The Linkages of the Manufacturing Sector with Other Sectors of Nigerian Economy

Werikechukwu James Okweshine

University of Benin

DOI: https://dx.doi.org/10.47772/IJRISS.2024.801155

Received: 16 January 2024; Accepted: 25 January 2024; Published: 16 February 2024

ABSTRACT

This paper examines the linkage between the manufacturing sector and other sectors of the Nigerian economy using Rasmussen method with the help of the Leontief inverse matrix. The National Bureau of Statistics (NBS) and the CBN Statistical Bulletin for 2011 provided the input-output transaction table of all sectors, which served as the source of data for the study. The constructed input-output (I-O) table gives a simple and logical arrangement of all economic activity within an economy. The result of this study shows that the manufacturing sector has a strong forward and backward linkage with other sectors of the Nigerian economy. The findings suggest that the Nigerian government should prioritize policies that promote growth in the manufacturing sector, as it will improve better living standard for all individuals in the sector and all others connected to the manufacturing sector. This can be done by providing tax breaks and other incentives to manufacturing firms, and by investing in infrastructure and education. The government should also focus on developing policies that promote the development of industries that produce intermediate goods and services, as these industries are important for the growth of the manufacturing sector as a whole also the manufacturing enterprises should be encouraged to employ domestic inputs.

Keywords: forward linkages, unbalanced growth, maunufacturing, Leontief inverse

INTRODUCTION

The manufacturing sector of any economy is widely regarded as the engine of growth and a catalyst for long-term transformation and national development. This is due to its immense potential as a tool for creating wealth, creating jobs, contributing to the country's GDP, and alleviating poverty among its citizens. The experiences of industrialized countries and rising economies such as China, India, North Korea, Malaysia, and Singapore reveal a positive association between the aforementioned indices of manufacturing sector performance and national growth and development. Thus, for many developing countries, such as Nigeria, the development of the manufacturing sector is critical for significant and sustainable national progress.

The manufacturing sector makes significant contribution to economic development through its production and employment linkages with other sectors of the economy in both developing and developed countries. It is a critical driver of economic growth and development. It is responsible for the production of goods that are used by other sectors of the economy, such as agriculture, construction, and services etc. The manufacturing sector also provides jobs and generates income for millions of Nigerians. Prior to the twenty-first century, the manufacturing sector was seen as the main engine of economic growth (Cornwell, 1997; Fagerberg and Verspagen, 1999; Timmer and de Vries, 2009). This was because manufacturing was seen as the sector that was most productive and efficient, and it was also the sector that was most likely to generate technological innovation. The events of the twenty-first century have attributed to the service and telecommunications industries an important role in the growth process in many developing and growing

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

nations (Szirmal, 2014).

The importance of the manufacturing sector to economic growth cannot be overemphasized. Amakom (2012) stated that a nation's economic efficiency is measured by the virility of its manufacturing sector. In Nigeria, from a modest 4.8% in 1960, the contribution of manufacturing to GDP has been fluctuating over the years. The surge of 7.4% in 1975 tumbled to 5.4%, by 1980 only to attain to a record high of 10.7% in 1985. By 1990, the share of manufacturing in GDP which stood at 8.1% fell to 7.9% in 1992 and further declined to 6.7% and 6.3% in 1995 and 1997 respectively. As of 2001 the share of manufacturing in GDP crashed to the lowest ebb of 3.4% after it has risen modestly to 6.2% in 2000. It gained some traction at 4.16% in 2011 which was less than its contribution at independence in 1960(CBN, 2012). According to the 2010 annual report of the Manufacturers Association of Nigeria, (MAN) presented during the 39th Annual General Meeting of the association, the Nigerian manufacturing sector only contributed 4.21% to the GDP in 2009.The results of the rebasing of Nigeria's GDP, hitherto 1990 to 2010 which showed that the Nigerian economy is more diversified than previously reported, showed manufacturing as contributing only 6.46% and 6.83% of the GDP in 2011 and 2013 respectively (NBS, 2014).

The manufacturing sector is expected to be a key driver of economic growth and development in Nigeria. Numerous studies have been done on the area of the linkage of the manufacturing sector with mixed findings. Salami & Kelikume (2011) result shows a weak linkage between the manufacturing sector and other sectors, with only two major sectors driving the economy, which to them are building and construction and hotel and restaurant. On the other hand, Olawuyi and Adebayo (2016); Iwayemi and Akinboade (2019); Ogunsanya and Akinlo (2020) and Salami and Olofin (2019) found a positive and significant relationship between the manufacturing sector and other sectors of the Nigerian economy even when their studies did not consider many other sectors in the economy. From these studies it was not clear how the linkages were measured and captured. In addition, reports from NBS show that in the first quarter of 2023, the economy was driven mainly by the Services sector and not building and construction and hotel and restaurant as Salami &Kelikume (2011) found. However, other studies failed to appropriately measure the linkages of the manufacturing sector like, Ogunsanya and Akinlo (2020) and Salami and Olofin (2019). Although, Osuagwu (2020) discovered a bidirectional relationship between agricultural and manufacturing industry both in the short and the long run, but did not look at all other sectors of the economy. Many of the studies work on the linkage of the manufacturing sector with other sectors of the economy were not done on the Nigerian economy.

It is against this backdrop that this paper seeks to examine the forward and backward linkages of the manufacturing sector with other sectors of the Nigerian economy with the help of the input-output analysis based on the 2010 – 2012 summary report of all sectors published by NBS in 2015, which happens to be the last report till the present time of this study.

LITERATURE REVIEW

The Nigerian Manufacturing Sector

(i) Over View of Nigeria Manufacturing Performance

The manufacturing sector's percentage of total economic output in Nigeria has typically declined since a record of 7.83% in 1982. Many factors have contributed to the variation in sector share through time, many of which demonstrate both manufacturing's responsiveness to global economic forces as well as its resilience policy changes in the sector. Manufacturing made up about 10% of Nigeria's economic output before the oil boom of the 1970s. After that, the sector's relative Gross Domestic Product (GDP) share decreased due to rising oil revenue, yet growth continued although more slowly. Early in the 1980s, the crisis brought on by the decline in oil prices forced policy attention to shift back to industry, with steel

production taking center stage. Prior to this, foreign capital inflows were limited by the Nigerian Enterprises Promotion Decrees of 1972 and 1977, which changed the predominant ownership of the company from foreign to Nigerian. The home manufacture of essential goods like soap and salt was encouraged by the cost of imported goods as well as the lack of foreign capital and technology. Alongside, price manipulation through export and import subsidies encouraged the importation of intermediary inputs and thus the expansion of assembly based industry. In the early 1980s, there was a temporary increase in manufacturing output that resulted in it making up 7.83% of overall economic activity. However, price manipulation discouraged local input manufacturing as well as investment in the infrastructure and human resources needed to do so in the future, and this share quickly started to decrease. Import restrictions on raw materials were put in place in 1987 as part of the World Bank's structural adjustment programmes (SAPs), which promoted import substitution. There were fewer plant closures and intermediate input producers could produce competitively again. A greater level of manufacturing efficiency was promoted by this in conjunction with the Privatization and Commercialization Act of 1988. A slight increase in the share of manufacturing in economic output of 0.62% points was observed from 1986-1988.

Nigeria continued to rely significantly on oil exports throughout the 1990s and 2000s, making to manufacturing decline. Firms were not export-oriented and were inefficient, causing competing firms to shift factories abroad. A few vital industries, like drinks, textiles, cement, and tobacco, kept the economy afloat, although even these were operating at less than half capacity. To this day, production is mainly located in Lagos and its periphery, and to a lesser extent some other commercial towns such as Kano or Kaduna.

Post rebasing, the manufacturing sector shows a more optimistic picture, as more modern manufacturing activities have been captured, and prices correctly deflated so that they are representative of the price structure in the economy at that time, taking account of inflation.

In 2013, Nigeria released the results of its GDP rebasing estimates. The trend reveals that the manufacturing sector continually increases the GDP from 2010 to 2013. Standing at a 2010 value of N3,578,641.72 million, the Manufacturing sector represented 6.55% of total real GDP in that year. It grew by N948,803.34 million or 26.51% in 2011 to reach N4,527,445.06 million or 7.79% of real GDP in that year and by N1,061,376.64 million or 23.44% in 2012 to reach a value of N5,588,821.69 million or 7.79% of real GDP that year. However, growth was highest in 2013, at N1,644,500.79 million or 29.42%, so that the contribution of the Manufacturing sector reached N7,233,322.48 million or 9.03% of real GDP, a value that had not been recorded in decades. Part of the reason for the increase in the contribution of the manufacturing sector to GDP is the better capturing of output.

(ii) Manufacturing Activities

Prior to rebasing of the Nigerian GDP, manufacturing included just three Activities—Oil Refining, Cement and Other Manufacturing. Now, the other manufacturing activity has been broken down into 11 different activities, bringing the total for the manufacturing sector to 13 they are; Oil Refining; Cement; Food, Beverages and Tobacco; Textile, Apparel, and Footwear; Wood and Wood products; Pulp Paper and Paper products; Chemical and Pharmaceutical products; Non-metallic Products, Plastic and Rubber products; Electrical and Electronic; Basic Metal and Iron and Steel; Motor Vehicles and Assembly; and Other Manufacturing (CBN, 2021)

(a). Food, Beverages and Tobacco

The Food, Beverages and Tobacco Activity had the largest output of all those in the Manufacturing Sector, with the greatest number of classes of goods captured. Of those product classes, the greatest contributor in all three years of review is Sugar, which had an output of, N2,438,316.12 million in 2011, constituting

44.99% and of the Food, Beverages and Tobacco total in each year. To put this in perspective, the product alone contributed 29.84% to the total output for the manufacturing sector as a whole in 2011. The product with the second greatest output is Bread, which produced a value N1,099,934.59 million in 2011 and N1,319,418.19 and contributed 20.30% to the total activity output in 2011. The third most significant contributor was Rice, followed by Biscuits. Rice output stood at 2,839,845 Kg valued at N681,562.84 million in 2011. This represented 12.58% and increases of N172,842.71 million or 33.98% in 2011. Biscuits represented N453,807.45 million or 8.37% in 2011. (NBS, 2015)

(b). Textiles, Apparel and Footwear

As the activity with the second largest output, Textiles Apparel and Footwear contributed an increasing share of 14.57% of total manufacturing output in 2011. The key driver of this growth was the product of Other Woven fabric, which dominates the activity. With output valued at N965,358.73 million, which was 11.81% of the manufacturing total. The second greatest contributor after this was Leather Shoes, which had a more mixed growth story. Contributing a N81,237.04 million expanding its share of the activity total to 6.82% of the activity total (NBS, 2015).

(c). Other Manufacturing

Other Manufacturing includes activities that have not elsewhere been classified in the Manufacturing Sector. Examples of products that are captured here are Office Furniture, Cupboard/wardrobes, Furniture/Doors/Windows, Mattresses and Brio/Pens. At a value of N575,671.36 million in 2011, Other Manufacturing was the third largest of all activities in the manufacturing sector, contributing 7.04% to the total. The fastest growing, and one of the main contributors to growth, is the manufacture of Mattresses, which from the N196,158.50 million or 22.80% of the total recorded in 2010, grew by N71,836.94 million or 80.32%. The following year, it grew by a further N54,009.24 million or 33.49%, reaching N215,287.80 million or 27.38% of the total. This was not the only class of products that experienced high growth over the period; in 2012 all products grew at a rate of over 30%. The lowest was even Mattresses at 33.49%, whilst the highest growth was recorded for Cupboard/Wardrobe manufacture, which increased by 42.75% or N179,98 million from N421.04 million in 2011 to N601.02 million in 2012.(NBS, 2015).

(iii) Industrial Policies in Nigeria

Over the years, several industrial policies, industrialization strategies, and policy reform initiatives have been developed and put into action in an effort to promote industrialization in the nation. Since 1960, the majority of the African continent has viewed industrialization as a means of fostering independence and lowering an excessive reliance on developed economies (Isiksa & Chimezie, 2016). An economy's industrial sector has a significant effect on how a country develops. It stands for a group of firms involved in converting raw materials into completed goods and services.. Industrial policy entails the government intervening in powerful reforms that will aid in broadening the economy's sectoral basis (Aza& Dodo, 2014).

Objectives and Strategies of Industrial Policy

– **Provision of Greater Employment Opportunities to Stern the Social and Political Consequences of Unemployment**: Government accords high priority to small and medium enterprises (SMEs) as avenue to generate employment. It plans to establish Small Scale Industries Corporation (SSIC) as a coordinating umbrella organization and effective institutional structure capable of providing technical services and credit facilities to viable SMEs.

– **Increased Export of Manufactured Goods:** The strategy for making Nigeria's exports more

competitive internationally and profitable to the industrialists includes the liberalized regulatory environment, promotion of export free zones, liberalization of access to foreign exchange, establishment of a realistic rate for the Naira, and other fiscal and financial incentives.

