , *corporate tax(ctx),prime lending rate (plr).*

Small case letters denote log of values. The VECM model for estimation is given in equation (1) below

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i X_{t-i} + \varepsilon_t \qquad (1)$$

Where the innovations are IDN (0, Ω) distributed. Cointegration arises when π has reduced rank r and can be written as $\pi = \alpha\beta'$ for some (pxr) matrices α and β. Γ_i s tell about the short run dynamics and of course π, the co integrating relationships.

This is a general VAR/VECM (k) model. If π is equal to zero this means that there is no cointegration. This is the model that is implicit in the Box-Jenkins method. The variables may be I (1); but that can easily be "cured" by taking differences (in order to achieve the usual asymptotic distribution theory). If π has full rank then all X_t must be stationary since the left hand side and the other right hand side variables are stationary.

Estimation

The data, observations necessary for practical realization of this research was sourced from central Bank of Nigeria (CBN) statistical Bulletin and include seasonally adjusted nominal exchange rate (exr), Corporate income tax (ctx), policy rate of money deposit Banks and other financial institutions, and the index of manufacturing output (imp). All variables are in logarithms. After the model is estimated, we proceed with conventional batteries of test. By performing these tests, check the model adequacy. In particular the following are of primary concern; the Lagrangian-Multiplier (LM test), for autocorrelation in the residuals, Jargue-Bera test (JB test), for normality assumption in the residual distribution. In addition the stability test for AR roots of the polynomials of the VECM. These tests are necessary for innovation accounting. Following the algorithm outlined in the methodology section. First step in our analysis is to check stationarity properties of the data by means of conventional ADF unitroot tests. The test results can be seen in the appendix. In case the results are less convincing, all doubts are cast away if one considers first difference of series.

The fact that the series are non-stationary and are cointegrated suggests that estimating VECM is the appropriate strategy to take, Cochrane (1994). We check for existence of long-run equilibria between the variables, condition which must be met before VECM construction. Before estimation, we determine the lag order of our model using SBIC, AIC and LR criteria. Table 4 in the appendix reports the lag order selection statistics. Thus we have relied on the LR and Akaike criterion suggestion by including two lags in the VECM, employing Eviews 5 software for this purpose.

Equation (1) was estimated accordingly, but of course the short run estimates are significant but are not informative since the system of equations are presented in reduced form. Thus we have the option of using the innovation accounting. We particularly focus on the impulse response function in order to quantify the impact of a one standard deviation shock in the error term of the endogenous variable (IMP) on the macroeconomic variables included in the model. For the purpose of carrying the innovation accounting, first we run the LM-test for autocorrelation in the residuals. the test fail to reject the null hypothesis at lag order given conventional 5%level of significance.

Table 6

VEC Residual Serial Correlation LM Tests
H0: no serial correlation at lag order h

Sample: 1970 2010
Included observations: 35

Lags	LM-Stat	Prob
1	20.43660	0.2012
2	15.03600	0.5220

Probs from chi-square with 16 df.

This implies that the minimum variance property holds. Next we conduct the JB- test for normality of the residuals.

Table 7

Component	Jarque-Bera	Df	Prob.
1	3.730264	2	0.1549
2	3.953355	2	0.1385
3	11.62003	2	0.0030
4	60.88396	2	0.0000
Joint	80.18761	8	0.0000

Jargue-Bera Test for normality

Judging by the low p-values of last two components the null of residuals are normally distributed. Thus hypothesis testing should be approached with caution. As for the failure of the JB, it is a common phenomenon.

With the eigen values inside the unit circle, a necessary condition for cointegration to exist. This stability condition allows for the impulse response innovation accounting to be carried out.

