Manufacturing Sector Performance and Selected Macroeconomic Variables in Nigeria: 1970-2009

OBINWANNE, JULIAN CHUKWUMA

(PG/MSc/04/39141)

DEPARTMENT OF ECONOMICS

UNIVERSITY OF NIGERIA

NSUKKA

October, 2013

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF ECONOMICS, UNIVERSITY OF NIGERIA, NSUKKA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTERS DEGREE IN ECONOMICS.

OCTOBER, 2013

Certification

Obinwanne, Julian Chukwuma, an M.sc student of the Department of Economics with registration number PG/Msc/04/39141 has successfully completed the research requirement for the award of a Masters Degree in economics. The work in this project is original and has not been submitted in part or in full for any other certification, diploma or degree of this or any other University.

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Prof. C.C. Agu

(Project Supervisor) (Head of Department)

Date : _ _ __ _ _ __ __ __ Date: __ __ __ __ __ ___

Approval

This is to certify that this M.sc project has been approved by the following authorities:

_____ _____

Prof C.C. Agu

(Head of Department) (Project Supervisor)

External Examiner

DEDICATION

This project work is dedicated to my late father, Ichie Benedict Anidile Obinwanne, who showed me the light and I found my way.

ACKNOWLEDGEMENTS

My sincere gratitude goes to my project Supervisor, Prof C.C. Agu for his guidance and patience throughout the period of this work.

To Ejike Onwudinjo, I say thank you for your encouragement and pieces of advice. I lack words to express my heart-feelings to Jude O. Chukwu and Emmanuel Nwosu for their wonderful assistance.

I cannot thank my wife, Uche enough for her wonderful support. My cousin Louis, I owe you a duty for typing and binding this work.

To all that contributed in one way or the other to the success of this work, I thank you immensely**.**

ABSTRACT

This study employs time series data to investigate empirically how the various macroeconomic variables affect the performance of the manufacturing sector in Nigeria for the period 1970-2009. It found out that over the sample period, the rate of growth of the manufacturing sector responds to variation in selected Macroeconomic variables such as Real Gross Domestic Product (RGDP), real interest rate, credit to private sector, real exchange rate, trade openness and political economy. However, the relationship between the growth rate and any of the real interest rate and exchange rate was found not to be statistically significant. Empirical evidence further revealed that the relationship between the growth rate of the manufacturing sector and the variables of the interest was found to exist even in the long run due to the fact that these variables were found to be co-integrated. The paper therefore recommends that policy makers need to exercise great care on prescribing international trade policies, while less emphasis should be laid on exchange rate policies because this would have no form of effect on the growth rate on the manufacturing sector. Also interest rate policies should not be used to drive the rate of growth of the manufacturing sector as they have no impact on the sector while efforts should be made to sustain the present civilian government .

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CHAPTER ONE

Introduction

1.1Background of the Study:

The Nigerian Economy since the attainment of political Independence in 1960 has undergone fundamental structural changes. The domestic structural shifts have however not resulted in any significant and sustainable economic growth and development. Available data show that the Nigeria economy grew relatively in the greater part of the 1970s. A case in point is the oil boom of the 1970s. The windfall profit from the oil price swings encouraged wasteful expenditure in the public sector and distorted the revenue bases for policy planning. These and the associated over valued exchange rate led to the collapse of agricultural exports, poor performance of the manufacturing sector, low productivity, dislocation of employment rate, rising rate of inflation, huge public debt, disequilibrium in the balance of payments and severe shortage of raw materials. These crises culminated in the introduction of the Structural Adjustment Programme (SAP) in 1986 and the current macroeconomic reforms. The core objective of the macroeconomic structural reform is a total restructuring of the Nigerian economy in the face of population explosion (Gbosi 2000; World Bank, 2000, etc). However, these structural disequilibrium and lack of gainful employment are some current major determinants of the macroeconomic behavior of the Nigerian Government and indeed of most other growing nations (Nwajiuba, Obilor and Uwazie, 2004)

Macroeconomic stability and growth are the main adjustment programmes introduced in Nigeria in the last few decades. Like the case of sub-Sahara African nations, the economic reforms were informed by the IMF and the World Bank supported Structural

Adjustment Programme. Soon after the end of the oil boom in 1982, the Nigerian economy earlier highlighted was mired in series of internal and external inflation, high unemployment and rising deficits. Others included rising and unsustainable external debt stock and debilitating debt services burden, declining industrial capacity utilization and emasculation of the agricultural sector (Iyoha, 2005)

In the case of Nigeria, for instance, in spite of the several economic reform programmes introduced between 1981 and 1999, the economy still posted very sluggish growth result of 2.8% in the decade of 1990s, which was drawn by population growth of equal magnitude, thus leaving per capita income growth at zero. Only about 3.3% growths were achieved between 1999 and 2003 with a marginal 9% per capita income, this proved incapable of addressing the growing poverty in the land.

It is estimated that for Nigeria to fight poverty successfully, the growth has to be sustained at 10% annual average over the next decades. The poor growth performance has thrown up enormous development challenges such as poor and volatile growth performance: volatile macroeconomic environment that confines investment for growth; low per capita GDP; high unemployment rates; insecurity; increasing urbanization rates; unacceptable rural and urban poverty of about 54% (NEEDS 2004;NEEDS 2007). However, there has been observed strong linkage between sound macroeconomics fundamental and the growth performance in the manufacturing sector.

Furthermore, the effect of these macroeconomic fundamentals on the manufacturing sector growth performances of developing countries have been of particular interest in the recent economics literature especially given the declining fixed capital formation rates in major developing countries during the 1990s and early 2000(UNCTAD,2003).

Anyanwu et al (1997) defined manufacturing sector as a sub-set of the industrial sector (others being processing, craft and mining sub-sectors). For them, manufacturing involves the conversion of raw materials into finished consumer goods or intermediate or producer goods. Manufacturing like other industrial activities creates avenue for employment, helps to boast agriculture, and helps to diversify the economy while helping the nation to increase its foreign exchange earnings, enabling local labor to acquire skills. In addition, it minimizes the risk of over dependence on foreign trade and leads to fullest utilization of available resources.

More importantly, many studies have shown that in developing countries, it is manufacturing sector through private sector initiatives that plays a greater role in determining economic growth. Empirical studies which include; Hernandez-cata, 2000; Barro and Lee, 1994; Ndikuman, 2000 conducted in Africa, Asia and Latin America have established beyond doubt the critical linkage between the manufacturing sector and economic growth. These studies further revealed that throughout the 1990s, the ratio of total gross manufacturing output to gross domestic product in Asia, which experienced a high average growth rate compared with the rest of the world, was about 27% while in Latin America and sub-Saharan Africa, the corresponding ratio were 20% and 17% respectively.

The realization of the significant and impressive contributions of the manufacturing enterprises to employment generation, entrepreneurial development, income generation, poverty alleviation and by extension promoting sustainable level of economic growth and development, in recent times however has created an increasing attention on the sector. In fact, there are growing empirical evidences to show that small scale manufacturing enterprises are significantly more cost effective in fulfilling developmental objective particularly in the areas of employment, indigenous

technological development, utilization of local resources and lower cost of supply of inputs and services to large scale and end users (George, 2007).

Manufacturing export has been the key behind unprecedented economic growth in Asian countries. Samuelson and Nordhaus (2005) opined that "Japan came to the economic race later than most European developed countries and USA. It made its mark by first imitating foreign technologies and protecting domestic industries from imports and then developing tremendous expertise in manufacturing and electronics. Similarly according to Salaudeen (2007), in India, the small scale manufacturing enterprise run 97 percent of the industrial units employs 45% of labour force, contributes 45 percent overall export and 7 percent of GDP. While in China, they contribute 60 percent of China's industrial output with over 23 million small and medium scale enterprises, 60 percent contribution to GDP; employ over 75 percent of the work force; 60 percent of total exports and 99 percent of all registered companies, and creating most new jobs.

According to Ndebbio (2006), studies conducted have shown that manufacturing subsector is the most dynamic part of the industrial sector, and without it industrial development is impossible. Therefore, for a developing country like Nigeria, Manufacturing holds the key to improved industrial output. For him, it is indeed a strategic instrument capable of fostering self-reliant development. If it is of course, base on local raw materials sourcing and widespread adoption of intermediate local technologies for production viewed against the background of growing evidence of a strong link between high manufacturing growth and sustainable growth, a steady decline since the mid 1980 in Nigeria gross capital formation as a ratio to GDP has been a matter of considerable concern to policy makers. Again, in the context of observed policy shift in the late 1990s, placing a greater emphasis on the

manufacturing sector following the various reforms conducted in the sector, a perceptible slide in the ratio of manufacturing output to GDP is all the more worrying. The much-awaited role of the manufacturing sector as an engine of growth has not yet materialized. The poor performance of domestic manufacturing production, together with the low quantum and little diversity of Nigeria's manufactured exports, has been attributed largely to the prolonged delay in the implementation of the import substitution strategy. This therefore, necessitated the restructuring of productive activities in the manufacturing sub-sector by a shift in industrial policy strategy under the framework of SAP in mid-1986 (CBN, 2001).

Since then, various macroeconomic policies have been introduced, among others, to revitalize the manufacturing sub-sector, diversify the economy away from its heavy reliance on oil revenues and improve the economy's future growth. The macro-economic policy measure designed, in the past to improve manufacturing performance rate over-valuation and its subsequent determination of market force, tariff reforms, removal of price controls to enable producers operate competitively, public sector reforms including the privatization and commercialization programmes and fiscal prudence.

In view of the nature of macroeconomic management reforms and lack of research on its impact on the manufactured sector in Nigeria, this study is an attempt to provide an empirical investigation of how macroeconomic reform affects the performance of the manufacturing sector in Nigeria.

1.2 STATEMENT OF PROBLEMS

The performance of the manufacturing sector in Nigeria since independence in 1960 has been very disappointing. Since the early 1980s, a number of factors, national and

international, had induced greater instability in the economic environment for the Nigeria industry. While prudently managed manufacturers are expected to plan and cope with normal and reasonable degree of volatility, many firms found it difficult to survive under greater and sometimes unusual macroeconomic volatility (Ogunlewe, 2003). Hooks (1994) cited by Apea and Seibera (2002) pointed out that deteriorating local conditions like inflation, interest rates and exchange rates hinder manufacturing productivity. The author added that sudden adverse movement in a country's terms of trade and sharp fluctuation in world interest rates, real exchange rates, and inflation rates contributed to the sorry state of the manufacturing sector in sub-Saharan Africa.

Nigerian economy, especially after the collapse of oil prices in the mid-1981 had witnessed large fiscal deficits, large debt burden, high rate of inflation and low rate of economic growth. Soludo (1995) articulates very vividly the specific implications of the effect of the collapse of the oil boom to include rapid decline of oil exports and accruing revenues from $26 billion in 1980 to $9.4 billion in 1989; the un-sustainability of external and fiscal imbalances, etc. Others included the spiraling of current budget deficits which peaked at 6 percent of GDP in 1983, and fiscal deficits were almost double that figure between 1981 and 1986, real aggregate demand fell by 35 percent and the situation continued to worsen and in 1989, per capita GDP dropped to around $250 compared to $1090 in 1980.

Arising from the above developments, the manufacturing subsector which was expected to achieve 15 percent value-added contribution to the GDP, thus serving as the major source of growth registered dismal performance instead. This is because the substantial devaluation of the naira during 1986-88 led to the escalation of costs of imported industrial inputs. In addition, the restrictive monetary policies of 1986 and

1987 reduced credit to the productive sector and also seriously hampered growth in effective demand for the finished goods.