– **Promotion of Industrial Development and National Integration through Industrial Dispersal:** The strategy for achieving this objective entails the division of the local government areas into three zones, using industrial production in gross and per capital basis. Available social and economic infrastructures and level of labor market development, as cri1eria for grouping the areas.

– **Improvement of The Nation's Technological Capacity:** Government intends to give active support to industrial research and development efforts by encouraging agents of industrial research and manpower training.

– **Increasing Local Content of Industrial Output to Promote Greater Linkages and Backward Integration in Order to Raise the General Level of Economic Activity:** The strategy here is to encourage the use of local raw materials through fiscal incentives, which allow about between 120-140% of expenses on Research and Development (R & D) as tax deductible to industries that source their raw materials locally.

– **Attracting Foreign Investment to Attain Accelerated Pace of Industrial Development:** The strategy entails liberalization of access to foreign exchange through an open foreign exchange market, easier capital and dividend repatriation through less cumbersome procedures, the review and amendment made to the Nigerian Enterprises Promotion Decree (NEPD) and the Debt Conversion Programme, all of which are designed to open up more areas to attract foreign investments.

– **Increased Private Sector Participation Aimed at Accelerated Pace of Industrial Development:** Government seeks to achieve this through privatization and commercialization of public sector investments. The Debt Conversion Programme is also slated for a major role in this regard.

These policies and other reforms were aimed at opening the Nigerian economy to the rest of the world, enhance industrial production capacity and positioned the industrial sector as driver of growth and long-term development.

(iv) Policy Programme to Link other Sectors of the Economy

The Nigeria Industrial Revolution Plan (NIRP) was established in 2013 to industrialize Nigeria. It is the first comprehensive, integrated, and strategic roadmap to Nigeria industrialization. The NIRP is expected to increase the level of Nigeria industrial output from 4% to 10% of GDP. The programme is also made to create wealth, create jobs, improve the country's trade balance, and increase government tax revenues. The is NIRP established to evaluate industries across the entire value-chain to ensure the relevant sub sectors, related industries, supply and demand conditions, are all put in proper conditions. It also adopts a coherent framework to address structural enablers that will increase competiveness in Nigeria. The NIRP further integrates Nigeria's Industrial Policy, Trade Policy, and Investment Policy. Finally, the NIRP also develops comprehensive linkages with other development plans involving other sectors in the Nigeria, such as, the gas master plan, agric transformation agenda, mining plan, infrastructure plan and many others.

Concept of Manufacturing and Sector Linkages

Manufacturing is the process of creating finished goods from raw materials by employing a variety of processes, equipment, activities, and labor in accordance with a detailed plan. The raw material undergoes transformation during processing so that it can become a component of a product or products. Once processed, it should have worth in the market or a value. Therefore, manufacturing is 'adding value' to the

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

material. The value added to the material through processing must be greater than the cost of processing to allow the organization to make money or a profit.A manufacturing organization will only be successful if it not only produces products, but also sells them. Accordingly, value added can be defined as (ICMA, 1974) the increase in market value resulting from an alteration of the form, location, or availability of a product, excluding the cost of materials and services. In general terms, based on the above definition, a manufacturing system can be defined as a system in which raw materials are processed from one form into another, known as a product, gaining a higher or added value in the process and thus creating wealth in the form of a profit. Adofu, et al (2018) views manufacturing as the production of merchandise for sale or use through the application of tools, machine, labour, chemical and biological formulation. It involves both handicraft of human activities and high tech by transforming of unfinished goods to finished goods. In modern economy today, the development of industries (industrialization) is extensively based on technological development of productive strategies. This simply implies a transformation of an economy from traditional low production system into modern mass production system, which involves more efficient and automated system through sustained and deliberate combination and application management techniques, suitable technology and other resources that promote high tech production techniques. It has been argued that the fastest channel by which rapid sustainable growth and development is achieved in any economy is via industrial capacity technological innovation and enterprise development, rather than vast human resources and level of endowed material resources.

Sectorial linkages essentially describe the relationship between several economic sectors. In an interdependent economy, many sectors are connected to one another in both direct (such as through the sharing of input and output, etc.) and indirect ways. Sectorial linkages, in reality, describe a sector's relationship to the other sectors of the economy through its direct and indirect intermediate purchases and sales (Saikia, 2011). Sectors are interconnected because they produce goods and services that are used as inputs by other sectors.Based on these concepts of linkage effect, one can identify the inter-industry linkages of a sector in the economy. In other words, the key sectors are those which have a proven capacity to stimulate the growth of other sectors either through providing their own output to other sectors (forward linkage) or through taking inputs from other sectors (backward linkage). The IO matrix is used to arrive at the linkage coefficient to identify the high linkage sectors. IO-based analysis is a scientific way to study the interdependence or linkages among industries of the economy. The IO matrix represents the nation's economic linkage sectors. IO-based analysis is a scientific way to study the interdependence or linkages among industries of the economy. The IO matrix represents the nation's economy; the IO table is based on the production system of an economy and is decomposed to a certain number of productive sectors which reflects flows of goods and services across sectors (Miller & Blair, 2009). Backward and forward linkage coefficients are not only used to estimate impacts for a given policy but also used to quantify the degree of sector/industry interdependence of a given economy and to identify those sectors/ industries (the so-called key sectors/industries) which might contribute significantly to economic growth (Bonfiglio, 2005).

Wassily Leontief defined linkages as the interdependencies between different sectors of an economy. He developed a mathematical model, known as the input-output model, to measure the direct and indirect effects of changes in the output of one sector on the output of other sectors. Leontief identified two types of linkages: Direct linkages -which are the direct relationships between sectors. For example, the steel industry directly supplies steel to the automobile industry. The other is the indirect linkages – which are the indirect relationships between and among sectors. For example, the steel industry indirectly supplies steel to the automobile industry by supplying steel to the machine tool industry, which in turn supplies machine tools to the automobile industry.

Hirschman (1958) was the first to propose backward and forward linkage. Hirschman was primarily a development economist with a focus on Latin American countries. The Strategy of Economic Development (1958), which established the backward and forward linkage concepts, was thus predicated on experiences

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

gained as an official advisor and private consultant in Columbia during the first half of the 1950s (Hirschman, 1986a). However, the economic theories outlined in the Strategy of Economic Development turned out to be broadly applicable. The linkage concept is generalized to the observation that ongoing activities induce agents to take up new activities. This effect expresses a linkage between the ongoing and the new activity (Hirschman, 1977, p. 80). The two seminal concepts in the sectoral linkage theory, that is, forward linkage effect and backward linkage effect, was described by Hirchman (1958) as a "non-primary" activity, that is, an activity that employs significant amounts of intermediate inputs from other activities which can then induce increase in supply and thereby expand domestic production. This is the backward linkage effect. Again, an activity that is "non-final", that is, an activity that does not cater exclusively to final demand and can be expected to induce attempts to utilize its outputs as inputs in some new activities, is the forward linkage effect.

With input-output structure, there are two types of economic linkages between sectors (Chenery and Watanabe, 1958). On one hand if the sector*i* increases its output then there is increased demand on sectors whose products are used as inputs in production to *j*. This demand relationship is referred to as backward linkage. On the other hand, increased output in sector *i* also means that the additional amount of product *i* are available to be used as inputs to production in the other sectors. This supply relationship is referred to as forward linkage.

Forward linkage, refers to the relationship between one industry or sector and another where the first industry's output serves as an input or raw material for the second industry's production process. This type of linkage typically occurs when the goods or services produced by one sector become essential inputs for another sector, creating a chain of interdependence within the economy. It sterns from the fact, that the product of a newly emerging industry is supplied as a material to another industry. It contributes to allowing the emergence of other new industries. Forward linkage of an industry helps to grow other industries that use its output as input. Forward linkage refers to what other products can be built, produced, or made using that particular product. Forward linkage effects are related to output utilization, i.e. the outputs from a given activity will induce attempts to use this output as inputs in some new activities (Hirschman, 1958, p. 100). Forward Linkage describes how an increase in output of certain sectors will encourage an increase in the output of other sectors. This linkage analysis indicates how to use the input as intermediate consumption and focused on input structure.

Backward linkage refers to the relationship between one industry or sector and another where the first industry relies on the output or services of the second industry as inputs for its production process. In other words, it represents the interdependence between industries where the second industry supplies essential materials, components, or services to the first industry. Backward linkage effects are related to derived demand, i.e. the provision of input for a given activity. It refers to the demand-side connections a firm has with other existing firms in the region. Simply, backward linkages of a product suggest what other products have contributed to make or produce one particular product. Backward Linkage describes an increase in the output of a certain sector will increase the input demands of other sectors and focused on demand structure.

Theories

(a) Balanced Growth

The balanced growth theory states that government of each developing country must make considerable investments across different sectors of the economy simultaneously (Hayami and Godo, 2005; Cypher and Dietz, 2008). Based on the theory, all areas of an economy should be developed simultaneously, thus no sector should be discriminated against. This will enlarge the market size, increase productivity, and provide an incentive for the private sector to investas well as to enhance inclusive growth. The theory emphasizes on the investment in a proportionate manner in all the sectors of development, so that goal of holistic

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

development is achieved. Therefore, the balanced growth implies growth in every wind of capital stock at constant rates. The three illustrious proponents of the balanced growth theory are Rosanstein Rodan, W.A. Lewis and Ranger Nurkse. The core of Rosenstein-Rodan's (1943) argument for balanced growth is his realization that industrial sectors are mutually beneficial and while expanding a single sector (or a limited group of sectors) may not be possible, but simultaneously expanding all (or a large number of) sectors may make those unprofitable sectors profitable through endogenous market creation and economies of scale.Murphy, Shleifer, and Vishny (1989) established the balanced growth hypothesis into a macroeconomic model. Their model incorporates an O-ring production function, skill clustering, and an effective growing returns mechanism. The simultaneous industrialization of several industries promotes rapid growth through the cumulative effect of economies of scale pushing up productivity and wages, and higher wages resulting in more demand for goods and services produced in these sectors, which allows further growth.

(b) Unbalanced Growth Doctrine

Hirschman, Fleming, Leibenstein, and Singer advocated unbalanced growth as a strategy for developing countries. Because resources are few in less developed countries, the approach emphasizes investment in strategic sectors of the economy rather than all sectors at once. Based on their theory the other sectors would benefit automatically as a result of linkage effects. According to Hirschman, "development is a chain of disequilibria that must be kept alive rather than eliminate the disequilibrium of which profits and losses are symptoms in a competitive economy". Therefore, if economy is to keep moving ahead, the task of development policy is to maintain tension, disproportions and disequilibria. The two major constructive criticisms of the balanced growth hypothesis are offered by Hirschman (1958) and Streeten (1959). Hirschman (1958) argues that the balanced growth paradigm is simply not applicable to developing countries due to a lack of resources. According to Hirschman (1958), if a country were ready to apply the doctrine of balanced growth, it would not be underdeveloped in the first place. Instead of balanced growth, he advocates an unbalanced growth strategy in which countries concentrate their limited resources in a few important areas with strong backward and forward linkage. Backward linkage is a sector's ability to generate demand for inputs from the rest of the economy, while forward linkages are its ability to generate input supply for the rest of the economy, with both determined by the economy's existing input–output structure. The attractiveness of Hirschman's argument also lies in its applicability because policymakers can, in principle, identify those strategic sectors by calculating each sector's linkages based on the country's input–output tables. Streeteen (1959), emphasizes that economic imbalance in both consumption and production is required for income and output growth. He does not disagree with Rosenstein-Rodan (1943) on the presence of industry complementarities. However, he went a step further, arguing that, despite the undesirable properties of unbalanced growth in a static setting, sectoral imbalance in a growing and entrepreneurial society creates incentives to invest in lagging consumer goods and production lines. Thus, his argument for unbalanced growth is intriguing: he contends that the ongoing attempt to eliminate imbalance supports the general expansion of the economy, so imbalance is a "necessary evil" for economic growth. In other words, development would result from the process rather than the resolution of an economic imbalance. Also implicit in it is the view that Hirschman's strategy of focusing on specific sectors could eventually lead—through backward and forward linkages—ex-post to balanced growth. Such possibility, in fact, makes the distinction between balanced and unbalanced growth doctrines much thinner on a theoretical level.

Empirical Studies

Salami &Kelikume (2011) examined the linkage between the manufacturing sector and other sectors in the Nigerian economy using dynamic estimating tools. They used the Granger causality test and vector auto regressive model to determine the impact of changes in manufacturing output on other sectors. The results

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

show a weak linkage between the manufacturing sector and other sectors, with only two major sectors driving the economy, building and construction, and hotel and restaurant. Using panel data analysis of 36 states from 1981 to 2014, Olawuyi and Adebayo (2016) examined the link between manufacturing and oil sector growth in Nigeria. The study discovers a favorable and statistically significant connection between the two variables. Specifically, the study founda positive relationship between manufacturing sector and the oil sector. To them this relationship is driven by the manufacturing sector providing inputs to the oil sector and also helping to create demand for oil products. Furthermore, the impact of Nigeria's manufacturing sector expansion on real estate prices from 2010 to 2015 was examined by Iwayemi and Akinboade (2019). Their findings showed that real estate pricing variables and manufacturing sector growth exhibited stagnant behavior. The growth of the manufacturing sector and real estate prices were also found to have a substantial long-run positive correlation. This means that manufacturing sector growth has a significant impact on real estate prices in Nigeria in the long run.