The result of the impulse response function can be found in table 9 in the appendix. It can be inferred from the table, one standard deviation shock in manufacturing output variable in one year period results in about 28% increase in the contemporaneous value of manufacturing output. After a one year period there is a subsequent increases in the percentage response of manufacturing output to a standard deviation shock on the contemporaneous value of endogenous variable. the continuous but marginal increase last about eight periods and starts decreasing to zero by the 22^{nd} period. In the case of the exr variable there is a decrease of 19.2% contemporaneous response to a standard deviation of the manufacturing output shock in the second period. After two periods the cumulative exceeds 60% but the exr decreases by 19.2%. The decrease in exr continues until the 24^{th} period, and then there is a change in the sign as the exr starts increasing positively but marginally. It is clear from the table, the

constant increases in the contemporaneous response to one standard deviation manufacturing shock by ctx and plr.

Concluding Remarks

The study examined the determinants of Private investment in the Manufacturing Sector in Nigeria. Specifically it entails a comprehensive analysis of the impact of exchange rate variation, policy lending rate and the corporate taxation on the manufacturing output. In view of the outcome of the study, the Nigerian tax design should encourage increased consumption expenditure within the domestic economy. This should be accompanied by strategies that encourage domestic consumption. Selective and protectionist policies should be encouraged to boost domestic private investment in Nigeria to shield ailing and near moribund local firms from unfarvourable external competition.

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Appendix

Table 8

ADF Unitroot test results

Variables	Adf-stat.	t-stat
Lctx	-1.225387	-2.945842
Limp	-2.871596	2.945842
Lexr	0.083278	-2.9434
Plr	-1.25474	-2.945842

Source: author's computation

Trend assumption: Linear deterministic trend (restricted)
Series: LIMP L_PLR L_EXR L_CTX
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

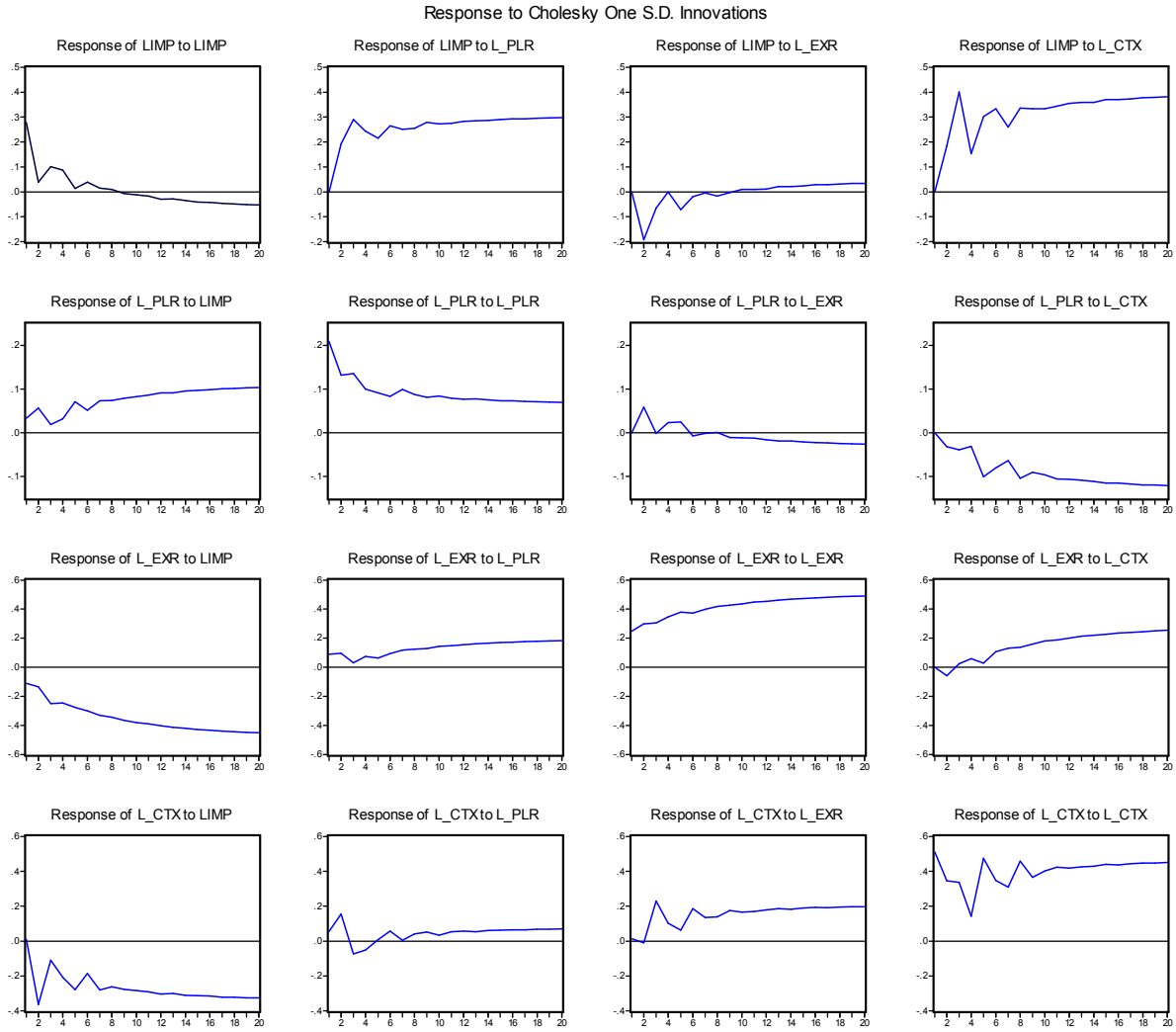
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.621875	71.15599	63.87610	0.0108
At most 1	0.463031	37.11743	42.91525	0.1684
At most 2	0.259496	15.35392	25.87211	0.5452
At most 3	0.129127	4.839058	12.51798	0.6196

