TRADE LIBERALIZATION AND PERFORMANCE OF THE MANUFACTURING SECTOR IN NIGERIA.

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A THESIS SUBMITTED TO THE SCHOOL OF ECONOMICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS OF KENYATTA UNIVERSITY.

NOVEMBER, 2017.

DECLARATION

This thesis is my original work and has not been presented for award of a degree in any other University.

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DEDICATION

This thesis is dedicated to my wife Ballin and my daughter Fukki-Liz.

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My deepest appreciation goes to Jesus Christ whom I look unto, in Him I take delight. His grace has been sufficient for me. I ascribe all glory, honour and adoration unto Him. I will continue to profess His name as my Lord.

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I take responsibility for the results, interpretations and conclusions in the thesis and any errors therein.

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ABBREVIATIONS AND ACRONYMS

AEC	African Economic Community
AMU	Arab Maghreb Union
ANCOM	Andean Common Market
ASEAN	Association of South East Asian Nations
CEN-SAD	Community of Sahel-Saharan States
CET	Common External Tariff
COMESA	Common Market for Eastern and Southern Africa
CU	Custom Union
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
ETLS	ECOWAS Trade Liberalization Scheme
EU	European Union
FDI	Foreign Direct Investment
GATT	General Agreement on Tariffs and Trade
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
ISI	Import Substitution Industrialization
ISIC	International Standard Industrial Classification
LPA	Lagos Plan of Action
MFN	Most Favoured Nation
NAFTA	North American Free Trade Area
NTB	Non-Tariff Barriers

OPEC	Organisation of Petroleum Exporting Countries
PCM	Price Cost Margin
RTA	Regional Trade Agreement
SADC	Southern Africa Development Community
SAP	Structural Adjustment Programme
SFEM	Second-tier Foreign Exchange Market
SMI	Survey of Manufacturing Industry
SPARTECA	South Pacific Regional Trade and Economic Cooperation Agreement
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organization

OPERATIONAL DEFINITION OF TERMS

Cohort:	A group of firms sharing similar characteristics in terms of the number of labour they employ, their industry activity, and the region they are located.
Competitiveness:	The ability of a firm to operate within domestic and world quality standards, yet obtain adequate returns on resources employed.
Export participation:	Used to refer to both the probability of a firm to sale its output in foreign markets and the export intensity of an exporting firm.
Import-discipline hypothesis:	Claims that trade liberalization which allows the free flow of foreign products into the domestic market tends to reduce the market share of local producers. This results in a relative competitive market as excess profits of firms operating in the domestic market reduces.
International Trade:	For purposes of this study, international trade in Nigeria will involve only manufactured goods, excluding services like banking and other financial flow services, and transportation services.

Markups:	The difference between the cost of a good and its selling price.
Price specie flow mechanism:	The accumulation of wealth resulting from surplus exports in mercantilism increases money supply in the economy leading to increase in domestic prices which results in exports becoming expensive and imports cheaper.
Performance:	Used to imply productivity, competitiveness, and export participation jointly.
Productivity:	Represents the efficiency of the total factors used by a firm in production.
Self-selection:	Refers to a situation where only the most productive firms participate in exports. This is under the premise that additional costs are incurred in selling goods to foreign markets of which creates an entry barrier that less productive firms cannot overcome.
Trade Liberalization:	Implies the removal or reduction of restrictions on international trade. This includes the removal or reduction of both tariff and non-tariff obstacles.

ABSTRACT

International trade has broadened possible opportunities available to countries for upgrading economic activities, including the development of manufacturing. Since the late 1980s, Nigeria has progressively pursued trade liberalization which has significantly exposed manufacturing activities to the international market. The goal was to raise the GDP share of manufacturing, share of manufactured exports in total merchandise exports, and manufacturing sector capacity utilization to 25 per cent, 8 per cent, and 60 per cent respectively by 2010. However, the GDP share of manufacturing remained at 9.69 per cent in 2015, share of manufactured exports in total merchandise exports was 2.92 per cent in 2015, and level of capacity utilization in the sector stood at 53.6 per cent in 2015. Therefore, concerns arise as to what the effect of freer trade is on performance of manufacturing in Nigeria. This study sought to analyze the effects of trade liberalization on performance of the manufacturing sector in Nigeria by specifically determining the effects on firm productivity, exports, and competitiveness. To address the specified objectives, the study made use of the quarterly firm-level data from the survey of manufacturing industry in Nigeria for the period 2008 to 2010. The data reported information for firms in organized cohorts based on their location, industry activity and size characteristics. Appropriate Fixed Effects and Random Effects estimation techniques were employed for the analysis. The results obtained are indicative of the position that whereas the import aspect of trade liberalization impedes productivity, the exports component enhances productivity. Thus, measures aimed at encouraging exports would be relatively more effective in improving productivity. Also, the findings show that higher productivity does not influence the decision on whether or not a firm would participate in exports, but higher productivity increases the share of exports in total sales for firms that are already participating in foreign markets. Furthermore, the results provide some evidence on the import discipline effect of trade liberalization thereby attesting to the notion that trade liberalization is a channel through which the competitiveness of firms in the manufacturing industry in Nigeria can be improved upon. Based on the findings, it is important that the government engages in more bilateral and multilateral trade negotiations, and establish certification centres across the country to expand exports. Also, it is necessary that the Nigeria Export Processing Zones Authority continue the expansion of free trade zones to encourage exports of local produce.Additionally, exporting firms should invest in the development of their human capital to improve the productivity of their employees towards increasing their share of exports in total sales. These measures are essential if trade liberalization is to enhance performance in the manufacturing sector in Nigeria.