Pilat and Wölfl (2005) explored the relationship between services and manufacturing, revealing a blurring distinction between the two sectors. Services contribute significantly to production, mainly through direct output and demand, but are more independent from other industries than the manufacturing sector. Their study also shows that a growing number of workers in the manufacturing sector are engaged in services-related occupations, with up to 50% of manufacturing workers in such occupations. However, most countries' manufacturing enterprises are not very diversified in their establishments, with Canada being a notable exception.

Osuagwu (2020) used annual time series data from 1982 to 2017 to study the long-run link between agriculture and manufacturing industry output in Nigeria. The study discovered bidirectional associations between the two variables, implying that agricultural and manufacturing industry production have a positive and significant impact on each other in both the short and long run. However, the study also found that changes in agricultural productivity are not restored to equilibrium in the long-run, suggesting that macroeconomic factors are distorting the linkages. Adebayo and Ogunsanya (2016) used an input-output analysis to investigate the impact of the manufacturing sector on the ICT sector in Nigeria. Based on their study, increased manufacturing sector value added is associated with increased ICT sector value added. This is due to the manufacturing sector providing inputs to the ICT sector as well as assisting in the creation of demand for ICT products and services. The study found that the direct impact of the manufacturing sector on the ICT sector is relatively small, but the indirect and induced impacts are much larger. This suggests that the manufacturing sector has a significant impact on the ICT sector through its linkages with other sectors of the economy. Oladinrin, Ogunsemi, and Aje (2012) analyzed the impact of manufacturing sector expansion on construction industry output in Nigeria. According to the report, growth in the manufacturing sector is correlated with higher output in the construction industry sector. According to their study, the manufacturing sector in Nigeria is a large consumer of construction output. In 2010, the manufacturing sector accounted for roughly 18% of overall building output. This implies that expansion in the manufacturing sector is likely to enhance demand for construction services. Using a computable general equilibrium (CGE) model, Ogwumike and Ogwumike (2015) assessed the influence of manufacturing sector growth on other sectors of the Nigerian economy. According to the findings, manufacturing sector expansion has positive effects on all sectors of the economy, with the construction sector having the greatest effect, followed by the services sector and the agricultural sector. Growth in the manufacturing sector also contributes to lower unemployment and higher salaries. Erdogan and Yildirim (2023) also examined the impact of the manufacturing sector on the construction sector in Turkey using cointegration analysis. They discovered a long-term cointegrating relationship between Turkey's manufacturing and construction sector growth. This suggests that the two sectors are moving in the same direction in the long run. The study also found that the manufacturing sector has a positive and statistically significant impact on the construction sector in the long run. Salami and Olofin (2019) used a panel vector autoregressive (PVAR) model to analyze the impact of manufacturing sector growth on financial sector development in Nigeria from 1986 to

2016. According to them, growth in the manufacturing sector has a favorable and statistically significant impact on the development of the financial sector. The study also discovered that the long-run influence of manufacturing sector expansion on financial sector development is greater than the short-run impact. Apergis and Payne (2014) examined the impact of manufacturing sector growth on oil production growth in oil-exporting countries. The study used a panel dataset of 12 oil-exporting countries over the period 1980-2010. They found a positive and statistically significant relationship between manufacturing sector growth and oil production growth. Ajibolade and Awokoya (2021) examined the impact of manufacturing sector growth on other sectors of the Nigerian economy and found that expansion in the manufacturing sector has a positive and statistically significant impact on all other sectors. The construction sector is the hardest hit, followed by the services sector. The study also revealed that the long-run impact of manufacturing sector expansion on other sectors is greater than the short-run impact.

Gonzalez and Lopez (2021) studied the dynamic interaction between the manufacturing and construction sectors in Mexico over the period of 1994 to 2019 using a vector auto regressive (VAR) model. The study found that the two sectors have a bidirectional relationship, meaning that growth in the manufacturing sector has a positive impact on growth in the construction sector, and vice versa. The study also found that the impact of manufacturing sector growth on construction sector growth is greater than the impact of construction sector growth on manufacturing sector growth.Khan et al (2015) investigated the relationship between Malaysia's manufacturing and construction industries, by employing the Granger causality test and the vector auto regression (VAR) technique. Their study found that there is a significant correlation between the two sectors as well as a causal connection in both directions. The construction sector takes approximately 21 months to respond the impact of shocks coming from manufacturing sector while the manufacturing sector responding time is 15 months. Ghosh and Basu (2018) investigated the relationship between the manufacturing sector and the ICT sector in India using an input-output analysis. The study found a link between increased ICT sector investment and the growth of the manufacturing sector. It also found that manufacturing sector growth is associated with higher ICT sector investment. This is due to the fact that the manufacturing sector both contributes to the ICT sector's input needs and serves to fuel demand for ICT goods and services.

The forward and backward linkage of the manufacturing sub-sector in Ethiopia's Amhara region was investigated by TesafaFentahun (2014). They found that there is no significant forward linkage between the manufacturing sub-sector and the agricultural sector, but found a significantly stronger backward linkages. The service sector, industrial sector, and import sector are the three main sources of inputs to the manufacturing sub-sector. Ogunsanya and Akinlo (2020) examined the relationship between manufacturing sector and real estate development in Nigeria, using a panel data model of 36 states from 2010 to 2018. They found that the expansion of the manufacturing sector has a significant positive impact on Nigerian real estate development. Furthermore, Sooriyakumar et al (2018) examined the relationships among agriculture, manufacturing and service sectors of Sri Lanka's provinces using a Panel Vector Error Correction Model. The research revealed a positive relationship between the manufacturing and agricultural sectors. The impact of agricultural growth on manufacturing growth is about three times of the impact of manufacturing growth on agricultural growth.

An input-output table was created using information from INEGI and WIOD in Gonzalez and Lopez's (2021) studied the effect of the manufacturing sector on the ICT industry in Mexico. The flow of goods and services between various industries is represented in the table. They found that the expansion of the manufacturing sector affects employment in the ICT industry in a favorable and statistically significant way. Also using input-output analysis and structural equation modeling, Petrov and Smirnova (2020) investigated the effects of the expansion of the manufacturing sector on investments in the construction sector in Russia. Based on the study, more investment in the construction industry is related to increase manufacturing sector growth both directly and indirectly through its influence on overall economic growth. The input-output

analysis shows that the manufacturing sector is a major consumer of construction output in Russia. The structural equation modeling their analysis showed that the impact of manufacturing sector growth on construction sector investment is mediated by the impact of manufacturing sector growth on economic growth.

THE MODEL

The unbalanced growth model serves as the foundation for this study. It is rooted in Hirschman's theory of unbalanced growth because it accounts for the forward and backward linkages that are associated with manufacturing and other sectors relationship. The Hirschman (1958) theory proposes an unbalanced growth theory resulting from certain common characteristics displayed by developing countries, including low levels of gross national income (GNI) per capita, slow growth of GNI per capita, inequality, technological backwardness, and existence of both the traditional and modern sectors (dualism).The theory is based on the distinct need for investment in key areas of the economy, making it relevant to the situation in Nigeria. Productivity growth in the manufacturing industry has the ability to support other industries' sustainable growth and development. However, as the theory assumes that sectors would automatically develop themselves through the linkages effect, the concept of Hirschman's backward and forward linkage becomes very relevant. These linkages is analyzed using the Leontief input output analysis.

According to Chenery and Watanabe (1958), there are two types of economic linkage between sectors in the input-output framework. On one hand, if the sector *i* increases its output, then there is increased demand on sectors whose products are used as inputs in production to *i*. This demand relationship is referred to as backward linkage. On the other hand, increased output in sector *i* also means that the additional amount of product *i* are available to be used as inputs to production in the other sectors. This supply relationship is referred to as forward linkage. The analysis of the strength of forward and backward linkages allows one to identify the linkages of the manufacturing sector to other sectors in the Nigerian economy.

The study examines the selected sectors in the Nigerian economy which includes; the manufacturing sector (MANUFs), information and communication sector (ICTs), construction sector (CONSTs), Trade sector (TRDs), Education sector (EDUs), Accommodation sector (ACCOMs), Mining and quarry sector (MQs), Real estate sector (REs) and other sectors (which includes sectors like transportation, agriculture and Crude oil and natural gas etc.).

Based on the theoretical framework above, the model is extended to incorporate the objective of the study. Let *n* be the sectors in the economy and consider the equilibrium between total supply and total demand for each good *i*.

$$x_i = m_{i1} + m_{i2} + \cdots + m_{in} + f_i \quad (3.1)$$

where x_i is the output of sector$i$, f_{ij} is sector *i's* product absorbed by sector *j*. $m_{i_j} = m_{ij}^d$ *and* f_i is total final demand for sector *i's* product, which is the domestic final demand. For the n sectors we have n sets of n equations

$$\begin{aligned} x_1 &= m_{11} + m_{12} + \cdots + m_{in} + \\ f_1\ x_2 &= m_{21} + m_{22} + \cdots + m_{2n} \\ &+ f_2 \\ &\vdots \\ x_n &= m_{n1} + m_{n2} + \cdots + m_{nn} + f_n \end{aligned} \quad (3.2)$$

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

Define a_{ij}, the domestic direct input coefficient, as

$a_{ij} = m_{ij}/x_j$ ……. (3.3)

and substitute (3) into (2)

$x_1 = a_{11}\, x_1 + a_{12}\, x_2 + \cdots + a_{1n}\, x_n + f_1$

$x_2 = a_{21}\, x_1 + a_{22}\, x_2 + \cdots + a_{2n}\, x_n + f_2$

⋮

$x_n = a_{n1}\, x_1 + a_{n2}\, x_2 + \cdots + a_{nn}\, x_n + f_n$ (3.4)

In matrix terms, one can write (4) as

$X = AX + F$ (3.5)

Here, sector output equal to all the output distributed to other sector as input and itself plus the output given to final demand. Where X represent the sectors of the economy

X_1 = Manufacturing sector

X_2 = Construction sector

X_3 = Information and communication sector

X_4 = Trade sector

X_5 = Education sector

X_6 = Accommodation sector

X_7 = Mining and quarry sector

X_8 = Real Estate sector

X_9 = Other sector (such as; Agriculture, Transportation and Crude oil and natural gas)

Method of Analysis

From equation (3.5), the method of analyzing the data that is considered appropriate for this study is the Leontief input-output analysis and its estimation technique used where a form of economic analysis base on the interdependence between and among economic sectors. The estimation technique is adopted because it shows how the output of one sector flow into another sector as input.

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} X = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ xn \end{bmatrix} F = \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_n \end{bmatrix} \quad (3.6)$$

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

And 1, a n*n identity matrix. Matrix A is the domestic direct input coefficient matrix.

Solving (5) for X, one can obtain

$X = (1\text{-}A)^{-1} F$ (3.7)

(a) Backward Linkage

Where $(1\text{-}A)^{-1}$ is known as the Leontief or input inverse matrix. The interpretation in the elements in the Leontief matrix $L= (1\text{-}A)^{-1}$ become clearer in writing (3.7) as

$x_1 = l_{11} f_1 + l_{12} f_2 + \cdots + l_{1n} f_1$

$x_2 = l_{21} f_1 + l_{22} f_2 + \cdots + l_{2n} f_2$

$\vdots$

$x_n = l_{n1} f_1 + l_{n2} f_2 + \cdots + l_{nn} f_n$ (3.8)

The coefficient l_{ij} indicates by how much the output of the i^{th} sector x_i, would increase if final demand for sector j's output f_j, had been increased by one unit. Therefore;

$x_1 = l_{11} f_1 + l_{12} f_2 + l_{13} f_3 + l_{14} f_4 + l_{15} f_5 + l_{16} f_6 + l_{17} f_7 + l_{18} f_8 + l_{19} f_9$

$x_2 = l_{21} f_1 + l_{22} f_2 + l_{23} f_3 + l_{24} f_4 + l_{25} f_5 + l_{26} f_6 + l_{27} f_7 + l_{28} f_8 + l_{29} f_9$

$x_3 = l_{31} f_1 + l_{32} f_2 + l_{33} f_3 + l_{34} f_4 + l_{35} f_5 + l_{36} f_6 + l_{37} f_7 + l_{38} f_8 + l_{39} f_9$

$x_4 = l_{41} f_1 + l_{42} f_2 + l_{43} f_3 + l_{44} f_4 + l_{45} f_5 + l_{46} f_6 + l_{47} f_7 + l_{48} f_8 + l_{49} f_9$

$x_5 = l_{51} f_1 + l_{52} f_2 + l_{53} f_3 + l_{54} f_4 + l_{55} f_5 + l_{56} f_6 + l_{57} f_7 + l_{58} f_8 + l_{59} f_9$