Table 4
VAR Lag Order Selection Criteria
Endogenous variables: LIMP L_PLR L_EXR L_CTX
Exogenous variables: C

Sample: 1970 2010
Included observations: 38

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-133.4946	NA	0.030361	7.856835	8.034589	7.918195
1	-27.40333	181.8708*	0.000178	2.708762	3.597532*	3.015565*
2	-9.920640	25.97429	0.000170*	2.624037*	4.223823	3.176283
3	3.976924	17.47122	0.000212	2.744176	5.054979	3.541865

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
Table 9


Response to Cholesky One S.D. Innovations
Response of LIMP to LIMP
Response of LIMP to L_PLR
Response of LIMP to L_EXR
Response of LIMP to L_CTX
Response of L_PLR to LIMP
Response of L_PLR to L_PLR
Response of L_PLR to L_EXR
Response of L_PLR to L_CTX
Response of L_EXR to LIMP
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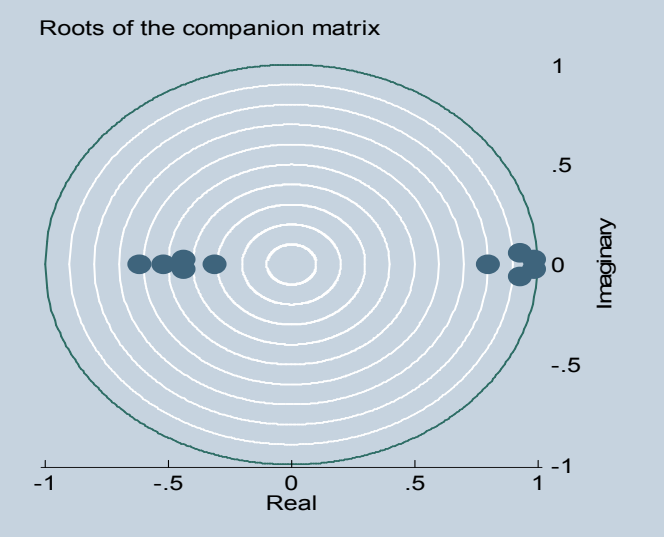
Response of L_CTX to L_CTX



VAR stability