Furthermore, the persistent depreciation of the naira and its inflationary impact increased cost of production by adversely affecting both locally sourced materials as well as imported manufactured input. Consequently Soludo (2007) cited in Ogunsanya (2007) analyzed the sectoral contribution to the growth of the country's GDP as agriculture, 41.49%; crude oil, 25.75%. mining and quarrying 0.27%; manufacturing;4.5%; building and construction, 1.53%; wholesale and retail trade, 13.74%; service 14.88%. It is obvious from these data that the manufacturing sector contributes negligible percentage. Ndebbio (2006) gives reasons for this dismal performances as he stated that "as expected because Nigeria is not industrialized, the levels of both industrial and manufacturing output have been disappointing given the negative rates recorded in some years in particular, the output of the manufacturing subsector has been constrained because of high cost of domestic production due to high cost of borrowed capital; increase in tariffs on basic utilities; poor infrastructure; low effective demand for locally manufactured goods and increased preference of some manufacturers to be more involved in buying and selling than in actual production".

Moreover, among 178 economies studied on the bases of the attractiveness of their business environments in the World Bank's Doing Business 2008 report, Nigeria represented by Lagos ranks at 108. Several sub-Saharan African countries placed ahead of Nigeria, included Bostwana, Ethiopia, Ghana, Kenya and South Africa. According to Essien and Akpan (2007), infrastructure deficiency has been the most prominent constraining factor to doing business in this country. Nigeria's infrastructure does not meet the needs of the average investor, there by inhibiting and increasing the

cost of doing business. Poor infrastructure particularly road networks, electricity and water supply; high cost and limited access to bank credit, high cost of imported raw materials and spare parts, high production cost; inadequate security; corruption, weak enforcement of contracts and lack of skilled labour. But to Essien and Akpan, the biggest infrastructure problem in Nigeria is Power Supply. Electric Power is regarded as a strategic resource and it represents the most important requirement for moving the manufacturing sectors forward. But regrettably Nigeria's Power system is so inadequate that it has held back economic progress and social well-being for several years.

Electricity supply has a direct influence in the development of country's industrial and manufacturing sector. However, the frequent and often blackouts that characterized services provided by PHCN to the manufacturing sector is very disturbing; Power supply has been so erratic and unreliable that much business has resorted to purchasing private generators at prohibitive cost. This deplorable infrastructural condition and inadequacy of electricity supply in Nigeria discourage private investment and sometime lead to outright shop closure or under utilization of existing resources.

Thliza (2007) collaborated this when he stated that the manufacturing sector in Nigeria has suffered some reduced capacity which has seen for instance the number of textile industry in the country to fall to just 40 in 2002, a quarter of the number in the mid 1980s. While Michelin tyre industries has relocated to Ghana where macroeconomic environment is more conducive. Ufftot (2010) collaborated this when he noted that in the past five years, the manufacturing sectors in Nigeria has been bedeviled with serious challenges that have forced many of them to close shop while others struggling to survive have laid off staff. Prominent among the many problems of the industrial and real sectors are epileptic power supply and high lending rates by banks.

The above developments invariably imply that an empirical study be undertaken to investigate why the performance of the manufacturing sector in Nigeria has been poor despite whole lot of policy measures that had been in place to revitalize the sector. The focus of this study is therefore on the relationship between manufacturing subsector and macro-economic variables in Nigeria. Undoubtedly, there have been reforms and fundamental changes in most of the macroeconomic indicators in Nigeria since the mid-1980s and it would be very expedient policy wise to understand how these changes may have affected the manufacturing sector's performance overtime.

Given the above scenario, the research therefore raises some fundamental questions:

1. Have there been changes in fundamental macroeconomic indicators in Nigeria following macroeconomic reforms.
2. Is there any relationship between macroeconomic indicators and manufacturing sector growth in Nigeria.

1.3 OBJECTIVES OF THE STUDY

This study examines the changes in fundamental macroeconomic indicators in Nigeria following major policy reforms. More specifically, we shall:

- Ascertain the degree and nature of changes in Nigeria's macroeconomic fundamentals over the years
- Determine the relationship if any, between macroeconomic fundamentals and the performance of the manufacturing sub-sector in Nigeria.

1.4 HYPOTHESES OF THE STUDY

We test two hypotheses in this study. These are:

1. There has been no significant change in the evolution of macroeconomic reforms in Nigeria over time.
2. Changes in macroeconomic reforms do not affect the growth of the manufacturing sector in Nigeria.

1.5 THE SIGNIFICANCE OF THE STUDY

The importance of undertaking a study in the manufacturing sector's growth and performance is informed by many factors. First, the sector seems to have remained adamant to various policy measures and reforms to improve its performance. Second manufacturing sector is still seen as the engine of growth especially when it is observed that it is the key growth factor in all industrial and emerging economies. Third, there are few country specific existing studies that have attempted to address the problem of the manufacturing sector though they focused more on the determinants of total factor productivity. Finally, this study would afford us the opportunity to know if changes in the macroeconomic environment are responsible for the poor performance of the sector and hence facilitate the search for best policy options that could enhance the performance of the sector.

1.6 SCOPE AND LIMITATIONS OF THE STUDY

The study will cover the period between 1970 and 2009. The choice of the period is based on data availability. The study is by no means an exhaustive treatment of the relationship between macroeconomic reforms and the performance of the manufacturing sub-sector in Nigeria. The macroeconomic variables for the study are numerous, and as such not all will be included in the study. The study is also limited by finance and time.

CHAPTER TWO

LITERATURE REVIEW

2.1 THEORETICAL LITERATURE

In the neoclassical growth framework, improvements in productivity or efficiency are treated as exogenous in the growth models. These models are couched in terms of the Solow's (1957) model. According to Solow's basic neoclassical model, productivity evolves exogenously as determined by technology. This simply means that government policies cannot affect the steady state, and the 'engine of growth' is technical progress. However, the emergence of the new growth theories in the mid-1980s has renewed the neoclassical theory to formally incorporate the technical progress and to account for what may be called the non-traditional determinants of output growth. The new growth theory with its endogeneity of technological change in tandem with the new international trade theory which integrates the notion of imperfect competition opens up the possibility of achieving perpetually higher growth rates at least in the theory. Openness to trade and FDI allow the transfer of technology, while world class management practices are assimilated which in turn, introduce innovation, cost-cutting and thus eliminate monopolies. These factors can permanently raise growth rate (Akinlo, 2005)

Romer (1992), Grossman and Helpman (1991) and Barro and Sala-I-Martin (1995), among others, indeed argued that countries that are more open to the rest of the world have a greater ability to absorb technological advances generated in the leading nations. However, according to Coe and Helpman (1995), the transfer of technology and concomitant knowledge spillovers from advanced to developing countries through export and import routes will be more successful in economies with better and more advanced

education. This indeed, forms the core of another class of growth models that postulate that productivity requires more than just direct investment in physical capital and the basic labour as well as trade but also investment in knowledge and human capital, research and development (R & D), and in infrastructure.

Another set of variables that could play a role in determining the level of productivity as they may influence the quality and efficient allocations of factors of production and their rate of utilization are classified under macroeconomic environment. Under this we have variables such as inflation, size of government, inflation variability, and exchange rate instability, among others. The general consensus in the literature of growth is that sound macroeconomic environment including well managed public finances, low inflation, and exchange rate stability, among others can contribute to raising trend productivity growth in the medium term though a positive impact on confidence and by promoting efficient resource allocation. However, theoretical and empirical works on this subject have not specifically focused on productivity. Thus, for most of these macroeconomic environment variables, the question of how they affect productivity is still open (Akinola, 2005).

An important variable that could impact either positively or negatively on productivity especially in SSA is the level of external debt. Although empirical studies have related it to growth of the GDP and establish negative effect of debt overhang, however, it remains to be related to productivity. High debt stock can have indirect negative effect on productivity where it worsens macroeconomic environment. In a situation where foreign investors perceive high debt stock as a sign of domestic macroeconomic instability and a host government's inability to maintain expedient monetary and fiscal policy, it could lead to cessation of FDI inflow and generate high capital flight with adverse effect on investment and thus total productivity.

Theoretically, what most arguments seem to suggest is that the extent to which Total Factor Productivity will increase depends on the economic and social conditions or in short, on the quality of environment of the country. The quality of the environment relates to the degree of openness, level of technological development, size of government, pattern of expenditure, level of deficit, level of inflation among others. On the major macro-economic challenges facing the manufacturing sector in Nigeria, Essien and Akpan (2007) noted with dismay as they state that "the existing macro-economic policies have also been un-conducive for a vibrant manufacturing sector investment. These include interest and exchange rate policies as well as other sectoral policies. Most entrepreneurs in Nigeria in advertently reduced their borrowings from banks due to high interest rates and short-term nature of the available loans. At the same time, banks were not actively lending to the real sector, and loanable funds were primarily used to finance consumer imports and for speculation in the foreign exchange markets. These factors have combined to act as deterrents to foreign investment flows and induced many Nigerians to take their money and skills abroad". Some other daunting challenges faced by manufacturing sector in Nigeria according to the authors include: For decades, Nigeria's economy was characterized by growing dominance of the public sector, over-dependence on oil exports and the pursuit of highly import-dependent industrial strategy. The manufacturing sector was dogged by weakness inherent in its skewed structure: dominated by a few multinationals and a large segment of small and medium-size enterprises with little linkage to the multinationals. Other problems included the poor state of physical infrastructure particularly road networks, electricity and water supply; high cost and limited access to bank credit; high cost of imported raw materials and spare parts; high production cost; inadequate security; corruption; weak enforcement of contracts and lack of skilled labour.

Similarly, NEEDS (2004) identify many factors inhibiting growth in Nigeria to include inconsistent macro-economic policy; instability and policy reversals; conflicts between different macro-economic policy goals; public sector dominance in production and consumption pervasive; rent-seeking and corruption facilitated by the fact that the government is the hub of economic activities; inadequate and decaying infrastructure; High volatility of major macro-economic aggregates; weak institutions capacity for economic policy management and coordination; un-sustainability of public finance at all levels of government; lack of effective coordination across levels of government and large debt overhang. Many of these problems are institutional. Others reflect the fact that the means are inadequate to achieve the goals. With specific reference to the manufacturing sector including micro, small and medium size enterprise NEEDS noted with disappointment that although it has the potential to increase wealth and employment, the sector has stagnated in Nigeria, and its contribution to GDP and employment remain small. The activity mix in the sector is also limited dominated by import-dependent processes and factors. Although reliable data are unavailable, rough indicators show that capacity utilization in the sector has improved perceptibly since 1999 but that the section still faces a number of constraints, including the following lack of demand for the products and services of small and medium-size enterprise and ineffective linkages between industry and research institutes and universities; lack of political will to implement local content and technical know-how policies; lack of engineering capacity to translate scientific research results into finished goods and maintain existing machinery; low level of entrepreneurial capacity; complete lack of institutional mentoring difference. The government intends to leave routine management of business to the private sector and to devote its own efforts in providing adequate infrastructure and a regulatory framework that is conducive to business.

In spite of the problems and constraints highlighted above, Nigeria has a strong and potentially vibrant private sector which can quickly respond if the macro-economic environment is improved. In order to enhance the prospects for better performance of private sector, Nigerian government has embarked on series of macro-economic reforms for instance, NEEDS has enunciated various measures in the policy document. Under the NEEDS, the dominance of government in running business would be reversed and government would rather redirect its efforts to providing essential services. In other words, government would act as a facilitator of economic development by creating and maintaining an environment that enables Nigerians to implement livelihood strategies and achieving personal goals. To this end, the government is expected to develop infrastructure, particularly power generation, transport and telecommunications infrastructure to stimulate the growth of the private sector (NEEDS. 2004).

Similarly, in 2003, Nigeria made a commitment of economic reform aimed at improving the country's economic growth reducing dependence on the oil sector generating employment and increasing investments in the economy for the period 2003-2007. This commitment was made possible by the appointment of an Economic management Team (EMT). An ambition reform programmes was outlined by the reform team, aimed at ensuring macro-economic stability, improving efficiency of public expenditure management tackling corruption and improving the domestic investment climate. To achieve these goals, the EMT embarked on various macro-economic and structural reform programmes (IMF 2005). The macroeconomic reforms were broadly successful, resulting in improved macroeconomic indicators (strong growth rates, reduced levels of inflation and increased level of forces reserves the successful completion of a debt relief package, and the first ever sovereign rating of the Nigerian economy at BB by two external agencies, Fitch and standard and poor (FMF, 2006).