$x_6 = l_{61} f_1 + l_{62} f_2 + l_{63} f_3 + l_{64} f_4 + l_{65} f_5 + l_{66} f_6 + l_{67} f_7 + l_{68} f_8 + l_{69} f_9$

$x_7 = l_{71} f_1 + l_{72} f_2 + l_{73} f_3 + l_{74} f_4 + l_{75} f_5 + l_{76} f_6 + l_{77} f_7 + l_{78} f_8 + l_{79} f_9$

$x_8 = l_{81} f_1 + l_{82} f_2 + l_{83} f_3 + l_{84} f_4 + l_{85} f_5 + l_{86} f_6 + l_{87} f_7 + l_{88} f_8 + l_{89} f_9$

$x_9 = l_{91} f_1 + l_{92} f_2 + l_{93} f_3 + l_{94} f_4 + l_{95} f_5 + l_{96} f_6 + l_{97} f_7 + l_{98} f_8 + l_{99} f_9$

We can say that

$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_9 =$$

$$(l_{11} + l_{21} + l_{31} + l_{41} + l_{51} + l_{61} + l_{71} + l_{81} + l_{91}).f_1 + (l_{12} + l_{22} + l_{32} + l_{42} + l_{52} + l_{62} + l_{72} + l_{82} + l_{92}).f_2$$
$$+(l_{13} + l_{23} + l_{33} + l_{43} + l_{53} + l_{63} + l_{73} + l_{83} + l_{93}).f_3 + (l_{14} + l_{24} + l_{34} + l_{44} + l_{54} + l_{64} + l_{74} + l_{84} + l_{94}).f_4$$
$$+(l_{15} + l_{25} + l_{35} + l_{45} + l_{55} + l_{65} + l_{75} + l_{85} + l_{95}).f_5 + (l_{16} + l_{26} + l_{36} + l_{46} + l_{56} + l_{66} + l_{76} + l_{86} + l_{96}).f_6$$
$$+(l_{17} + l_{27} + l_{37} + l_{47} + l_{57} + l_{67} + l_{77} + l_{87} + l_{97}).f_7 + (l_{18} + l_{28} + l_{38} + l_{48} + l_{58} + l_{68} + l_{78} + l_{88} + l_{98}).f_8$$
$$+(l_{19} + l_{29} + l_{39} + l_{49} + l_{59} + l_{69} + l_{79} + l_{89} + l_{99}).f_9$$

Shows that sums

$$l_{11} + l_{21} + l_{31} + l_{41} + l_{51} + l_{61} + l_{71} + l_{81} + l_{91}), (l_{12} + l_{22} + l_{32} + l_{42} + l_{52} + l_{62} + l_{72} + l_{82} + l_{92}) \cdots (l_{19} + l_{29} + l_{39} + l_{49} + l_{59} + l_{69} + l_{79} + l_{89} + l_{99})$$

are total output multiplier. For example, $l_{11} + l_{21} + l_{31} + l_{41} + l_{51} + l_{61} + l_{71} + l_{81} + l_{91}$=1.6935 denotes the total new output throughout all sectors of the economy that is associated with a 1 increase in final demand of manufacturing product.

- **Measuring the Backward Linkage using the Rasmussen Method**

Hence $\partial x_i / \partial f_j = l_{ij}$

Then, the sum of the elements in the j^{th} column of the Leontief inverse matrix measures the total output from all sectors generated from one unit final demand of sector j's output. That is,

$$l \bullet_j = \sum_{i=1}^{n} l_{ij} \quad (3.9a)$$

gives the output multiplier and reflects the backward linkage of sector j. A unitary increase in sector j's output requires $l_{\bullet j}$ units increased output for the economy as a whole, consisting of one unit in sector j's output plus direct and indirect inputs. That is, the output multiplier measures the effect of one monetary unit change in final demand for each sector on total output of sectors (including the sector itself).

- **Measuring the Backward Linkage using Chenery – Watanabe (CW) Method**

Linkage analysis is based on both the Leontief demand driven and supply driven model. The CW backward linkage is the column sum of the input coefficient matrix A. The CW backward linkage of sector j is defined as follows:

$$BL_j^c = \sum_{i=0}^{n} \frac{x_{ij}}{x_j} = \sum_{i=1}^{n} a_{ij} \quad (3.9b)$$

BL^c_j denotes the backward linkage of sector j for Chenery-Watanabe method, x_{ij} is the magnitude of sector *i's* output used in production by sector j, x_j is the output of sector j and a_{ij} denotes the input coefficient matrix. The direct input coefficients are weighted in accordance to the importance of each sector to final demand. The demand driven input-output model used final demand as an exogenous variable that is the reason why the share of sectors' final demand to total final demand will be good weight for identifying the relative strength of backward linkages of various industries in the economy.

(b) Forward Linkages

Instead of relating output to final demand, one can observe the relationship between output and principal inputs. That is, alternative to the demand side analysis, one can consider the one side viewpoint.

$$x_j = m_{j1} + m_{j2} + \cdots + m_{jn} + k_j$$

Where k_j includes import used by sector j and value added items. For the n sectors we have a set of n equations

$$x_1 = m_{11} + m_{12} + \cdots + m_{1n} + k_1$$

$$x_2 = m_{21} + m_{22} + \cdots + m_{2n} + k_2$$

$$\vdots$$

$$x_n = m_{n1} + m_{n2} + \cdots + m_{nn} + k_n \qquad (3.10)$$

Define a_{ij}, the domestic direct input coefficient, as

$$a_{ij}^* = \frac{m_{ij}}{x_i} \qquad (3.11)$$

and substitute (11) into (10)

$$x_1 = a_{11}^* x_1 + a_{12}^* x_2 + \cdots + a_{1n}^* x_n + k_1$$

$$x_2 = a_{21}^* x_1 + a_{22}^* x_2 + \cdots + a_{2n}^* x_n + k_2$$

$$\vdots$$

$$x_n = a_{n1}^* x_1 + a_{n2}^* x_2 + \cdots + a_{nn}^* x_n + k_n \qquad (3.12)$$

In matrix terms, one can rewrite (3.12) as

$$X^{'} = X'A + K$$

With

$$A^* = \begin{bmatrix} a_{11}^* & a_{12}^* & \cdots & a_{1n}^* \\ a_{21}^* & a_{22}^* & \cdots & a_{2n}^* \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1}^* & a_{n2}^* & \cdots & a_{nn}^* \end{bmatrix} K = \begin{bmatrix} k_1 \\ k_2 \\ \vdots \\ k_n \end{bmatrix} \qquad (3.13)$$

Where A^* is the domestic direct output coefficient matrix. Solving (3.12) for $X^{'}$,one obtains

$$X^{'} = Z^{'}(1 - A^*)^{-1} \qquad (3.14)$$

Where $(1 - A^*)^{-1}$ is the output inverse matrix. It ease the understanding of the output inverse matrix $(L^* = (1 - A^*)^{-1})$one can write (4.14) or equivalently as $X = L^* Z^{'}$as

$$x_1 = l_{11}^* k_1 + l_{21}^* k_2 + \cdots + l_{n1}^* k_n$$

$$x_2 = l_{12}^* k_1 + l_{22} k_2 + \cdots + l_{n2}^* k_n$$

$$\vdots$$

$$x_n = l_{1n}^* k_1 + l_{2n}^* k_2 + \cdots + l_{nn}^* k_n \qquad (3.15)$$

Therefore,

$$x_1 = l_{11}^* k_1 + l_{21}^* k_2 + l_{31}^* k_3 + l_{41}^* k_4 + l_{51}^* k_5 + l_{61}^* k_6 + l_{71}^* k_7 + l_{81}^* k_8 + l_{91}^* k_9$$

$$x_2 = l_{12}^* k_1 + l_{22}^* k_2 + l_{32}^* k_3 + l_{42}^* k_4 + l_{52}^* k_5 + l_{62}^* k_6 + l_{72}^* k_7 + l_{82}^* k_8 + l_{92}^* k_9$$

$$x_3 = l_{13}^* k_1 + l_{23}^* k_2 + l_{33}^* k_3 + l_{43}^* k_4 + l_{53}^* k_5 + l_{63}^* k_6 + l_{73}^* k_7 + l_{83}^* k_8 + l_{93}^* k_9$$

$$x_4 = l_{14}^* k_1 + l_{24}^* k_2 + l_{34}^* k_3 + l_{44}^* k_4 + l_{54}^* k_5 + l_{64}^* k_6 + l_{74}^* k_7 + l_{84}^* k_8 + l_{94}^* k_9$$

$$x_5 = l_{15}^* k_1 + l_{25}^* k_2 + l_{35}^* k_3 + l_{45}^* k_4 + l_{55}^* k_5 + l_{65}^* k_6 + l_{75}^* k_7 + l_{85}^* k_8 + l_{95}^* k_9$$

$$x_6 = l_{16}^* k_1 + l_{26}^* k_2 + l_{36}^* k_3 + l_{46}^* k_4 + l_{56}^* k_5 + l_{66}^* k_6 + l_{76}^* k_7 + l_{86}^* k_8 + l_{96}^* k_9$$

$$x_7 = l_{17}^* k_1 + l_{27}^* k_2 + l_{37}^* k_3 + l_{47}^* k_4 + l_{57}^* k_5 + l_{67}^* k_6 + l_{77}^* k_7 + l_{87}^* k_8 + l_{97}^* k_9$$

$$x_8 = l_{18}^* k_1 + l_{28}^* k_2 + l_{38}^* k_3 + l_{48}^* k_4 + l_{58}^* k_5 + l_{68}^* k_6 + l_{78}^* k_7 + l_{88}^* k_8 + l_{98}^* k_9$$

$$x_9 = l_{19}^* k_1 + l_{29}^* k_2 + l_{39}^* k_3 + l_{49}^* k_4 + l_{59}^* k_5 + l_{69}^* k_6 + l_{79}^* k_7 + l_{89}^* k_8 + l_{99}^* k_9$$

We can say that

$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_9 =$$

$$(l_{11}^* + l_{12}^* + l_{13}^* + l_{14}^* + l_{15}^* + l_{16}^* + l_{17}^* + l_{18}^* + l_{19}^*).k_1 + (l_{21}^* + l_{22}^* + l_{23}^* + l_{24}^* + l_{25}^* + l_{26}^* + l_{27}^* + l_{28}^* + l_{29}^*).k_2$$

$$+(l_{31}^* + l_{32}^* + l_{33}^* + l_{34}^* + l_{35}^* + l_{36}^* + l_{37}^* + l_{38}^* + l_{39}^*).k_3 + (l_{41}^* + l_{42}^* + l_{43}^* + l_{44}^* + l_{45}^* + l_{46}^* + l_{47}^* + l_{48}^* + l_{49}^*).k_4$$

$$+(l_{51}^* + l_{52}^* + l_{53}^* + l_{54}^* + l_{55}^* + l_{56}^* + l_{57}^* + l_{58}^* + l_{59}^*).k_5 + (l_{61}^* + l_{62}^* + l_{63}^* + l_{64}^* + l_{65}^* + l_{66}^* + l_{67}^* + l_{68}^* + l_{69}^*).k_6$$

$$+(l_{71}^* + l_{72}^* + l_{73}^* + l_{74}^* + l_{75}^* + l_{76}^* + l_{77}^* + l_{78}^* + l_{79}^*).k_7 + (l_{81}^* + l_{82}^* + l_{83}^* + l_{84}^* + l_{85}^* + l_{86}^* + l_{87}^* + l_{88}^* + l_{89}^*).k_8$$
$$+(l_{91}^* + l_{92}^* + l_{93}^* + l_{94}^* + l_{95}^* + l_{96}^* + l_{97}^* + l_{98}^* + l_{99}^*).k_9$$

Shows that sums

$$(l_{11}^* + l_{12}^* + l_{13}^* + l_{14}^* + l_{15}^* + l_{16}^* + l_{17}^* + l_{18}^* + l_{19}^*),(l_{21}^* + l_{22}^* + l_{23}^* + l_{24}^* + l_{25}^* + l_{26}^* + l_{27}^* + l_{28}^* + l_{29}^*),\cdots$$
$$(l_{91}^* + l_{92}^* + l_{93}^* + l_{94}^* + l_{95}^* + l_{96}^* + l_{97}^* + l_{98}^* + l_{99}^*)$$

are total output multipliers. For example, $l_{11}^* + l_{12}^* + l_{13}^* + l_{14}^* + l_{15}^* + l_{16}^* + l_{17}^* + l_{18}^* + l_{19}^* = 1.0387$ represents the effect of total output throughout all the sectors of the economy that is a ₦1 in principal inputs in manufacturing.

- **Measuring the Forward Linkage using the Rasmussen Method**

The coefficient l_{ij}^* measures the effect of sector j output of one unit change in the accessibility of principal inputs to sector *i*(that i$^S \partial x_j / \partial k_i = l_{ij}^*$. Thus, the sum of the element in the *ith* row of the output inverse

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

matrix gives the effect on total output right through all sectors of a unit change in principal inputs for sector *i.*

Hence,

$$l_{i\bullet}^{*} = \sum_{j=1}^{n} l_{ij}^{*} \qquad (3.16)$$

Reflects the forward linkage of sector i. Hence, the input multipliers measure the effects of one monetary unit change in principal inputs of each sector on total output of all sectors (including the sector itself).