Moreover, for Anyanwu et.al (1997) the organization of manufacturing in Nigeria had passed through four clear stages of development. The first is the pre-independence era when manufacturing was limited to primary processing of raw materials for exports and production of simple consumer items by foreign multinational corporations anxious to gain a foot hold in a growing market. During this period, manufacturing was mostly resource based, but some elements of import substitution and therefore, imported raw materials base was already present. The second is the immediate post-colonial era of the1960s characterized by more vigorous import substitution and the beginning of decline for the export-oriented processing of raw materials. Such a policy of import substitution meant initially to reduce over-dependence on foreign trade and save foreign exchange turned out to be a mere assemblage of those items rather than manufacturing. This negated the original aim since almost every item needed by the so called manufacturing industries was imported. At the same time, foreign ownership of manufacturing facilities reached its peak. The third is the decade of the 1970s. This was remarkable because the advent of oil and the enormous resources it provided for direct government investment in manufacturing made the government to exercise almost a complete monopoly in the following subsectors basic steel production, petroleum refining, petro-chemicals, liquefied natural gas, edible salt, flat steel plants machine tools, pulp and paper yeast and alcohol and fertilizer. The period was marked by the initiation of the indigenization program and hence intense economic activity but poor results since government's attempts at diversification into non-traditional products such as steel, petrochemicals fertilizers, and vehicle assembly yielded little success. The last phase is the decade of the 1980s market by dwindling government revenue consequent upon the nose-diving of oil prices at the world market and hence many adhoc attempts at tickling the economy were made. These attempts include the adoption of export promotion strategy on the realization of the pit falls of the import substitution strategy. The SAP era beginning from July 1986 had even emphasized this strategy especially as it release to non-oil exports, hence the expansion of

export promotion incentives of various description. Also due to the observed lopsided development in the entire manufacturing sectors, a strategy of balance development was emphasized in order to promote greater linkage within the sector but its result has been more rhetorical than practical.

In addition, due to dwindling oil revenue and foreign exchange for the importation of raw materials and spare parts, the government decided to lay emphasis on the strategy of industrialization by local sourcing of raw materials hence the manufacturing are encouraged to find local substitutes/alternatives of their raw materials. Apart from helping to maximize local resources utilization it will also help save foreign exchange, among other merits. It is partly because of this that a new industrial policy was enunciated in 1989 aimed at providing greater employment opportunities to stem the social and political consequences of unemployment to increase export of manufactured goods, to improving the nations technological capacity, increasing local content of industrial output so as to promote greater linkages and backward integration in order to raise the general level of economic activity attracting foreign investment for local industrial development and increasing private sector participation aimed at accelerated Pace of industrial development. Indeed manufacturing in Nigeria appears a favoured sector probably because it is generally believed that the main instrument of rapid growth, structural change and self-sufficiency lies in the manufacturing industry. Thus, resources have been channeled into this sector through heavy public sector investment essentially import-substitution basic industries through generous financial investment in addition to a high level of protection for private investment (Anyanwu, Oyefusi, Oaikhenan and Dimowo, 1997).

In fact, in his 2005 Democracy Day Lecture, Soludo (2005) was optimistic as he perhaps captures in proper perspective the macroeconomic reform agenda that aimed at

revitalizing the ailing sectors of Nigerian economy when he notes "The current reforms under the National Economic Empowerment and Development Strategy (NEEDS) get to the heart of Nigeria's fractured history by systematically diminishing the size and scope of Government's control of economic resources and simultaneously enlarging the domain of the private sector.

Hopefully with the successful privatization of key public parastatal such as NEPA, NITEL, ALSCON, and Ajaokuta steel; the concession of the ports and railways; Nigerian security printing and minting company (NSPM) plc etc, and the continued growth of the private sector the character of governance and politics would change. Again the current political reform conference would address the issue of fiscal federalism and bring back the principle of competition among the federating units of Nigeria. More fundamentally the results for the economy since 2000 and especially under the NEEDS agenda have been better than under any other regime in our history: The following are the facts of Nigerians life today: for five consecutive years (2000-2004) Nigeria have had positive per capita income growth rates, and on the aggregate, this is the only time it has happened during a democratic regime in Nigeria. This is also the first time that a household survey would show a decline in the incidence of poverty during a democracy, from 70% in 1999 to 54% in 2004. For the first time also politicians have realized that although we have different states and local governments, we have only one economy. Consequently the state Governors have collaborated with the Federal Government to save the excess earnings from crude oil export (and saved $5.9 billion in 2004). It is a sign that we are prepared to do things differently. This has helped to restore macroeconomic stability in spite of huge oil receipts. It also indicates that politicians and policy makers now understand the tenets of fiscal sustainability as a major foundation for building Nigeria's future. For the First time also, we have drawn up a plan, the NEEDS and are faithfully implementing it, and the first year results have either met or exceeded all targets on the following variables:

GDP growth, non-oil growth rate, inflation rate, target external reserves, money supply and a gamut of institutional and structural reforms. Non-oil output has exceeded oil growth rate during an oil boom. We are also exporting cassava and grains to the rest of the world. The National Assembly is also rising up to the occasion by enacting landmark legislation to move and sustain the economic such as EFCC, Anti money laundering, ICPC, Energy reform, pensions reform, DMO, etc, and hopefully will soon enact the fiscal responsibility Act. The anti-corruption crusade is demonstrating that there is increasingly nowhere to hide for the corrupt, and Nigerians upland the efforts. When we are through with the banking sector reforms with financial intelligence unit (FIU) and the nature of the international economy there will be nowhere to hide corruption money other than to invest it at home and Nigeria would be ultimate winners.

Finally the pillars of a sustainable market economy are being laid; liberalization and deregulation, a banking sector revolution, the enforcement of the rule of law and property rights, infrastructure development etc.

2.2 REVIEW OF THE GENERAL CHARACTERISTICS OF MANUFACTURING SUB-SECTOR IN NIGERIA

Prior to Nigeria's independence in 1960, the predominant economic activities were agricultural production and marketing of imported goods. Early manufacturing activities predating independence were limited to semi-processing of primary agricultural products as adjuncts to the trading activities of foreign companies. The agro-based manufacturing units that were established included vegetable oil extraction and refining plants, starch making, tobacco processing, pottery, raffia crafts, mat making, wood carving, and saw milling (CBN,2000). These were followed by textiles, breweries, cement, rubber processing, plastic products, brick making and pre-stressed concrete products. The private indigenous entrepreneurs relied on crude technologies for the production of light

consumer goods in the small scale and cottage industries were scattered across the country. At the beginning domestic capital investment was very small and the indigenous private investors were much interested in trading, transport, and construction business where returns on investment were larger and faster. The following table shows the evolution of manufacturing value-added share of GDP and its annual growth rate.

Table 2.1 MANUFACTURING VALUE-ADDED (MVA) SHARE OF GDP AND ANNUAL GROWTH RATE

YEAR	Manufacturing Value-Added Share of GDP	Annual Growth Rate (%)
1958	2.6	-
1959	3.1	25.6
1960	3.2	14.3
1961	3.6	17.6
1962	4.3	26.9
1963	4.1	0.9
1964	5.2	3.7
1965	4.9	21.6
1966	4.7	1.8
1967	8.4	-
1988	8.7	-
1989	8.2	1.6
1990	8.2	7.6
1991	8.3	7.6
1992	8.6	7.5
1993	7.3	-
1994	7.2	-0.8

1995	6.7	-5.5
1996	6.5	0.9
1997	6.3	0.7
1998	6.2	0.3

Source: Federal Office of Statistics (FOS)

The share of manufacturing value-added in the GDP was only 3.2 percent in 1960. But in the late 1980s and early 1990s, the share of manufacturing value-added in the GDP was above 8 per cent. But since 1993, the figure has consistently declined. The picture becomes clearer when one looks at the annual growth rate. The annual growth rate declined from 26.9 percent in 1962 to 1.8 percent in 1967. But due to some positive changes during the early 1990s, the growth rate became positive again but for a short period after which it plummeted to negative growth between 1994 and 1995. Since then the trend annual growth of Manufacturing Value Added has been very disappointing.

The factors that influence the structural changes and performance of the manufacturing sub-sector since independence include government intervention, low technological development, inward-looking strategy and protectionism (CBN, 2000; Ogwuma, 1997). As in other developing economies, the main objectives set by the industrial planners in Nigeria include, the desire to achieve increase in the share of manufacturing contribution to the GDP, replacement of imports with locally produced goods, innovativeness, industrial dispersal and employment generation. The performance of the manufacturing sub-sector is therefore, assessed employing criteria such as its share (MVA) in GDP, manufacturing production index which reflects changes in the level of aggregate output relative to a specific base year period, and plant capacity utilization rates. Other yardsticks include the growth and diversity of manufactured exports, degree of industrial dispersal,

employment generation, level of local raw materials utilization, foreign exchange savings and industrial self-sufficiency (CBN, 2000). The following table shows the index of industrial production and average capacity utilization in Nigeria between 1970 and 2005.

Table 2.2 Index of Industrial Production and Average Manufacturing Capacity Utilization in Nigeria (1970-2005)

Year	Manufacturing	Mining	Electricity Consumption	Total for sectors	Average Manufacturing Capacity Utilization
Weights	31.9	65.6	2.5	100.0	-
1970	24.1	72.2	18.2	41.3	
1971	27.3	104.9	24.2	54.8	
1972	29.7	122.5	27.5	62.3	
1973	36.6	138.0	32.3	72.4	
1974	35.5	151.2	35.9	76.2	
1975	43.9	119.9	42.3	71.8	76.6
1976	54.1	139.0	50.8	85.5	77.4
1977	57.5	140.3	58.4	88.6	78.7
1978	65.8	127.0	71.7	90.4	72.9
1979	97.3	154.4	64.1	120.3	66.8
1980	102.4	138.5	74.8	119.0	70.1
1981	117.4	96.2	89.4	115.6	73.3
1982	132.8	86.2	94.9	122.9	63.6
1983	94.8	82.5	97.1	96.4	49.1
1984	83.4	93.0	87.1	91.6	42

1985	100.0	100.0	100.0	100.0	37.1
1986	96.1	97.8	120.8	103.5	38.9
1987	128.4	88.4	118.8	122.1	40.4
1988	235.2	95.3	125.1	108.8	41.5
1989	154.3	109.2	165.2	125.0	42.5
1990	162.9	115.1	124.8	130.6	39.02
1991	178.1	120.1	125.3	138.8	39.4
1992	199.1	124.5	133.1	148.5	40.4
1993	145.5	120.9	142.2	129.4	36.2
1994	144.2	121.1	152.7	129.2	30.4
1995	136.3	124.4	150.2	128.7	29.3
1996	138.0	129.0	147.1	132.3	34.7
1997	138.5	141.5	143.7	140.5	34.2
1998	133.1	134.1	138.5	133.9	32.4
1999	137.7	125.5	139.4	121.1	35.9
2000	138.2	144.3	141.2	138.9	36.1
2001	142.2	144.9	144.6	145.3	39.6
2002	146.3	133.7	146.7	145.2	44.3
2003	148.1	146.6	147.2	146.7	46.2

Sources: Central Bank of Nigeria Annual Reports Various Issues; Federal Office of Statistics; National Electric Power Authority (NEPA)

The overall manufacturing capacity utilization as a result of the over-valued naira and substantial supply of imported raw materials, under the protective regime, rose markedly but fluctuated between 75 and 70 percent in the period 1975 to 1980. Many manufacturing enterprises including multi-nationals grew behind high protective fiscal barriers, making

huge profits in the 60s and 70s. The performance of the manufacturing sub-sector, therefore, deteriorated in the early 1980s. Manufacturing production fell by an average rate of about 1.5 percent per annum from 1980 to 1984. The substantial reduction in the sub-sector's gross investment and capacity utilization rate attributed largely to scarcity of foreign exchange, led to low value-added, high production costs and low production for exports. Also, the improvement in manufacturing production, induced largely by output-boosting measures contained in the structural adjustment programme (SAP), could not be sustained. Thus, average annual growth in manufacturing output fell from 13.0 percent in the period 1985-1989 to 0.2 and 1.9 percent for the periods 1990-1994 and 1995-1998, respectively (Table 2.2).

2.3 ECONOMIC REFORMS IN THE MANUFACTURING SUB-SECTOR IN NIGERIA

The faltering domestic manufacturing production, together with the low quantum and little diversity of Nigeria's manufactured exports, has been attributed largely to the prolonged implementation of import substitution strategy. This therefore, necessitated the restructuring of productive activities in the manufacturing sub-sector by a shift in industrial policy/ strategy under the framework of SAP in mid-1986 (CBN, 2001). SAP was introduced, amongst others, to revitalize the manufacturing sub-sector, diversify the economy away from its heavy reliance on oil revenues and improve the economy's future growth. These policy measures under SAP, designed to improve manufacturing performance include removal of exchange rate overvaluation, and its subsequent determination by market forces, tariff reforms, removal of price controls to enable producers operate competitively, public sector reforms including the privatization and commercialization programme and fiscal prudence.

Consequently, manufacturing production grew by an average of 8.1 percent between 1987 and 1992. The domestic resource based industries such as beer and stout, cotton, textile, cement, and roofing sheets performed relatively well while the reverse occurred for the import intensive low-value-added units, exemplified by electronic products, vehicle assembly and machinery and equipment. The overall manufacturing capacity utilization rate which fell from 42 percent in 1984 to 37.1 percent in 1985 increased slightly to 38.9, 40.4, 41.5, and 42.4 percent in 1986, 1987,1988, and 1989 respectively (Table 2.2). the growth momentum, in the sub-sector, however, could not be sustained for long, as manufacturing production was seriously hampered by frequent break-down of infrastructural facilities; increased production costs associated with market determined exchange and interest rates, and low effective consumer demand resulting in huge amount of inventories. The substantial devaluation of the naira during 1886-88 led to escalation of costs of imported inputs. In addition, the restrictive monetary policies of 1986 and 1987 reduced credit to the productive sector and also seriously hampered growth in effective demand for the finished goods. Also, the persistent depreciation of the naira and its inflationary impact increased cost of production by adversely affecting both locally sourced materials as well as imported input. Arising from these developments, the manufacturing sub-sector which was expected to achieve 15 percent value-added contribution to the GDP, thus serving as the major source of growth registered dismal performance instead. Average manufacturing value-added reflected an average increase of 2.74 percent between 1986 and 1995, in contrast to an average decrease of 1.3 percent between 1995 and 1997. However, manufacturing output, as measured by the production index decreased at an average of 0.73 percent, between 1995 and 1998. Average capacity utilization rate was 36.9 percent between 1986 and 1998 which was lower than the 65.1 percent achieved between 1975 and 1985.

2.4 EMPIRICAL LITERATURE

Most of the empirical literature on the relationship between macroeconomic fundamentals and productivity growth are centered around the following factors: trade and trade orientation; competition; macroeconomic environment; fiscal policy; monetary and financial development; knowledge, investment policies and capital flows.

The effect of trade on growth has received a lot of empirical works over the decades. However, the nature of the relationship remains a highly contentious issue. Theoretically, trade theory provides three channels through which trade could affect productivity. These include exploitation of comparative advantage, economies of scale, and exposure to competition. Mankiw (1995) and Ventura (1997) argue that the equalization of factor prices internationally could improve the substitutability of capital and labour thus improving growth prospects. Many empirical studies on the trade-productivity nexus using both macro time series and cross- sectional analysis provide support for positive linkage between the trade and productivity (Edwards, 1998; Miller and Upadhyay 2000; Dollar 1992; Sachs and Warner 1995). Edwards (1992) tries to solve measurement and endogeneity problems associated with some previous studies on the issue by using nine indices of trade policy and additionally applying instrumental variable regression. The result shows a positive correlation between openness and productivity growth.

Most studies opine that improvements in the regulatory environment can have a positive effect on productivity growth. For example, a study by Salgado (2002) shows that the structural reforms implemented in OECD countries during 1985-95, including lowering regulatory burdens and increasing standards of competition, increased total factor productivity growth between 0.2 and 0.3 percentage points on average.

The indicator of macroeconomic environment that have been used frequently in empirical work of determinants of productivity is inflation. Many reasons have been hypothesized as to why inflation may be detrimental to economic efficiency (Fischer, 1993; Levine and Renelt, 1992; Briault, 1995; Andress and Hernando, 1997).One of the main arguments is that it is not inflation, per se, that generates uncertainty but that higher inflation is correlated with higher variation in inflation and it is this that places a drag on the economy. Other arguments are that high inflation signals economic instability and possibly a lack of budget control. Economic uncertainty and price variability may induce excess capacity and hence reduce factor utilization (Fischer, 1993). It may be accompanied by higher variability of relative prices thereby distorting the efficiency of the price mechanism and hence harm the allocation of factors of production. Inflation may reduce the demand for real balances and if money serves as a factor of production reduce productivity. Relatively few empirical studies have been conducted on the effects of inflation on productivity especially in sub-Saharan Africa (SSA). Few studies that were focused on productivity-inflation nexus generally documented negative effect (Hercowitz et al. 1999; Englander and Gurney 1994). Edwards (1998) using inflation tax revenue as a percentage of GDP shows that inflation tax does not affect factor productivity significantly even though it has the anticipated negative sign.

Also, several empirical studies have shown that high inflation encourages capital flight (Olopoenia, 2000; Lensink et al. 1998; Dooley 1988). If inflation encourages capital flight and capital flight constrains investment, this would no doubt affect productivity in view of the linkage between investment and productivity.

Most empirical studies have focused on fiscal policy and economic growth with few focusing on relationship with productivity. It is argued that fiscal policy setting can affect productivity through various ways. First, it could cause a crowd-out of private investment

especially when government deficits are used to finance consumption. Second, non-harmonization of fiscal policy with monetary policy could cause serious credibility problem of the efficacy of monetary, which could lead to high interest rates. Thus, taxes could result in serious distortions that may reduce efficient allocation of resources (Barro, 1990; Mendoza et al. 1997).

The main conclusion from existing empirical studies in this area is that there may be a size effect of government intervention on allocative efficiency. It is often the case especially in developing countries that a large public sector deficit is accomplished by higher inflation tax in the long run. The studies by Hercowitz et al. (1999), finds that government fiscal deficit has a significant negative effect on productivity.

Akinlo (2005) argues that the role of financial intermediation on productivity consideration has been well documented in extensive theoretical and empirical literature. Theoretically, the main channel through which financial system could affect total factor productivity growth is efficiency in capital allocation. Following from Schumpeterian view of innovation, a well functioning financial system encourages technological innovation and hence productivity by identifying and finding more productive entrepreneurial energy. This hypothesis has been investigated by King and Levine (1993), Greenwood and Jovanic (1990), and Becivenga and Smith (1991). For instance studies by Greenwood and Jovanic (1990) and Becivenger and Smith (1991) have shown how information and risk-pooling as well as fund allocation by financial intermediation can encourage investment in risky ventures with potentially high returns. On the other hand, several other studies have shown that financial repression, characterized by artificially low domestic deposit rate and overvalued exchange rate impairs efficient capital allocation. Dooley (1988), for example, finds that financial repression, characterized by artificially low domestic deposit rates, is an important determinant of capital flight.

There is now growing evidence that knowledge investment especially education and R & D have significant impact on productivity. The endogenous growth models have emphasized the importance of R&D in the production of knowledge for understanding technological progress and productivity (Akinlo, 2005). This is exemplified in the work by Romer (1990), in which it is stressed that technology is essentially a non-rival, partially exclusive good. R&D can boost productivity either directly through innovation it generates or more indirectly through the adoption of technologies developed elsewhere. Griliches (1980) identify two positive forms of spillovers namely rent spillovers and knowledge spillovers. These two forms of spillovers work to improve productivity. Empirical evidence mostly in advanced countries indicates that R&D has positive and strong effect on productivity growth (Mohen, 1990; Griliches, 1992; Nadiri, 1993; and Cameron 1998). However, Jones and Williams (1998) have outlined several forms of negative spillovers that could negatively affect productivity of factors. These are inter-temporal knowledge spillovers, congestion externalities, and creative destruction.

Educational attainment is fundamental to human capital development which in turn is an important driver of labour productivity. It is unarguable that when a country's skill base is increased, structural change and technological improvements are engendered with positive impact on total factor productivity. Education helps not only to improve a country's technology but also to attract inward FDI. Few studies have investigated this but in Nigeria and SSA at large such studies are scanty. It is argued that the value of human capital can be affected by the structure of the distribution of the population. In a country with a relatively young population, productivity will be better enhanced. This is based on the fact that youthful workforce are more dynamic, flexible, and innovative.

2.5 LIMITATIONS OF PREVIOUS STUDIES

Although the importance of the manufacturing sector in the economic growth process has been widely developed in the literature, not much is known, both theoretically and empirically, about what induces the growth of the manufacturing sector in a developing country like Nigeria. It has been observed that developing countries do not always operate in a competitive environment and also faces constraints that are not accounted for in the neoclassical model. This partly explains why most economists do not agree on the subject of the macroeconomic determinant of the manufacturing sector in the developing countries (see Greene and Villanueva, 1991, Lensink et al. 1998, Blejer and Khan, 1984). This phenomenon is also the case with Nigeria, for which empirical literature is very deficient (See Ekpo, 1990; Akinola, 2005; and Olopoenia, 2000). Most of these studies are not country specific but rather a cross-country analysis. The study by Olopoenia (2000) is based on inflation and capital flight and that of Ekpo (1999) is on public expenditure and economic growth. Akinola (2000) conducted a study on trade openness and FDI inflow. No work known to us has carried out a study to ascertain the degree and nature of changes in Nigeria's macroeconomic fundamentals over the years and to determine the relationship if any, between macroeconomic fundamentals and the performance of the manufacturing sub-sector in Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 Model Specification

The performance of the manufacturing Sub-sector has been specified using various major theories. This includes the accelerator model, the liquidity theory, the expected profit theory, the Tobin's Q theory, and the neoclassical flexible accelerator theory. The flexible accelerator model appears to be the most popular of these theories. However, in the context of developing countries, and due to data limitations and structural constraints, a variant of the flexible accelerator model is often been used including the literature on the determinants of private investment in these countries.

Our specification of the manufacturing function will be drawn from the neoclassical model of investment with appropriate consideration to the structural and institutional features of the Nigeria economy. According to the neoclassical model originally developed by Jorgensen (1963), solving the profit maximization problem of a representative firm yields the demand for capital as a function of output and the cost of capital under certainty (Ram, 1993).

$K^*pt = F(Yt, Ct)$…….. (1)

Where K^*_{pt} is optimum or desired capital stock by private sector in period t; Y_t is the output, and Ct is the cost of capital proxied by interest rate.

In addition to the arguments that the quantity constraints coming from the financial markets may be more binding than the cost of capital in a developing country such as Nigeria, the flow of credits to the manufacturing sector is added. It has also been observed that exchange rate plays a significant role in the growth of the manufacturing

sector though the theoretical prediction are ambiguous owing to the fact that empirical result conducted in other developing countries reported divergent result on its impact on the manufacturing sector growth process. The capital stock,

$PI_t = (K_{pt} - K_{pt-1}) + \delta K_{pt-1}$ ……. (2)

In the steady state, this equation becomes,

$PI^*_t = \delta K^*_{pt}$ …….. (3)

where PI^*_t = optimum private capital at time t, and
δ = rate of depreciation of capital

Thus the equation becomes,

$K^*_{pt} = F(Y_t, RIR_t, DCRP_t, REXC_t, OPENS)$…. (4)

where Y_t = output,
RIR_t = real interest rate
$DCRP_t$ = domestic credit to the private sector
$REXC_t$ = real exchange rate
OPENS = trade openess

Inserting (3) into (2), obtain

$PI^*_t = \delta (Y_t, RIR_t, DCRP_t, REXC_t, OPENS)$…….. (5)

The actual stock of private capital may not adjust completely to reach the desired level due to technical constraints, and the time it takes to plan, decide, build and install new capital. Such dynamic structure in private capital behaviour can be introduce through a practical adjustment mechanism like the following,

$K_{pt} - K_{pt-1} = B (K^*pt - K_{pt-1})$ …… (6)

where β is the coefficient of adjustment in this difference between desired private capital in the time t and actual private capital in the previous period. For practical purposes, one can express equation (6) in terms of gross private investment as

$IP_t - Pt_{-1} = \beta (IP^*_t - IP_t - 1)$ …… (7)

Rearranging equation (7), obtain.