- **Measuring the Forward Linkage using Chenery – Watanabe (CW) Method**

The CW method based on direct input (or output) coefficient measures only the effects generated by the inter-relationships between sectors. The output coefficient is weighted in accordance with the importance of each sector in the total value-added. The supply driven input-output model value added component is an exogenous variable, thus a good weighting measure will be share of a given sector's value added to the total value added in the economy.

- **Key Sector Analysis**

In the spirit of Rasmussen (1956), one can standardize the backward and forward linkage measure $l_{\bullet j}$ and $l_{i\bullet}^{*}$ respectively, according to the overall measure for the economy as a whole (let BL and FL be the normalized measures). If $BL_j > 1$, then a unitary increase in final demand for sector j's output will generate an above average in activities in the economy. Similarly, if $FLi > 1$then a unitary decrease in the availability of primary inputs to sector *i* will lead to an above average decrease in economic activity. A sector is classified as a key sector if *BLj*<1 and *FLi*> 1, as forward linkage oriented sector if *BLj*< 1 and *FLi* >1, as backward linkage oriented sector if *BLj*>1 and FLi<1. Additionally, as suggested by Boucher (1976), one can use a measure if dispersion, the coefficient of variation, to access how spread is the effects across the economy associated with individual sectors. The backward coefficient of variation of a sector is given by

$$V_j = \frac{\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(l_{ij} - \frac{1}{n}\sum_{i=1}^{n} l_{ij}\right)}^{2}}{\frac{1}{n}\sum_{i=1}^{n} l_{ij}} \qquad (3.17)$$

And the forward coefficient of variation by

$$V_i^{*} = \frac{\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(l_{ij}^{*} - \frac{1}{n}\sum_{i=1}^{n} l_{ij}^{*}\right)}^{2}}{\frac{1}{n}\sum_{i=1}^{n} l_{ij}} \qquad (3.18)$$

A high *Vj* means sector j draws profoundly on a small number of sectors while a low *Vj* means on sector *i*
while a low V_i^{*} means that the other sectors draws evenly on sector *i.*

Source of Data

The data used for this study were sourced from secondary source. The data is a single year data of 2011 from National Bureau of Statistics (2015) and Central Bank of Nigeria (2021) publications. This data is actually backward, but it the last publication annual summary for some sectors done by the NBS in 2015.

Nevertheless, challenge will not adversely affect the final result of the study. The macroeconomic variables on which the data was collected includes the manufacturing sector (MANUFs), information and communication sector (ICTs), construction sector (CONSTs), Trade sector (TRDs), Education sector (EDUs), Accommodation sector (ACCOMs), Mining and quarry sector (MQs), Real estate sector (REs) and Others(ORs).

DATA PRESENTATION AND ANALYSIS OF RESULT

Structure of Input-Output Table

Explanation of the structure of Input-Output table of Nigeria on 2011 include intermediate input, value added (compensation, depreciation, net taxes and net surplus), import, final demand (non-profit serving household, household, government expenditure, inventory change, gross fixed capital formation), Export and output of each sectors. The explanation is shown in Table 5.1 (billion naira).

Table 4.1: Intermediate Input, Value Added, Import Final Demand and Output of Sector, I-O Table 2011

INDUSTRY	ACCOMODATION AND FOOD SERVICE SECTOR	CONSTRUCTION SECTOR	EDUCATION SECTOR	INFORMATION AND COMMUNICATION SECTOR	MANUFACTURING SECTOR
ACCOMODATION AND FOOD SERVICE SECTOR	17,524,210,000.00	2,140,000.00	34,011,790,000.00		58,891,880,000.00
CONSTRUCTION SECTOR					
EDUCATION SECTOR			17,253,320,000.00		
INFORMATION AND COMMUNICATION SECTOR	18,781,120,000.00	18,361,460,000.00	50,979,860,000.00		90,000,000,000.00
MANUFACTURING SECTOR	12,599,990,000.00	1,518,763,270,000.00	142,357,820,000.00	2,597,820,450,000.00	2,034,167,580,000.00
MINNING AND QUARRYING SECTOR	–	845,866,200,000.00			
REAL ESTATE SECTOR	12,599,990,000.00	4,460,000.00	30,145,800,000.00		395,000,000,000.00
TRADE SECTOR					
OTHER SECTOR	139,211,250,000.00	234,480,320,000.00	407,718,030,000.00	7,426,077,265,000.00	1,842,420,100,000.00
INTERMEDIATE INPUT	200,716,560,000.00	2,617,477,850,000.00	682,466,620,000.00	10,023,897,715,000.00	4,420,479,560,000.00
VALUE ADDED	283,376,427,266.35	1,905,574,902,521.26	1,110,721,053,932.01	6,379,560,103,251.40	4,527,445,058,829.46
COMPESATION	59,088,510,000.00	259,799,500,000.00	460,064,050,000.00	2,792,912,970,000.00	1,496,632,330,000.00
DEPRECIATION	125,934,650,000.00		32,604,760,000.00	825,112,540,000.00	891,730,450,000.00

TAX LESS SUBSIDY					132,595,370,000.00
NET OPERATING SURPLUS	98,353,267,266.35	1,645,775,402,521.26	618,052,243,932.01	2,761,534,593,251.40	2,139,082,278,829.46
IMPORT	1,777,831,427,357.70	2,051,343,954,643.50	1,367,562,636,429.00	6,837,813,182.15	2,598,369,009,215.10
TOTAL SUPPLY	2,261,924,414,624.05	6,574,396,707,164.76	3,160,750,310,361.01	16,410,295,631,433.50	11,546,293,628,044.60

MINNING AND QUARRYING SECTOR	**REAL ESTATE SECTOR**	**TRADE SECTOR**	**OTHER SECTOR**	**TOTAL INTERMEDIATE INPUTS**	**Change in Inventory**
1,693,000,000.00		1,453,483,070,000.00	575,628,394,135.40	2,141,234,484,135.40	
			158,956,644,467.95	158,956,644,467.95	264,336,830,000.00
			223,854,397,480.18	241,107,717,480.18	3,837,270,000.00
2,024,160,000.00	3,816,000,000.00	81,484,240,000.00	4,856,184,982,464.98	5,121,631,822,464.98	
21,394,530,000.00	18,502,760,000.00	1,358,846,790,000.00	134,011,056,328.44	7,838,464,246,328.44	447,627,850,000.00
			4,362,578,697,440.66	5,208,444,897,440.66	105,668,110,000.00
1,045,950,000.00	19,534,470,000.00	25,600,000,000.00	391,367,208,739.72	875,297,878,739.72	
			332,628,939,086.31	332,628,939,086.31	1,632,160,000.00
13,025,610,000.00	270,530,070,000.00	595,929,470,000.00	1,231,827,509,856.36	12,161,219,624,856.40	-391,101,892,977.57
39,183,250,000.00	**312,383,300,000.00**	**3,515,343,570,000.00**	**12,267,037,830,000.00**	**34,078,986,255,000.00**	**432,000,327,022.43**
11,098,977,672,369.80	**4,584,964,007,258.10**	**10,325,565,302,720.10**	**23,497,174,866,836.00**	**63,713,359,394,984.40**	
29,343,590,000.00	620,516,660,000.00	254,495,690,000.00	11,236,563,217,558.80	17,209,416,517,558.80	
1,740,000.00		61,902,361,000.00	1,116,337,099,335.76	3,053,623,600,335.76	
1,990,450,000.00		110,162,970,000.00	858,810,973,338.23	1,103,559,763,338.23	
11,069,632,342,369.80	3,964,447,347,258.10	9,899,004,281,720.09	10,285,463,576,603.20	42,346,759,513,751.70	
-	273,512,527,285.80	273,512,527,285.80	5,326,656,468,890.96	13,675,626,364,290.00	
11,138,160,922,369.80	**5,170,859,834,543.90**	**14,114,421,400,005.90**	**41,090,869,165,726.90**	**111,467,972,014,274.00**	

HOUSEHOLD	**NON HOUSEHOLD**	**GOVERNMENT**	**GROSS CAPITAL FORMATION**	**EXPORT**	**TOTAL OUTPUT**
8,287,544.11	12,439,534,817.40	108,240,112,000.00		1,996,127.14	2,261,924,414,624.05
4,143,772.06	2,487,906,963.48	649,440,672,000.00	5,499,170,490,000.00	19,961.27	6,574,396,707,164.76
1,657,508,822,931.20	47,270,232,306.12	811,800,840,000.00		399,225,427,643.51	3,160,750,310,361.01
6,630,035,291,724.80	37,318,604,452.20	1,028,281,064,000.00		3,593,028,848,791.57	16,410,295,631,433.50
1,657,508,822,931.20	5,473,395,319.66	108,240,112,000.00	890,141,060,000.00	598,838,141,465.26	11,546,293,628,044.60
2,486,263,234,396.80	22,391,162,671.32	920,040,952,000.00		2,395,352,565,861.05	11,138,160,922,369.80

4,102,334,336,754.72	24,879,069,634.80	162,360,168,000.00		5,988,381,414.65	5,170,859,834,543.90
8,701,921,320,388.80	37,318,604,452.20	649,440,672,000.00		4,391,479,704,078.59	14,114,421,400,005.90
16,202,136,312,836.30	59,212,185,730.82	974,161,008,000.00	3,507,885,630,448.63	8,577,356,296,832.37	41,090,869,165,726.90
41,437,720,573,280.00	**248,790,696,348.00**	**5,412,005,600,000.00**	**9,897,197,180,448.63**	**9,961,271,382,175.40**	**111,467,972,014,274.00**

Source: Author's report (2023)

Table 4.2 Technical Coefficient

Sectors	**AFs**	**CONSTs**	**EDUs**	**ICTs**	**MANUFs**	**MQs**	**REs**	**TRDs**	**ORs**
AFs	0.0077	3.26E-07	0.0108		0.0051	0.0002		0.103	0.014
CONSTs									0.0039
EDUs			0.0055						0.0054
ICTs	0.0083	0.0028	0.0161	0.1583	0.0078	0.0002	0.0007	0.0058	0.1182
MANUFs	0.0056	0.231	0.045		0.1762	0.0019	0.0036	0.0963	0.0033
MQs		0.1287							0.1062
Res	0.0056	6.78E-07	0.0095		0.0342	0.0001	0.0038	0.0018	0.0095
TRDs									0.0081
ORs	0.0615	0.0357	0.129	0.4525	0.1596	0.0012	0.0523	0.0422	0.03

Source: Author's source (2023)

Table 4.2 represents the technical coefficient. For every one unit of output produced in the accommodation and food service sector, 0.0056 unit of input is required from the manufacturing sector. For every one unit of output produced in the construction sector,0.2310 unit of input is required from the manufacturing sector. For every one unit of output produced in the education sector, 0.0450 unit of input is required from the manufacturing sector. For every one unit of output produced in the manufacturing sector, 0.1762 unit of input is required from itself. For every one unit of output produced in the mining and quarry sector, 0.0019 unit of input is required from the manufacturing sector. For every one unit of output produced in the real estate sector, 0.0036 unit of input is required from the manufacturing sector. For every one unit of output produced in the trade sector, 0.0963 unit of input is required from the manufacturing sector. For every one unit of output produced in the other sectors, 0.0033 unit of input is required from the manufacturing sector.

For every one unit of output produced in the manufacturing sector, 0.0051 unit of input is required from the accommodation and food service sector. For every one unit of output produced in the manufacturing sector, 0.0078 unit of input is required from the information and communication sector. For every one unit of output produced in the manufacturing sector, 0.0342 unit of input is required from the real estate sector. For every one unit of output produced in the manufacturing sector, 0.1596 unit of input is required from the other sectors.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

Table 4.3 Measurement of the Total Backward Linkage

Leontief Inverse	**AFs**	**CONs**	**EDUs**	**ICTs**	**MANUFs**	**MQs**	**REs**	**TRDs**	**ORs**
AFs	1.0090	0.0029	0.0137	0.0091	0.0096	0.0002	0.0009	0.1056	0.0167
CONs	0.0003	1.0004	0.0006	0.0021	0.0009	7.060553E-6	0.0002	0.0003	0.0043
EDUs	0.0004	0.0005	1.0064	0.0029	0.0012	9.997762E-6	0.0003	0.0004	0.0060
ICTs	0.0173	0.0160	0.0361	1.0648	0.0358	0.0004	0.0078	0.0169	0.1306
MANUFs	0.0107	0.2844	0.0631	0.2082	1.2224	0.0024	0.0062	0.1214	0.0325
MQs	0.0079	0.1385	0.0174	0.0568	0.0236	1.0002	0.0063	0.0084	0.1174
Res	0.0067	0.0107	0.0134	0.0123	0.0442	0.0002	1.0046	0.0073	0.0118
TRDs	0.0006	0.0007	0.0013	0.0043	0.0018	1.477475E-5	0.0005	1.0006	0.0089
ORs	0.0743	0.0920	0.1627	0.5329	0.2211	0.0018	0.0590	0.0786	1.1004
Total Backward Linkages	1.1272	1.5461	1.3147	1.8934	1.5606	1.005231833	1.0858	1.3395	1.4286

Source: Author's source (2023)

Table 4.3 represents the Leontief inverse matrix(*l)* which shows the backward linkage of all sectors. For every column its total backward linkage is given respectively. The final demand for ₦1 in manufacturing sector requires increasing total output of about 1.5606.