$IP_t = \beta IP^*_t - (1 - \beta) IP_{t-1}$ …… (8)

3.2 MODEL SPECIFICATION

Following (Olopoenia, 2000; Lensink et al. 1998; Dooley 1988), a model of macroeconomic fundamentals and manufacturing sector in Nigeria is specified as follows:

MANFGR= f(RGDP,RIR,CRP,REXC,OPENS,PRISK,μ_t) --- (9)

Assuming a linear relationship between our dependent variable and the independent variable and the econometric specification of the above becomes:

$$MANFGR_t = \psi_0 + \psi_1(RGDP) + \psi_2(RIR) + \psi_3(CRP) + \psi_4(REXC) + \psi_5(OPENS) + \psi_6(PRISK) + \mu_t \quad \text{---------- (10)}$$

where;

$MANFGR_t$= Manufacturing sector growth rate

$RGDP_t$ = Real Gross domestic product

RIR_t = Real interest rate

CRP_t = Credit to the private sector

$REXC_t$ = Real exchange rate

$Openness_t$ = openness as a measure of trade in the country (captured by export and import ratio)

$PRISK_t$ =A Dummy variable for political risk with one for military regime and zero for civilian Administration

Based on the practice in most studies, and the need to obtain a parsimonious result, we shall employ the Autoregressive Distributed Lag (ADL) variant of the above equation which is specified as follows:

$$\Delta MANFGR_{t-k} = \lambda_0 + \lambda_1 \Delta MANFGR_{t-k} + \lambda_2 \Delta RGDP_{t-k} + \lambda_3 \Delta RIR_{t-k} + \lambda_4 \Delta CRP_{t-k} + \lambda_5 \Delta REXC_{t-k} + \lambda_6 \Delta OPENS_{t-k} + \lambda_7 \Delta PRISK_{t-k} + \mu_t \quad \text{---------- (11)}$$

The presence of co-integration or a long run relationship amongst the variables will be tested. If the residual are stationary and a long run relationship is established, then the long run and error correction estimates of the above equation will be estimated. Error Correction Model (ECM) of the above model becomes:

$$\Delta MANFGR_t = £_0 + £_1 \Delta MANFGR_t + £_2 \Delta RGDP_t + £_3 \Delta RIR_t + £_4 \Delta CRP_t + £_5 \Delta REXC_t + £_6 \Delta OPENS_t + £_7 \Delta PRISK_t + \mu_t \quad \text{---------- (12)}$$

3.3 Method of Estimation

We shall use the Autoregressive Distributed Lag technique based on ordinary least squares in the model estimation. Since the study involves a time series, we shall test for the existence of co- integration between manufacturing output growth and the right hand side variables of equation (8). Error correction model estimations would be used to ascertain the short run impact of capital market variables on the growth of private investment, and speed of adjustment of investment towards its long run equilibrium value.

The choice of this technique is informed by its theoretical plausibility, explanatory ability, and accuracy of the estimated parameter and its reliable traits as the best unbiased estimator. Its error term has a minimum and equal variance. The stochastic term has a zero mean – conditional mean value is zero and normally distributed.

The ADL model is a highly statistically significant approach to determine the co integration relation in an annual data samples for validity, Ghatak and Siddiki (2001). Provisions were also made to ensure numerical accuracy, data stationarity and co integration elimination if co integration exists in the model, by the application of Error Correction Mechanism (ECM).

3.3.1 Unit Root Test

The Study employed both the Augmented Dickey –Fuller (1981) test and Philips-Perron (1988) test in a regression equation with a constant to test for stationarity of the model variables. This approach is superior to the other models.

3.3.2 Cointegration Test

The study employed the Engle-Granger (1987) residual based (two-step) approach to cointegration test. This test enabled us to test for the long-run equilibrium relationship amongst variables of the model.

3.4 Data Sources and Techniques for Evaluation

Data for this study shall be from secondary sources. The estimation period is from 1970 to 2006. The data are obtained from CBN Statistical Bulletin, CBN Annual Report and Statement of Accounts for various years. The work will rely on PC-Give Econometric software, version 8.0 for estimation of the model, while MS-Excel will be used in entering the data for analysis.

CHAPTER FOUR

EMPIRICAL RESULTS

4.1 PRESENTATION AND DISCUSSION OF RESULTS

4.1.1 UNIT ROOT TEST RESULT

First, as we are dealing with time series variables which are generated through a stochastic process (that is, a collection of random variables ordered in time), we are to determine first if this stochastic process is stationary. For this purpose, the Augmented Dickey-Fuller test is used. A variable is stationary if the absolute ADF value (|τ|) is greater than any of the absolute Mackinnon tau critical values.

The Augmented Dickey Fuller (ADF) test was applied to find the existence of unit root in each of the time series.

Hypothesis testing: H_0: δ=0 Versus H_1: δ<0

Decision Rule: reject the null hypothesis if $|\tau_{cal}| > |\tau_{tab}|$, do not reject if otherwise.

The results of the ADF test at levels and first difference can be found in the appendix A1 and appendix A.2 respectively but the summaries are reported in Table A and B below invoking the Augmented Dickey Fuller test and the Phillip Perron Test respectively:

RESULT FOR UNIT ROOT TESTS USING THE AUGMENTED DICKEY FULLER TEST:

Table 4.1

Variables	ADF value	Order of integration
LNMSG	-3.739 [-3.662]	l(1)
LNRGDP	-5.422 [-3.662]	I(1)
LNCPS	-3.942 [-3.662]	I(1)
RIR	-5.464 [-3.655]	l(0)
REXR	-5.247 [-3.662]	l(1)
TO	-6.255 [-3.662]	I(1)

Note: the figure in parenthesis represent ADF critical value at 1%. Figures within parenthesis indicate Mackinnon |τ| critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Researcher's Estimation using Stata 10.

From **Table 4.1** above, using the augmented dickey fuller test, it is evident that all the variables are stationary at 1% ADF critical value. These variables are stationary at first difference except RIR which is stationary in level form.

RESULT FOR UNIT ROOT TESTS USING THE PHILLIP PERRON TEST:

Table 4.2

Variable	PP value		Order of integration
LNMSG	Z (rho) Z (t)	-21.839 [-18.084] -3.773 [-3.662]	I(1)
LNRGDP	Z (rho) Z (t)	-33.712 [-18.084] -5.410 [-3.662]	I(1)
LNCPS	Z (rho) Z (t)	-22.773 [18.084] -3.944 [-3.662]	I(1)
RIR	Z (rho) Z (t)	-33.732 [-18.152] -5.458 [-3.655]	I(0)
REXR	Z (rho) Z (t)	-36.211 [-18.084] -5.273 [-3.662]	I(1)
TO	Z (rho) Z (t)	-44.286 [-18.084] -6.275 [-3.662]	I(1)

Note: the figure in parenthesis represent PP critical value at 1%.

Source: Researcher's Estimation using Stata 10.

From **Table 4.2** above, all the variables are stationary at 1% PP critical value. These variables are stationary at first difference except RIR which is stationary in level form.

4.1.2 COINTEGRATION TEST RESULT:

The variables used in this study are integrated of order one that is I (1), but we have to check if their linear combination is stationary. In order to test for this, Augmented Engle-Granger test is used, which is simply applying ADF to the residuals of the regression in equation (4) in chapter three.

Hypothesis Testing:

H_0: $\delta=0$ (there is no cointegration)

H_1: $\delta<0$

Decision Rule:

Reject Ho if $|\tau_{cal}|>|\tau_{tab}|$, do not reject if otherwise. It can be shown by table C below but the detail of this test is contained in Appendix B.

Table 4.3

VARIABLE	**T – calculated value**	**τ- tabulated value**	**Order of integration**
Residuals	-5.562	-3.668*	l(0)

Note: * denotes 1% critical value

From table C above, since $|\tau_{cal}|>|\tau_{tab}|$, at 1% critical value, we reject the null hypothesis that it is non-stationary and conclude that it is integrated of order zero I(0) and also conclude that the variables used in this model are cointegrated (ie.they have a long-term, or equilibrium, relationship among them.

4.1.3 SPEED OF ADJUSTMENT

TABLE 4.4: TWO-STEP ERROR CORRECTION ESTIMATES WITH LAG LENGTH 1 (SHORT-RUN IMPACT)

Variable	Coefficient	Std. Error	t-statistic	Probability
C	-0.407459	0.020248	-2.01	0.053
D(RGDP)	0.0664544	0.0434955	1.53	0.137

D(CPS)	0.1456486	0.0710754	2.05	0.049
D(RIR)	-0.0001127	0.0009412	-0.12	0.906
D(EXR)	-0.0017915	0.0011833	-0.36	0.722
RSD(-1)	0.0005764	0.0013294	0.43	0.668

ΔLNMSGR = -0.407459C + 0.0664544ΔLNRGDP + 0.1456486ΔCPS – 0.0001127ΔRIR – 0.0017915ΔSAV + 0.0005764RSD (-1)

In order to capture the short-run dynamics of the model, the error correction mechanism was applied. The results of vector error correction model are reported in Table 4.4 above. The coefficient of ecm1 (–1) showed the speed of adjustment to equilibrium in the period under study. Statistically, the ECM term (i.e. RSD) is not significant, suggesting that LNMSG does not adjust to the explanatory and thus does not correct any discrepancy between long-term and short-term within a year.

4.1.4 PRESENTATION AND ANALYSIS OF THE REGRESSION RESULTS:

Table 4.5

VARIABLE	VALUES
Constant	7.36775 (0.591718) [12.45]
LNRGDP	-0.1802902 (0.0246076) [-7.33]
LNINV	-0.1431737 (0.058082) [-2.46]
RIR	0.000725 (0.0023216) [-0.31]
EXR	0.0013161

	(0.0019154) [0.69]
TO	0.0285469 (0.0128423) [2.22]
PRISK	0.3007626 (0.1069962) [2.81]
R squared	0.73
Adj R squared	0.68
F(6, 33)	14.89
Prob> F	0.0000
Durbin Watson	1.88

In the table above, the topmost value in each cell of the right column is the regression coefficient. The values in the parenthesis (****) are the standard errors while the t-values are given by the values enclosed in the second parenthesis, [****].

4.2.1 Economic Theoretical Test

This subsection is concerned with evaluating the regression results based on a priori expectations and the size of the estimated coefficients. That is, the sign and size of each variable.

1. CONSTANT: From table D above, we observed that the constant is positive and statistically significant within the time frame of 1970-2009, implying that the autonomous rate of growth of the manufacturing sector is positive as the years go by. That is in the absence of changes in any of the regressors, there would be autonomous manufacturing sector growth rate growth equivalent to magnitude of 7.36975% ceteris paribus.

2. REAL GROSS DOMESTIC PRODUCT (RGDP):- RGDP turned out negatively and marginally related to economic growth. Our result shows that on the average within the study period in Nigeria, a 1% increase in RGDP would culminate into a decrease in the rate of growth of the manufacturing sector by 0.1802902 percent, Aceteris paribus. However, this relationship is undermined by the insignificance of the coefficient.
3. CREDIT TO PRIVATE SECTOR:- The relationship between CPS and MSG is seen to be statistically significant. Our result shows that on the average within the study period in Nigeria, a percentage increase in the CPS would culminate into a decrease in the rate of growth of the manufacturing sector by 0.1431737 percent, ceteris paribus.
4. REAL INTEREST RATE (RIR): From the regression result above, RIR is negative but not statistically significant different from zero, meaning that within the study period of 1970-2009, an increase in RIR by 1 percent brings about on the average, a 0.000725 percentage decrease in the rate of growth of the manufacturing sector holding other variables affecting growth constant.
5. REAL EXCHANGE RATE (REXC): Real exchange rate turned out positively and marginally related to economic growth. Our result shows that on the average within the study period in Nigeria, A unit increase in the ₦/$ exchange rate (amounting to a depreciation of the naira) would culminate into an increase in manufacturing growth rate by 0.0013161 percent, ceteris paribus. However, this relationship is undermined by the insignificance of the coefficient.
6. TRADE OPENNESS:- The result indicates that a percentage increase in trade openness (a proxy for degree of international trade) would on the average stimulate a 0.0285469 percentage increase in the rate of growth of the manufacturing sector in Nigeria within the study period, ceteris paribus.

7. POLITICAL RISK:- From the table above, degree of political instability, as proxied by the probability of government change negatively affects the growth rate of the manufacturing sector which conforms to a priori expectation. Holding other variables constant, under the study period of 1970-2009, on the average, semi-elasticity for a dummy regressor can be obtained by the device suggested by Halvorsen and Palmquist which is: take the antilog (to base e) of the estimated dummy coefficient ($e^{0.3007626}$=1.350888603) and subtract 1 from it and multiply the difference by 100. This gives approximately 35%, suggesting that the military government's median contribution per GDP growth rate in Nigeria is lower than that of the civilian government by 35 %.The insignificance of political instability could be due to the fact that most of the adverse military events in Nigeria have been relatively low in intensity, limiting the scale of immediate economic disruption.

4.2.2 TESTS BASED ON STATISTICAL CRITERIA (FIRST ORDER TESTS)

The statistical or first order tests shall be conducted taking into account the student t-statistic, F-statistic, R^2 and $\bar{R}^2$ values. The theory of hypothesis testing according to Gujarati (2009:113) is concerned with developing rules or procedures for deciding whether to reject or not to reject the null hypothesis denoted by H_0. Accepting or rejecting H_0 is drawn from the values of the relevant test statistic got from a given set of data.

1. **The Coefficient of Determination Test**

From the regression result in appendix B, R^2 = 0.73 or 73.03% and $\bar{R}^2$ = 0.6812 or 68.12%. This implies that about 73% of the variation in manufacturing sector growth rate is explained by variations in the explanatory variables while the $\bar{R}^2$of about 68 % implies that it has been adjusted to take into account the degrees of freedom associated with the sum of squares and it also indicates a good fit

(meaning 68 % of the variations in economic growth is explained by the variations in the explanatory variables having been adjusted for degrees of freedom associated with the sum of squares which is highly a good measure of goodness of fit).

2. t-Statistic Test

This involves comparing the estimated t-statistic with its tabulated values at a given level of significance under a null hypothesis H_0

The null hypothesis for this test is:

$H_0: \beta_i = 0$

$H_1: \beta_i \neq 0$

The critical value of two tail test is obtained from the student t-table for $\alpha/2$ level of significance and (n-k) degrees of freedom (df).

where:$\alpha = 5\% = 0.05$; $\alpha/2 = 0.025$

K = number of parameters including the intercept in the regression = 5

n = number of observations = 40

Decision Rule:

Reject H_0 if $|t_{cal}| > |t_{\alpha/2}|$ with (n-k)df and do not reject if otherwise. From the statistical table, $t_{\alpha/2}(n\text{-}k)df = t^{34}_{0.025} df \approx 2.000$.

The table below summarizes the significance of the variables at 5% critical level

Table 4.6 THE t-STATISTIC TEST TABLE

Variables	t-statistic	Critical value (α)	Decision Rule	Conclusion
CONSTANT	12.45	± 2.000	t > 2.000	Statistically Significant
LNRGDP	-7.33	± 2.000	t< 2.000	Statistically Significant
LNCPS	-2.46	± 2.000	t > 2.000	Statistically Significant
RIR	-0.31	± 2.000	t > 2.000	Statistically Insignificant

EXR	0.69	± 2.000	t< 2.000	Statistically Insignificant
TO	2.22	± 2.000	t > 2.000	Statistically Significant
PRISK	2.81	± 2.000	t > 2.000	Statistically Significant

Note: α = 0.05; (n-k)df = 3; t* means that only absolute values are considered.

From table 4.6 above, all the variables are statistically significant at 5% level except for real exchange rate and money supply growth rate.

3. **The F-Test**

This test can be said to be a joint hypothesis testing employing the Analysis of Variance (ANOVA). Gujarati (2004:254). It is a test used to measure the overall significance of the variables in the model. Under this test the null hypothesis is given as:$H_0 : \beta_2=\beta_3=...= \beta_k=0$ Versus $H_1 : \beta_2 \neq \beta_3 \neq ... \neq \beta_k \neq 0$ for K=7

Decision Rule:

If $F_{cal} > F_\alpha$ (K-1, n-K), reject H_0, do not reject H_0 if otherwise

Where: F_α (K-1, n-K) is the critical F-value at the chosen level of significance (α) and (K-1) degrees of freedom(df) for the numerator and (n-K) degrees of freedom (df) for the denominator; K= number of parameters used in the regression

n= number of observations; α= 0.05

Table 4.7 below summarizes the significance of the overall parameters in the regression.

TABLE 4.7 THE F-STATISTIC TEST TABLE

F-STATISTICS	$F_{0.05}(6, 33)$	DECISION RULE	CONCLUSION
14.89	3.77	$F_{cal} > 3.77$	Statistically Significant

Note: Since F-statistic = 14.89 > $F_{0.05}(6, 33)$=...., we reject the H_0 and conclude that at 5% level of significance, the overall significance of the parameters is statistically different from zero implying a good fit.

4.2.3 TESTS BASED ON ECONOMETRIC CRITERIA

This subsection deals with post mortem test of the regression results.

These are:

1. **Normality test**

The normality test conducted here is Jarque-Bera (JB) normality test specified as:

$$JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right] \text{---------- (7)}$$

where S= Skewness; K= Kurtosis

Hypothesis Testing:

H_0: JB=0 (the error term follows a normal distribution)

The JB statistic asymptotically follows the chi-square distribution with 2 degrees of freedom, one for skewness and one for kurtosis.

Decision Rule:

Reject H_0 if $JB_{cal} > JB_{tab(0.05)}$ with 2 degrees of freedom, do not reject if otherwise or if the probability value is sufficiently low, reject the H_0. From the result of the normality test shown in appendix D. The Skewness is approximately 4.400305 and the kurtosis is approximately 23.13378. Using equation (7) above to compute the JB

$$JB = 40\left[\frac{(4.400305)^2}{6} + \frac{(23.13378-3)^2}{24}\right] = 804.7$$

JB_{cal} is approximately given as 804.7. From the statistical table,

$\chi^2_{0.05}$with 2df = 5.99

Since 162.258 > 5.99, we reject H_0 at 5% level of significance; we thus conclude that the residual is not normally distributed at 5% level of significance.

It is expected that as the number of observation increases (asymptotically), the error terms become normally distributed (Gujarati, 2004: 148).

2. Test for Multicollinearity

One of the assumptions of OLS is the assumption of no multicollinearity among regressors in the model. In carrying out this test, a simple rule of thumb is used to search for high pair wise or zero order correlation between any two regressors. If the correlation coefficient is in excess of 0.8, then Multicollinearity is a serious problem (Gujarati and Sangeetha 2007: 367). Following this rule, there is high collinearity between TO and REXC as well as CPS and EXR (The correlation matrix table in shown in appendix F). This suggests that they share a common trend. Dropping any of them will amount to specification bias since they are all core variables and according to Gujarati, it is recommended that nothing should be done in cases of multicollinearity between core variables.

3. Test for heteroscedasticity

The white General Heteroscedasticity test detection approach is adopted as stated in chapter 3 above. The test which follows a chi square distribution is conducted as follows;

1. Generate the residual.
2. Square the residual.
3. Generate the squares of the independent variables and there cross partials.
4. Regress the residuals on the variables, their squares and cross partials.
5. Obtain the R^2.
6. Multiply the R^2 by n (the no of observations).

The 6th item above is the $\chi^2_{cal.}$

H_0**:** $\alpha_1 = \alpha_2 = \alpha_3 \ldots \alpha_k = 0$

H_1: $\alpha_1 \neq \alpha_2 \neq \alpha_3 \ldots \alpha_k \neq 0$

Decision Rule:

Reject H_0 if $\chi^2_{\mathbf{cal}} > \chi^2_{\mathbf{tab}}$ at 5% level of significance.

R^2 from auxiliary regression = 0.4596, n =40

n.R² = 40* 0.4596 = 19.824, χ^2_{tab} at 5% = 43.77

Since $\chi^2_{cal} < \chi^2_{tab}$ at 5% do not reject the null hypothesis and conclude that at 5% level of significance there is homoscedasticity.

4. Test for Autocorrelation

The Durbin Watson d-test is adopted for this test. Hence, we compare the established lower limit d_L and upper limit d_U of durbin Watson based on 5% level of significance and k-degrees of freedom.

Where: k=number of explanatory variables excluding the constant

Table 4.8: Durbin Watson d-test: decision rules

NULL HYPOTHESIS	DECISION RULE	CONDITION (IF)
No positive autocorrelation	Reject	$0 < d < d_L$
No positive autocorrelation	No Decision	$d_L \leq d \leq d_U$
No negative autocorrelation	Reject	$4 - d_L < d < 4$
No negative autocorrelation	No Decision	$4 - d_U \leq d \leq 4 - d_L$
No autocorrelation, positive or negative	Do not reject	$d_U < d < 4 - d_U$

Hypothesis testing:

1. H_o: ρ = 0 (no autocorrelation) versus H_1: ρ> 0,

   Decision rule: Reject H_0 at α level if d <d_U, that is, there is statistically significant positive autocorrelation.

2. H_0:ρ = 0 versus H_1: ρ <0.

   Decision rule: Reject H_0 at α level if the estimated (4 − d) <d_U, that is, there is statistically significant evidence of negative autocorrelation.

3. H_0: ρ = 0 versus H_1: ρ ≠ 0.

Decision rule: Reject H_0 at 2α level if d <$d_U$or (4 − d) <d_U, that is, there is statistically significant evidence of autocorrelation, positive or negative.

From the regression result in appendix B, we found a positive autocorrelation with the error terms since we got Durbin Watson to be 1.877131, d_L and $d_U$are 1.161 and 1.859 respectively. Since d <d_L that is 1.161< 1.859, from the table above we reject H_0 and accept that there exists a positive autocorrelation in the error term.

4.3 EVALUATION OF RESEARCH HYPOTHESIS

The null hypotheses posed at the introduction of this work are: There has been no significant change in the evolution of macroeconomic reforms in Nigeria over time and changes in macroeconomic reforms do not affect the growth of the manufacturing sector in Nigeria. However in this work, rate of growth of the manufacturing sector was proxied with the logarithm function of the manufacturing capacity utilization while credit to private sector was proxied with private investment. Other variables included in the model are real gross domestic product, real interest rate, real exchange rate, trade openness and political risk. After subjecting this hypothesis through the econometric methodology to research, the following research findings were made: The table containing the regression result shows that amidst the sporadic changes in macroeconomic reforms in Nigeria over time, certain macroeconomic indicators such as real gross domestic product (RGDP), real interest rate, credit to private sectors, real exchange rate,

trade openness and political risk has been fluctuating in response to the rate of growth of the manufacturing sector. However these changes are significant with respect to all the aforementioned variables except for real interest rate and real exchange rate.

To this end, these variables are to an extent and on the average key macroeconomic determinants of the rate of growth of the manufacturing sector in Nigeria. As determinants, they also show evidence of statistical significance except for real interest rate and real exchange rate.