Table 4.4 Measurement of the Total Forward Linkage

Leontief Inverse	**AFs**	**CONs**	**EDUs**	**ICTs**	**MANUFs**	**MQs**	**REs**	**TRDs**	**ORs**	**Total Forward Linkage**
AFs	1.0090	0.0029	0.0137	0.0091	0.0096	0.0002	0.0009	0.1056	0.0167	1.1677
CONs	0.0003	1.0004	0.0006	0.0021	0.0009	7.060553E-6	0.0002	0.0003	0.0043	1.0091
EDUs	0.0004	0.0005	1.0064	0.0029	0.0012	9.997762E-6	0.0003	0.0004	0.0060	1.0181
ICTs	0.0173	0.0160	0.0361	1.0648	0.0358	0.0004	0.0078	0.0169	0.1306	1.3257
MANUFs	0.0107	0.2844	0.0631	0.2082	1.2224	0.0024	0.0062	0.1214	0.0325	1.9513
MQs	0.0079	0.1385	0.0174	0.0568	0.0236	1.0002	0.0063	0.0084	0.1174	1.3765
Res	0.0067	0.0107	0.0134	0.0123	0.0442	0.0002	1.0046	0.0073	0.0118	1.1112
TRDs	0.0006	0.0007	0.0013	0.0043	0.0018	1.477475E-5	0.0005	1.0006	0.0089	1.019
ORs	0.0743	0.0920	0.1627	0.5329	0.2211	0.0018	0.0590	0.0786	1.1004	2.3224

Source: Author's source (2023)

Table 4.4 represents the Leontief inverse matrix (l^*) which shows the forward linkage of all sectors. For every row or line its total forward linkage is given respectively. 1.9513 represents the effect of total output throughout all the sectors of the economy that is associated with a ₦1 increase in the principal input in manufacturing sector.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

Measurement of Linkage with the 8 Sector and Other Sectors

Using the 8 sectors and other sectors, the study measured the linkages of sectors in a somewhat aggregative manner. It is to be noted here that 8 sectors and other sectors had been considered for the Leontief inverse matrix, and then presented its total linkage coefficient using the Input-Output matrix. Table 4.4 presents the summary of the forward and backward linkage for the 8 sectors and other sectors for the year 2011.

Table 4.5: Forward and Backward Linkage Leontief- Total Linkage for the Year 2011(for 8 Sectors and Other Sectors)

Sector code	Sectors in the I-O Table	BackwardLinkages	Forward Linkages
1	Accommodation and food service	1.1272	1.1677
2	Construction	1.5461	1.0091
3	Education	1.3147	1.0181
4	Information and Communication	1.8934	1.3257
5	Manufacturing	1.5606	1.9513
6	Mining and Quarry	1.0052	1.3765
7	Real Estate	1.0858	1.1112
8	Trade	1.3395	1.0187
9	Others	1.4282	2.3224

Source: Author's Calculation (2023)

Table 4.5shows that manufacturing has the second highest total forward linkage while for the backward linkage; manufacturing also holds the second position. It implies that the manufacturing sector plays a very important role in the backward and forward linkage.

Using Linkage Leontief Inverse-Rasmussen Linkage for Identification of Key Sector

The key sector is identified by using the Rasmussen Linkage coefficients as shown in table 4.5. In terms of criteria of key sectors as shown by Hirschman (1958) using the Rasmussen Linkage, the pivotal sectors of the economy are those set of sectors that exhibits highest interconnection with other sectors through backward as well as forward linkages, more precisely, sectors for which backward and forward linkages are greater than unity. Such characteristics are seen in the manufacturing sector.

Table 4.6: Showing its High and Low Backward and Forward Linkage for 2011

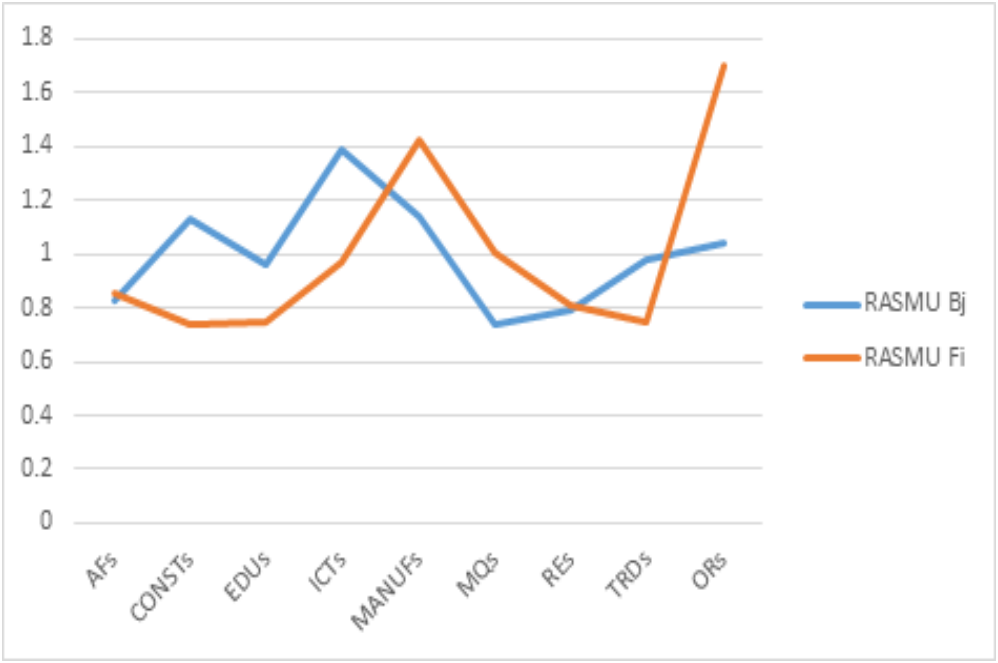
Sectors	RASMU Bj	Levels Bj	RASMU Fi	levels Fi
AFs	0.8246	Low	0.8543	Low
CONSTs	1.1312	High	0.7382	Low
EDUs	0.9619	Low	0.7450	Low
ICTs	1.3854	High	0.9699	Low
MANUFs	1.1417	High	1.4277	High
MQs	0.7355	Low	1.0071	High

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

REs	0.7944	Low	0.8131	Low
TRDs	0.9800	Low	0.7454	Low
ORs	1.0452	High	1.6995	High

Source: Author's report (2023)

Figure 2: Rasmussen Forward and Backward Linkage Coefficient for 2011



Source: Author's calculation (2023)

Figure 2 shows that the sectors are sensitive to the change of final demand reflected by Rasmus Fi. The manufacturing sector, mining and quarrying sector (MQs, MANUFs), and other sector(ORs) is labeled as a more sensitive sector because decreasing of final demand will decrease the production and the input demand from this relatively more decreasing compared with other sectors. The manufacturing sector has the second highest forward linkage index with 1.4277 units. An increase of output in the manufacturing sector (MANUFs) can encourage the increase in output in another sector especially sector that is used as intermediate consumption in the manufacturing sector (MANUFs). If final demand decreases by 1 unit, the output of the manufacturing sector will be allocated to other sectors and this sector also decreasing by 1.4277 units.

Meanwhile, the potential sector has leverage power economic activity reflects by Ramusby. The (CONTs, ICTs, MANUFs) and Other sectors(ORs) has leverage power because the increase of final demand from other sector will increase. So the input of another sector will also increase and in the end economic activities also increase. The manufacturing sector has the second highest backward linkage index with 1.1417 units. This value means that if final demand of this sector is increasing by 1units, then the input demand will increase by 1.1417 units. If there is a decrease or deficit in this sector, it can impact significant problem in the production process of another sector.

The result of the model estimation shows that the manufacturing sector has a strong forward linkage to other sectors of the Nigerian economy. Also the result of the model estimation shows that the manufacturing sector has a strong backward linkage to other sectors of the Nigerian economy.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

POLICY RECOMMENDATIONS AND CONCLUSION

Policy Recommendations

As a result of the strong linkage effect of manufacturing sector to other sectors in Nigeria economy it becomes imperative for the government to;

- offer financial incentives enterprises that invest in research and development. This would result in the development of new products and processes that require new inputs from other industries. Manufacturing enterprises should be encouraged to employ domestic inputs. The policy would also help to strengthen backward linkages and to reduce the country's reliance on imported inputs. Providing training and support to small and medium-sized enterprises (SMEs) that supply inputs to the manufacturing sector would help them to scale up their operations and meet the growing demand for their products.
- ensure up to date tracking of economic transactions of the manufacturing sector with many of the informal entities in the economy so as to properly capture the additional influence in other sectors of the economy.
- increase infrastructural development that will make other sector to operate with ease thereby enhancing their productivity
- ensure adequate implementation of the Nigeria Industrial Revolution Plan established in 2013 to the fullest.

Conclusion

This study identified the linkages between the manufacturing sector and other sectors of the Nigerian economy with the background of the input output model which is usually the theoretical basis of backward and forward linkage. Therefore, the study has been able to show the manufacturing sector has a strong forward linkage with other sectors and that it also has a strong significant backward linkage with other sectors of the Nigerian economy. Hence, it is important for the government to make the manufacturing sector more competitive by granting incentives such as subsidy, tax holidays, to the manufactures and also invest in education and training programs to develop the skills of the Nigerian workforce. This will ensure that manufacturing companies have a pool of skilled workers to draw from. This training will also help them market their products in foreign markets. Finally, since the manufacturing sector is a major influencer of other sectors, its improvement would boost the productivity of other sectors that are linked with it and overall lead to economic growth.

REFERENCES

1. Adebayo, T. O., &Ogunsanya, O. A. (2016). The impact of manufacturing sector on the ICT sector in Nigeria: An input-output analysis. Journal of Policy Modeling, 38(3), 494-508.
2. Adenikinju, A. (2005). Industrialization in Nigeria: Issues, challenges and prospects. Nigerian Economic Society: 50th Anniversary Conference Proceedings, 241-254.
3. Adofu, E. A., Olanrewaju, J. O., &Oladipupo, O. S. (2018).The impact of manufacturing sector on economic growth and development in Nigeria.International Journal of Development and Sustainability, 7(12), 2020-2030.
4. Ajibolade, F. O., &Awokoya, A. K. (2021). The impact of manufacturing sector growth on other sectors of the Nigerian economy: A disaggregated analysis. Journal of African Business, 22(8), 1126-1151.
5. Amakom, E. C. (2012). The role of the manufacturing sector in economic growth and development: A case study of Nigeria. Journal of Sustainable Development, 5(3), 118-128.

6. Amire, K. O., Shittu, I. O., &Okonjo-Iweala, N. I. (2019). The relationship between investment, agriculture and manufacturing sectors in Nigeria: A generalized method of moments (GMM) approach. International Journal of Finance & Economics, 24(2), 334-348.
7. Apergis, N., & Payne, J. E. (2014). The impact of manufacturing on oil production: A panel analysis of oil-exporting countries. Journal of Economic Studies, 41(4), 604-623.
8. Aza, M. O., & Dodo, J. (2014). Industrial policy and economic development in Nigeria: A review of the literature. International Journal of Development Research, 4(1), 1-10.
9. Basu, K. (Hirschman, A. O. (1958). The strategy of economic development. Yale University Press.
10. Bonfiglio, A. (2005). The role of sectoral linkages in economic growth and development: A survey. Journal of Economic Studies, 32(1), 111-133.
11. Central Bank of Nigeria (CBN).(2012). Annual Report. https://www.cbn.gov.ng/documents/annualreports.asp
12. Central Bank of Nigeria (CBN).(2023). Statistical Bulletin. Retrieved from https://www.cbn.gov.ng/documents/Statbulletin.asp
13. Central Bank of Nigeria.(2017). Annual Statistical Bulletin. Retrieved from https://www.cbn.gov.ng/out/2018/rsd/cbn%202017%20annual%20report_web.pdf
14. Chenery, H. B., & Watanabe, T. (1958).International comparison of the structure of production. Econometrica, 26(4), 487-521.
15. Cornwell, R. (1997). The role of manufacturing in economic growth in developing countries. In The role of manufacturing in economic development (pp. 1-18).Springer.
16. Cypher, J. M., & Dietz, T. (2008). The economics of sustainable development. Routledge.
17. Englama, A. A., Nwoke, G. I., & Abubakar, A. A. (2010).The impact of crude oil discovery on the manufacturing sector of Nigeria.Journal of Economics and Sustainable Development, 1(4), 1-10.
18. Erdogan, S., & Yildirim, A. (2023). The impact of manufacturing sector growth on construction sector growth in Turkey: A cointegration analysis. Construction Economics and Building, 23(1), 1-11.
19. Evans, J. R. (1996). Production planning and control: Manufacturing and services (4th ed.). McGraw-Hill.
20. Fagerberg, J., & Verspagen, B. (1999). Productivity growth, technological innovation and economic development: A review of the literature. In The Oxford handbook of economic growth (pp. 126-69).Oxford University Press.
21. Felix, A. A., & Emmanuel, O. A. (2015). The role of industrialization in economic development: A case study of Nigeria. Journal of Economics and Sustainable Development, 6(10), 43-53.
22. Ghosh, S., &Basu, A. (2018). The relationship between manufacturing and ICT sector in India: An input-output analysis. Economic and Political Weekly, 53(28), 37-44.
23. Gonzalez, A., & Lopez, J. A. (2021). The dynamic interaction between the manufacturing and construction sectors in Mexico: A vector autoregressive (VAR) analysis. Journal of Macroeconomics, 68, 103221.
24. Hayami, Y., & Godo, Y. (2005).The economics of development: From the pre-classical to the neoclassical approach. Cambridge University Press.
25. Hirschman, A. O. (1958). The strategy of economic development. Yale University Press.
26. Hirschman, A. O. (1977). The rise and decline of development economics. Princeton University Press.
27. Hirschman, A. O. (1986a). Development economics after twenty years: A Latin American perspective. Journal of Economic Literature, 24(4), 1552-1570.
28. Institute of Cost and Management Accountants (ICMA). (1974). The concept of value added (2nd ed.). ICMA.
29. Isiksa, C. C., &Chimezie, A. (2016). Industrialization and economic development in Nigeria: A review of the literature. Journal of Economics and Sustainable Development, 7(12), 14-22.
30. Iwayemi, O. S., &Akinboade, O. A. (2019). The impact of manufacturing sector on economic growth in Nigeria: A time series analysis. International Journal of Business and Management, 14(5), 1-12.