4.3.1 SUMMARY

In this chapter, the researcher first subjected the variables to both unit root test as well as the Phillip Perronstationarity test. However, most of these variables were not stationary at level but were made stationary at first difference. By the Engel Granger Cointegration which was carried out to check if the variables are cointegrated. The result showed that the variables of interest are cointegrated in levels. Then, the result of the regression model was presented. This result was economically interpreted and statistically analyzed. Certain diagnostic tests were conducted to confirm that the analysis done was in accordance with the assumptions of the regression model invoked. The researcher finally evaluated the research hypothesis based on the result obtained; the null hypothesis of this research work was rejected with respect to the fact that within the study period (that is, 1970 to 2009), there has been significant evolution of macroeconomic reforms in Nigeria over time. Also, it was empirically shown that changes in macroeconomic reforms affects the growth of the manufacturing sector in Nigeria.

CHAPTER FIVE

SUMMARY, POLICY RECOMMENDATIONS AND CONCLUSION

5.1 SUMMARY

In this study, an analysis of the relationship between macroeconomic fundamentals and the performance of the manufacturing sub-sector was carried out. This research work is conducted employing an econometric methodology to research. Economic, statistical and econometric tools were used in analyzing and presenting data. The analysis shows that rate of growth of the manufacturing sectors responds to variations in certain macroeconomic variables such as economic growth, real interest rate, credit to private sector, real exchange rate, trade openness and the political economy.

However, the relationship between real interest rate and exchange rate was found not to be statistically significant leaving the researcher with the deduction that these variables have nothing to do with manufacturing sector growth rate within the study period. More so, it was also discovered empirically that no form of long run relationship exists between the variables of the study which are RGDP, energy consumption (decomposed into petroleum consumption and gas consumption), capital formation and labour force.

Furthermore, the relationship between the growth rate of the manufacturing sector and the variables of interest was found to exist even in the long run due to the fact that these variables were found to be cointegrated.

5.2 CONCLUSION

This study agrees with works which hold the view that the pace at which the manufacturing sector grows is dependent on core macroeconomic variables in Nigeria within the study period. However, this work contradicts the finding of works such as that of Essien and Akpan (2007) where it was held that interest rate and exchange rate policies have been un-conducive for a vibrant manufacturing sector. This is because these variables were found not to be significant in this work and using them as policy instruments is will be merely and exercise in futility in the Nigerian economy within the study period.

Furthermore, the study is in tandem with the NEEDS document which proposes that factors inhibiting growth in Nigeria include inconsistent macroeconomic policy; instability and policy reversals, political instability among others. This is because it was deduced empirically that the manufacturing sector of the economy fairs under the civilian regime well by a margin of 35% compared to military regime.

More so, this work also emphasized that trade liberalization impact on the rate of growth of the manufacturing sector. This is because empirically, it was found that trade openness (a proxy for trade liberalization) was marginally and positively related to the rate of growth of the manufacturing sector.

5.3 POLICY RECOMMENDATIONS

In terms of economic policy implications, the analysis presented here can serve as a warning concerning policies prescription regarding certain macroeconomic variables. Policy makers need to exercise great care on prescribing international trade policies. To this end, international trade should be encouraged as it empirically has been shown to affect growth rate of manufacturing sector positively within the study period. However, less emphasis should be laid on exchange rate

policies because this would have no form of effect on the growth rate of manufacturing sector.

Policies targeted at improving the economic growth of the Nigerian economy should be encouraged because this has a trickle-down effect on the rate of growth of the manufacturing sector positively. However, interest rate policies should not be used to drive the rate of growth of the manufacturing sector as it has no impact on the growth rate of manufacturing sector positively within the study period.

In conclusion, since the growth rate of the manufacturing sector was found to impact on the growth rate of manufacturing sector, efforts should be made to sustain the present civilian government if the growth of the manufacturing sector is to be sustained and improved on.

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APPENDICES

```
  ___  ____  ____  ____  ____ tm
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   10.0   Copyright 1984-2007
  Statistics/Data Analysis             StataCorp
                                       4905 Lakeway Drive
                                       College Station, Texas 77845 USA
                                       800-STATA-PC  http://www.stata.com
                                       979-696-4600  stata@stata.com
                                       979-696-4601 (fax)

Unlimited-user Stata for Windows (network) perpetual license:
       Serial number:  77060511030
         Licensed to:  Emmanuel
                       University of Nigeria
. tsset years
        time variable:  years, 1970 to 2009
                delta:  1 unit
```

APPENDIX A1 : TEST OF STATIONARITY USING AUGMENTED DICKEY FULLER (ADF) UNIT ROOT TEST FOR LNMSGIN LEVELS

```
. dfuller lnmsg

Dickey-Fuller test for unit root                   Number of obs   =        39

                         ------------ Interpolated Dickey-Fuller -------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)          -1.242            -3.655            -2.961           -2.613
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.6554
```

UNIT ROOT TEST FOR MSGAT FIRST DIFFERENCE

```
. gen dlnmsg=D.lnmsg
(1 missing value generated)

. dfuller dlnmsg

Dickey-Fuller test for unit root                   Number of obs   =        38

                         ------------ Interpolated Dickey-Fuller -------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)          -3.739            -3.662            -2.964           -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0036
```

UNIT ROOT TEST FOR LNRGDP IN LEVEL

```
. dfuller lnrgdp

Dickey-Fuller test for unit root                   Number of obs   =        39

                         ------------ Interpolated Dickey-Fuller -------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)          -2.309            -3.655            -2.961           -2.613
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.1691
```

UNIT ROOT TEST FOR LNRGDP AT FIRST DIFFERENCE

```
. gen dlnrgdp=D.rgdp
(1 missing value generated)

. dfuller dlnrgdp

Dickey-Fuller test for unit root                    Number of obs   =        38

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -5.422            -3.662            -2.964           -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

UNIT ROOT TEST FOR LNINV IN LEVELS

```
. dfuller lninv

Dickey-Fuller test for unit root                    Number of obs   =        39

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              2.176            -3.655            -2.961           -2.613
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9989
```

UNIT ROOT TEST FOR LNINVAT FIRST DIFFERENCE

```
. dfuller dlninv

Dickey-Fuller test for unit root                    Number of obs   =        38

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -3.942            -3.662            -2.964           -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0017
```

UNIT ROOT TEST FOR REAL INTEREST RATE IN LEVELS

```
. dfuller rir

Dickey-Fuller test for unit root                    Number of obs   =        39

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -5.464            -3.655            -2.961           -2.613
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

UNIT ROOT FOR REAL EXCHANGE RATE IN LEVELS

```
. dfuller exr

Dickey-Fuller test for unit root                    Number of obs   =        39

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              0.654            -3.655            -2.961           -2.613
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9889
```

UNIT ROOT TEST FOR REAL EXCHANGE RATE AT FIRST DIFFERENCE

```
. gen dexr=D.exr
(1 missing value generated)

. dfuller dexr

Dickey-Fuller test for unit root                   Number of obs   =        38

                         ------------ Interpolated Dickey-Fuller -------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -5.247           -3.662            -2.964           -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

UNIT ROOT FOR TRADE OPENNESS IN LEVELS

```
. dfuller to

Dickey-Fuller test for unit root                   Number of obs   =        39

                         ------------ Interpolated Dickey-Fuller -------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              0.718           -3.655            -2.961           -2.613
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9902
```

UNIT ROOT TEST FOR TRADE OPENNESS AT FIRST DIFFERENCE

```
. gen dto=D.to
(1 missing value generated)

. dfuller dto

Dickey-Fuller test for unit root                   Number of obs   =        38

                         ------------ Interpolated Dickey-Fuller -------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -6.255           -3.662            -2.964           -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

APPENDIX A2:- TEST OF STATIONARITY USING PHILLIPS- PERRON

PHILLIPS- PERRON TEST FOR LNMSG IN LEVELS

```
. pperron lnmsg

Phillips-Perron test for unit root                 Number of obs   =        39
                                                   Newey-West lags =         3

                         ------------ Interpolated Dickey-Fuller -------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)           -3.554          -18.152           -12.948          -10.480
 Z(t)             -1.468           -3.655            -2.961           -2.613
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.5493
```

PHILLIPS- PERRON TEST FOR LNMSG AT FIRST DIFFERENCE

```
. pperron dlnmsg

Phillips-Perron test for unit root                 Number of obs   =        38
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical             10% Critical
               Statistic                     Value                   Value                   Value
------------------------------------------------------------------------------------------------------
 Z(rho)         -21.839                     -18.084                 -12.916                 -10.460
 Z(t)            -3.773                      -3.662                  -2.964                  -2.614
------------------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0032
```

PHILLIPS- PERRON TEST FOR LNRGDP IN LEVEL

```
. pperron lnrgdp

Phillips-Perron test for unit root                 Number of obs   =        39
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical             10% Critical
               Statistic                     Value                   Value                   Value
------------------------------------------------------------------------------------------------------
 Z(rho)          -2.831                     -18.152                 -12.948                 -10.480
 Z(t)            -2.582                      -3.655                  -2.961                  -2.613
------------------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0968
```

PHILLIPS- PERRON TEST FOR LNRGDP AT FIRST DIFFERENCE

```
. pperron dlnrgdp

Phillips-Perron test for unit root                 Number of obs   =        38
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical             10% Critical
               Statistic                     Value                   Value                   Value
------------------------------------------------------------------------------------------------------
 Z(rho)         -33.712                     -18.084                 -12.916                 -10.460
 Z(t)            -5.410                      -3.662                  -2.964                  -2.614
------------------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

PHILLIPS- PERRON TEST FOR LNINV IN LEVEL

```
. pperron lninv

Phillips-Perron test for unit root                 Number of obs   =        39
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical             10% Critical
               Statistic                     Value                   Value                   Value
------------------------------------------------------------------------------------------------------
 Z(rho)          1.521                     -18.152                 -12.948                 -10.480
 Z(t)            1.538                      -3.655                  -2.961                  -2.613
------------------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9977
```

PHILLIPS- PERRON TEST FOR LNINV AT FIRST DIFFERENCE

```
. pperron dlninv

Phillips-Perron test for unit root                 Number of obs   =        38
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical             10% Critical
               Statistic                     Value                   Value                   Value
------------------------------------------------------------------------------------------------------
 Z(rho)         -22.773                     -18.084                 -12.916                 -10.460
 Z(t)            -3.944                      -3.662                  -2.964                  -2.614
------------------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0017
```

PHILLIPS- PERRON TEST FOR REAL INTEREST RATE IN LEVELS

```
. pperron rir

Phillips-Perron test for unit root                 Number of obs   =        39
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical      10% Critical
               Statistic                     Value                   Value            Value
------------------------------------------------------------------------------------------
 Z(rho)         -33.732                     -18.152                 -12.948          -10.480
 Z(t)            -5.458                      -3.655                  -2.961           -2.613
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

PHILLIPS- PERRON FOR TRADE OPENNESS IN LEVELS

```
. pperron to

Phillips-Perron test for unit root                 Number of obs   =        39
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical      10% Critical
               Statistic                     Value                   Value            Value
------------------------------------------------------------------------------------------
 Z(rho)          1.545                     -18.152                 -12.948          -10.480
 Z(t)            1.076                      -3.655                  -2.961           -2.613
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9950
```

PHILLIPS- PERRON FOR TRADE OPENNESS AT FIRST DIFFERENCE

```
. pperron dto

Phillips-Perron test for unit root                 Number of obs   =        38
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical      10% Critical
               Statistic                     Value                   Value            Value
------------------------------------------------------------------------------------------
 Z(rho)         -44.286                     -18.084                 -12.916          -10.460
 Z(t)            -6.275                      -3.662                  -2.964           -2.614
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

PHILLIPS- PERRON TEST FOR EXCHANGE RATE IN LEVELS

```
. pperron exr

Phillips-Perron test for unit root                 Number of obs   =        39
                                                   Newey-West lags =         3

                                         ---------- Interpolated Dickey-Fuller ----------
                 Test                    1% Critical             5% Critical      10% Critical
               Statistic                     Value                   Value            Value
------------------------------------------------------------------------------------------
 Z(rho)          0.932                     -18.152                 -12.948          -10.480
 Z(t)            0.574                      -3.655                  -2.961           -2.613
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9870
```

PHILLIPS- PERRON TEST FOR EXCHANGE RATE AT FIRST DIFFERENCE