31. Iwayemi, O. S., &Akinboade, O. A. (2019). The impact of manufacturing sector expansion on real estate prices in Nigeria. Journal of Building and Real Estate, 10(1), 81-95.
32. Khan, M. A., Rehman, M. U., &Shafie, N. (2015). The relationship between manufacturing and construction sectors in Malaysia. International Journal of Economics & Business Research, 10(1), 19-28.
33. Leontief, W. W. (1936). Quantitative input-output relations in the economic system of the United States.Review of Economics and Statistics, 18(3), 105-125.
34. Lewis, W. A. (1955). The theory of economic growth. George Allen &Unwin.
35. Manufacturers Association of Nigeria (MAN).(2010). Annual Report.Presented during the 39th Annual General Meeting of the association. https://africanfinancials.com/document/ng-flourm-2021-ar-00/
36. Miller, R. E., & Blair, P. D. (2009).Input-output analysis: Foundations and extensions. Cambridge University Press.
37. Murphy, K. M., Shleifer, A., &Vishny, R. W. (1989).Industrialization and the big push.The Journal of Political Economy, 97(5), 1003-1026.
38. Nath, V. (1962).A model of the Indian economy, 1961-75.The Indian Economic Journal, 9(45), 62-74.
39. National Bureau of Statistics (NBS).(2014). Gross Domestic Product Report. https://www.bea.gov/data/gdp/gross-domestic-product
40. Nigerian Bureau of Statistics. (2013). Manufacturing sector in Nigeria: 2011-2012. Retrieved from https://www.nigerianstat.gov.ng/pdfuploads/manufacturing.pdf
41. Nigerian Bureau of Statistics. (2023). The Performance of the Manufacturing Sector in Nigeria: A 52-Year Analysis of Growth and Retrogression (1960-2012). Retrieved from https://www.nigerianstat.gov.ng/pdfuploads/Manufacturing%20sector%202010-2012.pdf
42. Nurske, R. (1953). Problems of capital formation in underdeveloped countries. Basil Blackwell.
43. Ogunsanya, O. A., &Akinlo, A. O. (2020).The impact of manufacturing sector growth on real estate development in Nigeria.Journal of African Business, 21(1), 87-102.
44. Ogwumike, F. O., &Ogwumike, O. O. (2015). The impact of manufacturing sector growth on other sectors of the Nigerian economy: A computable general equilibrium (CGE) analysis. Journal of African Business, 16(7), 954-974.
45. Okoye, E. I., Nwakoby, O. N., &Okories, C. C. (2016).The impact of industrialization on economic growth and development in Nigeria.Journal of Emerging Trends in Economics and Management Sciences, 7(1), 71-78.
46. Oladinrin, O. A., Ogunsemi, D. O., &Aje, I. O. (2012). The impact of manufacturing sector expansion on construction industry output in Nigeria. Journal of Policy Modeling, 34(4), 602-617.
47. Olawuyi, S. O., & Adebayo, A. S. (2016). The linkages between the manufacturing sector and other sectors of the Nigerian economy: A panel data analysis. Journal of Economic Development, 41(1), 13-32.
48. Osuagwu, B. E. (2020). The long-run relationship between agriculture and manufacturing industry output in Nigeria. Journal of African Business, 21(4), 536-550.
49. Osuagwu, E. S. (2020). Input-output analysis of the linkages between the agricultural and manufacturing industry both the short and long run.(Unpublished master's thesis). University of Nigeria, Nsukka.
50. Park, S.-H.(1991). Intersectoral relationships between manufacturing and services.Journal of Development Economics, 35(1), 67-93.
51. Petrov, V. O., &Smirnova, E. A. (2020).The impact of manufacturing sector growth on investments in the construction sector in Russia.Journal of the New Economy, 13(1), 3-20
52. Pilat, D., &Wölfl, A. (2005). Blurring the boundaries: Services and manufacturing in the global economy. Oxford Review of Economic Policy, 21(1), 69-85.
53. Rasmussen, P. N. (1958). Studies in inter-sector relations. North-Holland Publishing Company.
54. Rodan, P. N. (1943). Problems of industrialization of eastern and southeastern Europe.The Economic Journal, 53(210/211), 202-211.

55. Rodan, P. N. (1961). Notes on the theory of the "big push". In A. N. Agarwala& S. P. Singh (Eds.), The economics of underdevelopment (pp. 1-7). Oxford University Press.
56. Saikia, N. (2011). Sectoral linkages and economic growth in India: An input-output analysis. IISER Kolkata Working Paper, (187).
57. Salami, A. O., &Kelikume, I. (2011).Empirical analysis of the linkages between the manufacturing and other sectors of the Nigerian economy.WIT Transactions on Ecology and the Environment, 150, 687-698.
58. Salami, A. O., &Olofin, S. O. (2019). The impact of manufacturing sector on agricultural sector in Nigeria: A time series analysis. International Journal of Agricultural Policy and Research, 7(10), 34-43.
59. Salami, A. O., &Olofin, S. O. (2019). The impact of manufacturing sector growth on financial sector development in Nigeria: A panel vector autoregressive (PVAR) analysis. Journal of African Business, 20(10), 1419-1436.
60. Streeten, P. (1959). Unbalanced growth.Oxford Economic Papers, 11(2), 161-178.
61. Szirmal, A. (2014). The role of manufacturing in economic growth.In Economic growth and development (pp. 123-145).Routledge.
62. Timmer, M. P., & de Vries, G. J. (2009).Patterns of structural change in developing countries.In The Oxford handbook of economic growth (pp. 361-429).Oxford University Press.

APPENDIX

APPENDIX 1

General Algebraic Modeling System

Compilation

1 Sets

2 i sectors /ACC Accommodation

3 CONS Construction

4 EDU Education

5 ICT Information and communication

6 MANU Manufacturing

7 MQ Minning and quarry

8 RE Real Estate

9 TRD Trade

10 OTH Others/

11 Alias (i,j,k);

12 Parameter

13 UN0(i) ARTIFICIAL VECTOR

14 X0(i) INITIAL SECTORIAL PRODUCT

15 VA0(i) VALUE ADDED

16 PCE0(i) PRIVATE CONSUMPTION EXPENDITURE ON FINAL DEMAND

17 NH0(i) NON HOUSEHOLD CONSUMPTION OF FINAL DEMAND

18 GF0(i) GOVERNMENT FINAL DEMAND

19 COM0(i) COMPESATION

20 DEP0(i) DEPRECIATION

21 TAX0(i) TAX ON PRODUCTION AND PRODUCT LESS SUBSIDY

22 NOS0(i) NET OPERATING SURPLUS

23 INT0(i) INTERMEDIATE DEMAND

24 CI0(i) CHANGE IN INVENTORIES

25 PV0(i) PRICE INDEX

26 GFC0(i) GROSS FIXED CAPITAL FORMATION

27 M0(i) IMPORT

28 XP0(i) EXPORT

29 NE0(i) NET EXPORT(XP-M)

30 AFD0(i) DOMESTIC FINAL DEMAND

31 IDM(i,k) IDENTITY MATRIX OF DIMENSION CARD(i)

32 DIPUR(j) INTERMEDIATE UNIT COST

33 A(i,j) TECHNICAL COEFFICIENT;

34 TABLE IO(i,j) TRANSACTION INTERSECTORIAL MONETARY PRICES

	ACC	CONS	EDU	ICT
ACC	17,524,210,000.00	2,140,000.00	34,011,790,000.00	
CONS				
EDU			17,253,320,000.00	
ICT	18,781,120,000.00	18,361,460,000.00	50,979,860,000.00	
MANU	12,599,990,000.00	1,518,763,270,000.00	142,357,820,000.00	2,597,820,450,000.00
MQ	–	845,866,200,000.00		
RE	12,599,990,000.00	4,460,000.00	30,145,800,000.00	
TRD				
OTH	139,211,250,000.00	234,480,320,000.00	407,718,030,000.00	7,426,077,265,000.00

MANU	MQ	RE	TRD	OTH
58,891,880,000.00	1,693,000,000.00		1,453,483,070,000.00	575,628,394,135.40
				158,956,644,467.95
				223,854,397,480.18
90,000,000,000.00	2,024,160,000.00	3,816,000,000.00	81,484,240,000.00	4,856,184,982,464.98
2,034,167,580,000.00	21,394,530,000.00	18,502,760,000.00	1,358,846,790,000.00	134,011,056,328.44
				4,362,578,697,440.66
395,000,000,000.00	1,045,950,000.00	19,534,470,000.00	25,600,000,000.00	391,367,208,739.72
				332,628,939,086.31
1,842,420,100,000.00	13,025,610,000.00	270,530,070,000.00	595,929,470,000.00	1,231,827,509,856.36

46 TABLE SECTOR (*,j) MONETARY SECTORS

	ACC	CONS	EDU	ICT
PCE	8287544.11	4143772.06	1657508822931.20	6630035291724.80

NH	12439534817.40	2487906963.48	47270232306.12	37318604452.20
GF	108240112000.00	649440672000.00	811800840000.00	1028281064000.00
CI		264336830000.00	3837270000.00	
GFC		5499170490000.00		
COM	59088510000.00	259799500000.00	460064050000.00	2792912970000.00
DEP	125934650000.00		32604760000.00	825112540000.00
TAX				
NOS	98353267266.35	1645775402521.26	618052243932.01	2761534593251.40
NE	-1777829431230.56	-2051343934682.23	-968337208785.49	3586191035609.43
X	2261924414624.05	6574396707164.76	3160750310361.01	16410295631433.50

MANU	MQ	RE	TRD	OTH
1657508822931.20	2486263234396.80	4102334336754.72	8701921320388.80	16202136312836.30
5473395319.66	22391162671.32	24879069634.80	37318604452.20	59212185730.82
108240112000.00	920040952000.00	162360168000.00	649440672000.00	974161008000.00
447627850000.00	105668110000.00		1632160000.00	-391101892977.57
890141060000.00				3507885630448.63
1496632330000.00	29343590000.00	620516660000.00	254495690000.00	11236563217558.80
891730450000.00	1740000.00		61902361000.00	1116337099335.76
132595370000.00	1990450000.00		110162970000.00	858810973338.23
2139082278829.46	11069632342369.80	3964447347258.10	9899004281720.09	10285463576603.20
-1999530867749.84	2395352565861.05	-267524145871.15	4117967176792.79	3250699827941.41
11546293628044.60	11138160922369.80	5170859834543.90	14114421400005.90	41090869165726.90

```
60  X0(j)= Sector("X",j);
61  PCE0(j)= Sector("PCE",j);
62  NH0(j)= Sector("NH",j);
63  GF0(j)= Sector("GF",j);
64  CI0(j)= Sector("CI",j);
65  GFC0(j)= Sector("GFC",j);
66  COM0(j)= Sector("COM",j);
67  DEP0(j)= Sector("DEP",j);
68  TAX0(j)= Sector("TAX",j);
69  NOS0(j)= Sector("NOS",j);
```

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

```
70    NE0(j)= Sector("NE",j);
71    AFD0(i)= PCE0(i)+NH0(i)+GF0(i)+CI0(i)+GFC0(i)+NE0(i);
72    VA0(i)= COM0(i)+DEP0(i)+TAX0(i)+NOS0(i);
74    IDM(i,k)=1$(ORD(i)EQ ORD(k));
75    A(i,j)=IO(i,j)/X0(j);
76    DIPUR(j)=Sum(i,A(i,j));
77    UN0(j)=1.00;
78    PV0(j)=UN0(j)-DIPUR(j);
79    INT0(i)=Sum(j,A(i,j)*X0(j));
80  VARIABLES
81   GDP         PIB
82   INV(j,k)    INVERSE LEOINTIEF VECTOR MATRIX
83  POSITIVE VARIABLE X;
85  EQUATION
86   GDPEQ       DEFINITION GDP
87   INVEQ(i,k)  INVERSE MATRIX
88   MBEQ(i)     PER PRODUCT;
90   GDPEQ..Sum(j,PV0(j)*X(j))=e=GDP;
91   INVEQ(i,k)..Sum(j,(IDM(i,j)-A(i,j))*INV(j,k))=e=IDM(i,k);
92   MBEQ(i)..Sum(j,(IDM(i,j)-A(i,j))*X(j))=e=AFD0(i);
94  MODEL LEONTIEF/GDPEQ,INVEQ,MBEQ/;
95  OPTION LIMROW=0, LIMCOL=0;
96  OPTION SOLPRINT=OFF;
97  SOLVE LEONTIEF USING LP MAXIMIZING GDP;
99  PARAMETER
100   XX(i)       VERIFICATION OF PRODUCTION CALCULATION
```

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

```
LEON(j,k) INVERSE OF LEOINTIEF
CSM(j)     TOTAL COLUMN
RSM(i)     TOTAL ROW
DENO       RERMUSEN LINKAGES IMPACT OF DEMAND
B(i)       IMPACT OF DEMAND j ON THE ECONOMY
F(i)       IMPACT OF CHANGE IN DEMAND ON ALL SECTORS
RAP(j,*)   FINAL REPUR;

LEON(j,k) = INV.L(j,k);
XX(j) = Sum(k,LEON(j,k)*AFD0(k));
CSM(j) = Sum(i,LEON(i,j));
RSM(i) = Sum(j,LEON(i,j));
DENO =(1/(card(i))**2)*(Sum((i,j),Leon(i,j)));
B(j) =(1/(card(i))*CSM(j))/DENO;
F(i) =(1/(card(i))*RSM(i))/DENO;
    RAP(j,"ACTIVITIES")= XX(j);
    RAP(j,"TOTAL COL")= CSM(j);
    RAP(j,"RASMUBj")= B(j);
    RAP(j,"TOTAL ROW")= RSM(j);
    RAP(j,"RASMU Fi")= F(j);
    RAP(j,"DEMAND INT")= INT0(j);
    RAP(j,"DEMAND FIN")= AFD0(j);
    RAP(j,"INT COST")= DIPUR(j);
    RAP(j,"PRICE VA")= PV0(j);
    OPTION DECIMALS=4
DISPLAY DENO, A, LEON, RAP;
```

COMPILATION TIME = 0.000 SECONDS 3 MB 44.4.0 06604687 WEX-WEI

GAMS 44.4.0 06604687 Sep 19, 2023 WEX-WEI x86 64bit/MS Windows – 10/20/23 05:00:05 Page 2

G e n e r a l A l g e b r a i c M o d e l i n g S y s t e m

Range Statistics SOLVE LEONTIEF Using LP From line 97

RANGE STATISTICS (ABSOLUTE NON-ZERO FINITE VALUES)

RHS [min, max] : [1.000E+00, 2.360E+13] – Zero values observed as well

Bound [min, max] : [NA, NA] – Zero values observed as well

Matrix [min, max] : [3.255E-07, 1.000E+00]

GAMS 44.4.0 06604687 Sep 19, 2023 EX-WEI x86 64bit/MS Windows – 10/20/23 05:00:05 Page 3

G e n e r a l A l g e b r a i c M o d e l i n g S y s t e m

Model Statistics SOLVE LEONTIEF Using LP From line 97

MODEL STATISTICS

BLOCKS OF EQUATIONS 3 SINGLE EQUATIONS 91

BLOCKS OF VARIABLES 3 SINGLE VARIABLES 91

NON ZERO ELEMENTS 520

GENERATION TIME = 0.078 SECONDS 4 MB 44.4.0 06604687 WEX-WEI

GAMS 44.4.0 06604687 Sep 19, 2023 WEX-WEI x86 64bit/MS Windows – 10/20/23 05:00:05 Page 4

G e n e r a l A l g e b r a i c M o d e l i n g S y s t e m

Solution Report SOLVE LEONTIEF Using LP From line 97

S O L V E S U M M A R Y

MODEL LEONTIEF OBJECTIVE GDP

TYPE LP DIRECTION MAXIMIZE

SOLVER CPLEX FROM LINE 97

**** SOLVER STATUS 1 Normal Completion

**** MODEL STATUS 1 Optimal

**** OBJECTIVE VALUE 63713359394984.4531

RESOURCE USAGE, LIMIT 0.016 10000000000.000

ITERATION COUNT, LIMIT 0 2147483647

— *** This solver runs with a demo license. No commercial use.

— GMO setup time: 0.00s

— GMO memory 0.52 Mb (peak 0.52 Mb)

— Dictionary memory 0.00 Mb

— Cplex 22.1.1.0 link memory 0.00 Mb (peak 0.01 Mb)

— Starting Cplex

— LP status (1): optimal.

— Cplex Time: 0.00sec (det. 0.15 ticks)

Optimal solution found

Objective: 63713359394984.453125

**** REPORT SUMMARY : 0 NONOPT

0 INFEASIBLE

0 UNBOUNDED

GAMS 44.4.0 06604687 Sep 19, 2023 WEX-WEI x86 64bit/MS Windows – 10/20/23 05:00:05 Page 5

G e n e r a l A l g e b r a i c M o d e l i n g S y s t e m

E x e c u t i o n

—- 126 PARAMETER DENO = 0.1519 RERMUSEN LINKAGES IMP ACT OF DEMAND

—- 126 PARAMETER A TECHNICAL COEFFICIENT

	ACC	CONS	EDU	ICT	MANU	MQ	RE	TRD	OTH
ACC	0.0077	3.26E-07	0.0108		0.0051	0.0002		0.103	0.014
CONS									0.0039
EDU			0.0055						0.0054
ICT	0.0083	0.0028	0.0161	0.1583	0.0078	0.0002	0.0007	0.0058	0.1182
MANUFs	0.0056	0.231	0.0450		0.1762	0.0019	0.0036	0.0963	0.0033
MQ		0.1287							0.1062
RE	0.0056	6.78E-07	0.0095		0.0342	0.0001	0.0038	0.0018	0.0095

TRD									0.0081
OTH	0.0615	0.0357	0.129	0.4525	0.1596	0.0012	0.0523	0.0422	0.03

—- 126 PARAMETER LEON INVERSE OF LEOINTIEF

	ACC	CONS	EDU	ICT	MANU	MQ	RE	TRD	OTH
ACC	1.0090	0.0029	0.0137	0.0091	0.0096	0.0002	0.0009	0.1056	0.0167
CON	0.0003	1.0004	0.0006	0.0021	0.0009	7.060553E-6	0.0002	0.0003	0.0043
EDU	0.0004	0.0005	1.0064	0.0029	0.0012	9.997762E-6	0.0003	0.0004	0.0060
ICT	0.0173	0.0160	0.0361	1.0648	0.0358	0.0004	0.0078	0.0169	0.1306
MANU	0.0107	0.2844	0.0631	0.2082	1.2224	0.0024	0.0062	0.1214	0.0325
MQ	0.0079	0.1385	0.0174	0.0568	0.0236	1.0002	0.0063	0.0084	0.1174
RE	0.0067	0.0107	0.0134	0.0123	0.0442	0.0002	1.0046	0.0073	0.0118
TRD	0.0006	0.0007	0.0013	0.0043	0.0018	1.477475E-5	0.0005	1.0006	0.0089
ORs	0.0743	0.0920	0.1627	0.5329	0.2211	0.0018	0.0590	0.0786	1.1004

—- 126 PARAMETER RAP FINAL REPUR

	ACTIVITIES	TOTAL COL	RASMU Bj	TOTAL ROW	RASMU Fi	DEMAND INT	DEMAND FIN	INT COST	PRICE VA
ACC	3.00E+11	1.1271	0.8246	1.1676	0.8543	2.14E+12	-1.66E+12	0.0887	0.9133
CONS	4.50E+12	1.5461	1.1312	1.009	0.7382	1.59E+11	4.36E+12	0.3981	0.6019
EDU	1.75E+12	1.3148	0.9619	1.0182	0.745	2.41E+11	1.55E+12	0.2159	0.7841
ICT	1.55E+13	1.8935	1.3854	1.3256	0.9699	5.12E+12	1.13E+13	0.6108	0.3892
MANU	7.47E+12	1.5605	1.1417	1.9514	1.4277	7.84E+12	1.11E+12	0.3828	0.6172
MQ	1.01E+13	1.0053	0.7355	1.3764	1.0071	5.21E+12	5.93E+12	0.0035	0.9965
RE	4.66E+12	1.0858	0.7944	1.1113	0.8131	8.75E+11	4.02E+12	0.0604	0.9396
TRD	1.38E+13	1.3395	0.98	1.0188	0.7454	3.33E+11	1.35E+13	0.2491	0.7509
OTH	3.41E+13	1.4285	1.0452	2.3228	1.6995	1.22E+13	2.36E+13	0.2985	0.7015

EXECUTION TIME = 0.344 SECONDS 4 MB 44.4.0 06604687 WEX-WEI

USER: GAMS Demo, for EULA and demo limitations see G230706/0001CB-GEN

https://www.gams.com/latest/docs/UG%5FLicense.html DC0000

**** FILE SUMMARY

Input C:\Users\user\Documents\gamsdir\projdir\Untitled_1.gms

Output C:\Users\user\Documents\Gold GAMS\Untitled_1.lst

APPENDIX 2: FINAL DEMAND

	HOUSEHOLD	PERCENTAGE	NON PROFIT SERVING HOUSEHOLD	PERCENTAGE	GOVERNMENT EXPENDITURE	PERCENT-AGE
ACCOMODATION SECTOR	8,287,544.11	0.00%	12,439,534,817.40	5.00%	108,240,112,000.00	2%
CONSTRUCTION SECTOR	4,143,772.06	0.00%	2,487,906,963.48	1.00%	649,440,672,000.00	12%
EDUCATION SECTOR	1,657,508,822,931.20	4.00%	47,270,232,306.12	19.00%	811,800,840,000.00	15%
INFORMATION AND COMMUNICATION SECTOR	6,630,035,291,724.80	16.00%	37,318,604,452.20	15%	1,028,281,064,000.00	19%
MANUFACTURING SECTOR	1,657,508,822,931.20	4.00%	5,473,395,319.66	2.20%	108,240,112,000.00	2%
MINNING AND QUARRYING SECTOR	2,486,263,234,396.80	6.00%	22,391,162,671.32	9.00%	920,040,952,000.00	17.00%
REAL ESTATE SECTOR	4,102,334,336,754.72	9.90%	24,879,069,634.80	10.00%	162,360,168,000.00	3%
TRADE SECTOR	8,701,921,320,388.80	21.00%	37,318,604,452.20	15.00%	649,440,672,000.00	12.00%
OTHER SECTOR	16,202,136,312,836.30	39.10%	59,212,185,730.82	23.80%	974,161,008,000.00	18.00%
	41,437,720,573,280.00	100%	248,790,696,348.00	100%	5,412,005,600,000.00	100%

EXPORT	PERCENTAGE	IMPORT	PERCENTAGE
1,996,127.14	2%	1,777,831,427,357.70	13%
19,961.27	12%	2,051,343,954,643.50	15%
399,225,427,643.51	15%	1,367,562,636,429.00	10%
3,593,028,848,791.57	19%	6,837,813,182.15	0.1%
598,838,141,465.26	2%	2,598,369,009,215.10	19%
2,395,352,565,861.05	17.0%	–	0.0%
5,988,381,414.65	3%	273,512,527,285.80	2%
4,391,479,704,078.59	12.0%	273,512,527,285.80	2.0%
8,577,356,296,832.37	18.0%	5,326,656,468,890.96	39.0%
19,961,271,382,175.40	100%	13,675,626,364,290.00	100%

Assumptions Made for the Study

Percentage was assigned to the sectors to attain the Central Bank of Nigeria, Export and Import outcome

Note: Raw materials used in the information, accommodation and mining and quarry sector was assumed to be gotten from the manufacturing sector

Raw materials used in the construction sector was assumed to come from the Mining and quarry sector Raw materials used in the manufacturing sector was gotten from the agricultural sector (classified as others)

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue I January 2024

To balance the change in inventory a value of ₦ 172,970,257,022.43 was assumed as the raw materials for the other sector that was gotten from other sectors.

The net operating surplus for each sector was gotten by subtracting, compensation, Depreciation and Tax from the value added of each sector.

The GDP used is the GDP at current market price.