```
. pperron dexr

Phillips-Perron test for unit root                 Number of obs   =        38
                                                   Newey-West lags =         3

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic          Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)          -36.211           -18.084           -12.916          -10.460
 Z(t)             -5.273            -3.662            -2.964           -2.614
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

APPENDIX B:-ENGLE-GRANGER (RESIDUAL-BASED) COINTEGRATION TEST (UNIT ROOT ON THE RESIDUAL FROM REGRESSION).

```
. predict resid, resid
(2 missing values generated)

. dfuller resid

Dickey-Fuller test for unit root                   Number of obs   =        37

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic          Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -5.562            -3.668            -2.966           -2.616
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

REGRESSION RESULT FOR THE ERROR CORRECTION MODEL (ECM)

```
. reg d(lnmsg lnrgdp lninv rir exr to) l.resid

      Source |       SS       df       MS              Number of obs =      37
-------------+------------------------------           F(  6,    30) =    1.50
       Model |  .070741546     6  .011790258            Prob > F      =  0.2123
    Residual |  .235934478    30  .007864483            R-squared     =  0.2307
-------------+------------------------------           Adj R-squared =  0.0768
       Total |  .306676024    36  .008518778            Root MSE      =  .08868

------------------------------------------------------------------------------
     D.lnmsg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lnrgdp |
        D1.  |   .0664544   .0434955     1.53   0.137    -.0223753    .1552841
       lninv |
        D1.  |   .1456486   .0710754     2.05   0.049     .0004932    .2908041
         rir |
        D1.  |  -.0001127   .0009412    -0.12   0.906    -.0020349    .0018095
         exr |
        D1.  |   .0017915   .0011833     1.51   0.140    -.0006251    .0042081
          to |
        D1.  |  -.0032565    .009067    -0.36   0.722    -.0217738    .0152608
       resid |
        L1.  |   .0005764   .0013294     0.43   0.668    -.0021386    .0032914
       _cons |  -.0407459    .020248    -2.01   0.053    -.0820979    .0006061
------------------------------------------------------------------------------
```

```
. reg d(lnmsg prisk) l.resid
```

Source	SS	df	MS	Number of obs =	37
Model	.037544619	2	.01877231	F(2, 34) =	2.37
Residual	.269131405	34	.00791563	Prob > F =	0.1086
				R-squared =	0.1224
				Adj R-squared =	0.0708
Total	.306676024	36	.008518778	Root MSE =	.08897

D.lnmsg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
prisk						
D1.	.1024303	.0516152	1.98	0.055	-.0024644	.207325
resid						
L1.	.0011786	.0012465	0.95	0.351	-.0013547	.0037119
_cons	-.0103422	.0147193	-0.70	0.487	-.0402554	.0195709

```
. reg d(lnmsg lnrgdp lninv rir exr to prisk) l.resid
```

Source	SS	df	MS	Number of obs =	37
Model	.085066857	7	.012152408	F(7, 29) =	1.59
Residual	.221609168	29	.007641695	Prob > F =	0.1779
				R-squared =	0.2774
				Adj R-squared =	0.1030
Total	.306676024	36	.008518778	Root MSE =	.08742

D.lnmsg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnrgdp						
D1.	.061892	.0430043	1.44	0.161	-.0260617	.1498457
lninv						
D1.	.139875	.0701883	1.99	0.056	-.0036762	.2834261
rir						
D1.	-.0001736	.0009288	-0.19	0.853	-.0020733	.0017261
exr						
D1.	.0008194	.0013655	0.60	0.553	-.0019733	.0036122
to						
D1.	-.004899	.0090178	-0.54	0.591	-.0233425	.0135445
prisk						
D1.	.0816145	.0596088	1.37	0.181	-.0402991	.2035282
resid						
L1.	.0007394	.0013158	0.56	0.578	-.0019518	.0034306
_cons	-.0367362	.0201729	-1.82	0.079	-.0779944	.0045219

APPENDIX C:-REGRESSION RESULT FROM STATA PAGE:

```
. reg  lnmsg lnrgdp lninv rir exr to prisk
```

Source	SS	df	MS	Number of obs =	40
Model	2.86149071	6	.476915118	F(6, 33) =	14.89
Residual	1.0568566	33	.032025958	Prob > F =	0.0000
				R-squared =	0.7303
				Adj R-squared =	0.6812
Total	3.91834731	39	.100470444	Root MSE =	.17896

lnmsg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnrgdp	-.1802902	.0246076	-7.33	0.000	-.2303546	-.1302257
lninv	-.1431737	.0580892	-2.46	0.019	-.2613572	-.0249902
rir	-.000725	.0023216	-0.31	0.757	-.0054484	.0039985
exr	.0013161	.0019154	0.69	0.497	-.0025808	.005213
to	.0285469	.0128423	2.22	0.033	.0024191	.0546747
prisk	.3007626	.1069962	2.81	0.008	.0830772	.5184481
_cons	7.369775	.591718	12.45	0.000	6.165916	8.573634

```
. estat  dwatson

Durbin-Watson d-statistic(  2,    37) =  1.877131
```

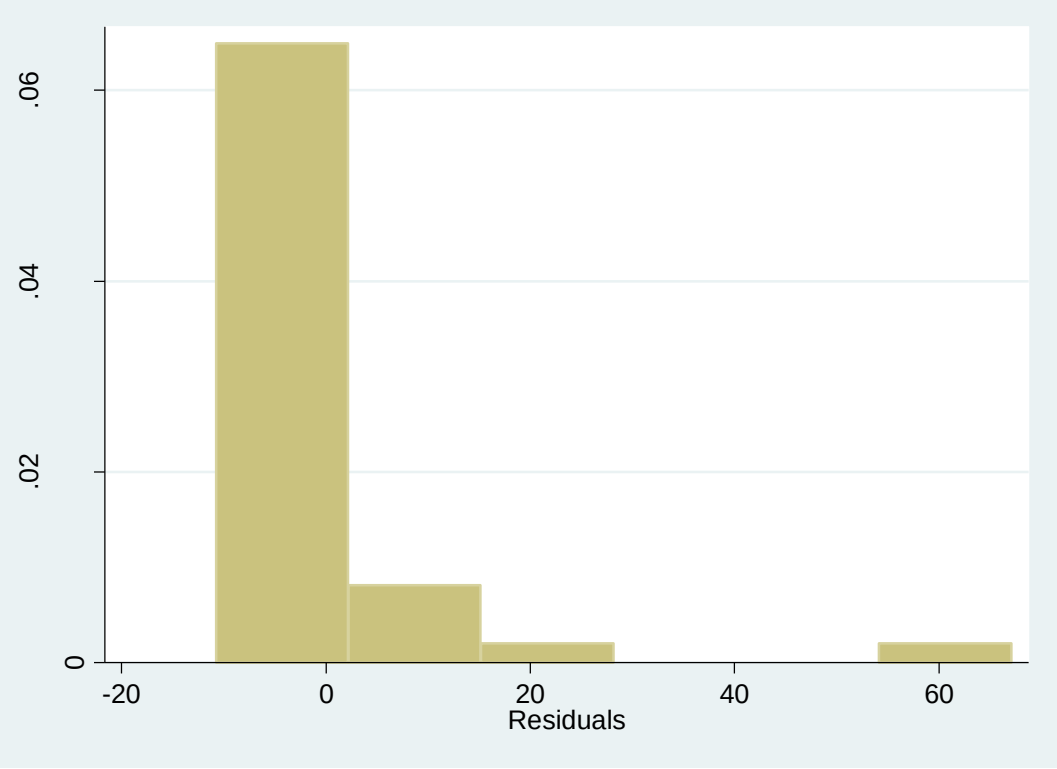
APPENDIX D:- NORMALITY TEST

```
. su resid, detail
```

Residuals

	Percentiles	Smallest		
1%	-10.75393	-10.75393		
5%	-7.085211	-7.085211		
10%	-5.326187	-6.259069	Obs	38
25%	-3.696143	-5.326187	Sum of Wgt.	38
50%	-3.642068		Mean	1.09e-07
		Largest	Std. Dev.	12.57916
75%	-.8653372	4.729776		
90%	4.729776	5.498294	Variance	158.2352
95%	27.15693	27.15693	Skewness	4.400305
99%	67.12321	67.12321	Kurtosis	23.13378

HISTOGRAM OF RESIDUALS:



APPENDIX E:- TEST FOR HETEROSCEDASTICITY: (WHITE'S APPROACH)

CASE OF NO CROSS TERM

```
. reg residsqr lnrgdpsqr lninvsqr rirsqr tosqr exrsqr
```

Source	SS	df	MS	Number of obs =	38
				F(5, 32) =	0.43
Model	1260309.18	5	252061.837	Prob > F =	0.8234
Residual	18705266.2	32	584539.568	R-squared =	0.0631
				Adj R-squared =	-0.0833
Total	19965575.4	37	539610.145	Root MSE =	764.55

residsqr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnrgdpsqr	.6621604	5.830898	0.11	0.910	-11.21499	12.53931
lninvsqr	3.693199	8.581527	0.43	0.670	-13.7868	21.1732
rirsqr	-.1929349	.589626	-0.33	0.746	-1.393964	1.008094
tosqr	-1.856467	1.785883	-1.04	0.306	-5.494192	1.781258
exrsqr	.0241054	.0435368	0.55	0.584	-.0645763	.112787
_cons	-375.4238	961.6045	-0.39	0.699	-2334.148	1583.3

CASE OF CROSS TERMS

```
. reg residsqr lnrgdpsqr lninvsqr rirsqr tosqr exrsqr lnrgdplninv lnrgdprir lnrgdpto lnrgdpexr lninvto lninvrir lninvexr ri
> rexr toexr
```

Source	SS	df	MS	Number of obs =	38
				F(15, 22) =	1.44
Model	9894439.86	15	659629.324	Prob > F =	0.2125
Residual	10071135.5	22	457778.887	R-squared =	0.4956
				Adj R-squared =	0.1516
Total	19965575.4	37	539610.145	Root MSE =	676.59

residsqr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnrgdpsqr	-68.30566	107.0786	-0.64	0.530	-290.3732	153.7619
lninvsqr	-106.6909	136.655	-0.78	0.443	-390.0961	176.7143
rirsqr	-.1208346	.7229239	-0.17	0.869	-1.620087	1.378418
tosqr	-37.02175	26.3862	-1.40	0.175	-91.74337	17.69988
exrsqr	-.2222418	.6364523	-0.35	0.730	-1.542163	1.097679
lnrgdplninv	145.0429	233.7975	0.62	0.541	-339.8235	629.9093
lnrgdprir	-.0870697	11.46829	-0.01	0.994	-23.87085	23.69671
lnrgdpto	-430.8946	371.8262	-1.16	0.259	-1202.015	340.2257
lnrgdpexr	57.38525	45.10747	1.27	0.217	-36.16193	150.9324
lninvto	469.8528	404.4443	1.16	0.258	-368.9133	1308.619
lninvrir	.1240821	13.52665	0.01	0.993	-27.92847	28.17663
lninvexr	-56.06512	51.23782	-1.09	0.286	-162.3259	50.19561
rirto	-4.773288	6.688971	-0.71	0.483	-18.64537	9.09879
rirexr	1.050026	.5743265	1.83	0.081	-.1410543	2.241106
toexr	2.790386	2.930039	0.95	0.351	-3.286143	8.866914
_cons	2815.387	2373.09	1.19	0.248	-2106.101	7736.875

APPENDIX F:-TEST FOR MULTICOLLINEARITY

THE CORRELATION MATRIX:

```
. corr lnrgdp lninv rir to exr
(obs=40)
```

	lnrgdp	lninv	rir	to	exr
lnrgdp	1.0000				
lninv	0.6255	1.0000			
rir	0.2623	0.3170	1.0000		
to	0.5735	0.9326	0.3360	1.0000	
exr	0.6039	0.9238	0.3099	0.9091	1.0000