CHAPTER ONE

INTRODUCTION

1.1 Background

1.1.1 Historical Perspectives of Global Trade Liberalization

International trade has existed through much of history and the motivation is hinged to the fact that the distribution of natural, human, and capital resources varies across economies. Different technologies or allocations of resources are required for the efficient production of various kinds of traded goods services. Moreover, preferences for traded goods and services also differ between countries. As a result, international trade has provided the means through which countries have expanded their range of available goods and services and made up for those goods and services in which they are not better off producing. This has resulted in an increasing web of linkages in markets providing new possibilities for upgrading economic activities. It has allowed for worldwide sourcing strategies, which offers new scope for firms to participate in the global market, and also supplying many goods and services on a competitive basis. This interaction of countries in the world economy has been suggested to be an important avenue for countries to promote economic growth and development (Rondinelli, 2003).

Foremost in the drive for and shaping of the world trading system is the spread of industrialization from Europe, to the Americas, Asia and Africa; and the enormous technological advances in transportation and communications which have steadily led to reduction in the cost of moving goods, technology, capital, and people around the world (Cairncross, 1997). Developments such as the invention of steamships, construction of

railroads and innovation of telegraphs, automobiles, airplanes and the internet have all contributed immensely to making the world a "global village". These have expanded the horizon of international trade. While the early development of international trade specifically, from the 16th up to the 20th centuries were barely influenced by trade liberalization, by the second half of the 20th century trade liberalization took the center stage in international trade (WTO, 2013).

The earliest activities in the direction of trade liberalization can be traced to the period between the 1820s and the 1840s of which, freer trade occurred based on bilaterally agreed reciprocal tariff reductions where agreements with other nations on mutual tariff reductions were done. However, from the late 1840s leading to the start of the second half of the 20th century countries began to unilaterally take decisions on reducing barriers on trade. Notable in this regard, is the repeal of the Britain's Corn Laws in 1846 which ended the country's use of tariffs previously put in place to protect its agriculture and industry from foreign competition. By that action, the country acted independently in reducing import duties. This followed partly from the failure of Britain to obtain acceptable reciprocity agreements with other countries that were wary of allowing their domestic markets to be dominated by its leading industries. In addition, the new stance of policy was believed to boost the country's prosperity through cheap imports as consumers benefit and business costs are reduced. (Howe 1997; 1998; WTO 2007).

After the Second World War, political and economic cooperation that sought reductions of trade barriers across countries led to the creation of the General Agreement on Tariffs and Trade (GATT) in 1947. GATT was to be the formal institution to preside over trade

among countries and lend a hand to iron out the potential difficulties that might arise. The establishment of GATT gave increased impetus to the considerable liberalization of world trade and aided the continuous growth of international trade (WTO, 2013).

GATT was a set of multilateral trade agreements directed at reducing trade barriers by lessening tariff duties and eliminating quotas among contracting countries. It sought to ensure that trade among member nations were conducted without discrimination. Member nations were to open their markets equally to every other member. Under GATT, an agreement between any two member countries of GATT to reduce a tariff would automatically be extended to every other member. This was referred to in the Most Favoured Nation (MFN) clauses (GATT, 1994). Furthermore, GATT contained a long list of precise tariff concessions for each contracting nation, representing tariff rates that each country had agreed to extend to others. It also preferred the use of tariffs to import quotas or other quantitative trade restrictions for protection; it consistently pursued the elimination of the latter. GATT included other general rules such as the uniformity in customs regulations and the requirement of each member nation to negotiate reductions in tariffs on request by another. Even so, whenever trade concessions lead to excessive losses to domestic producers, GATT made provision for an escape clause allowing contracting nations to alter agreements through tariff adjustment (GATT, 1994; WTO, 2013).

Within the framework of GATT, there have been 8 rounds of multilateral trade negotiations (MTN) conducted; the Geneva Round of 1947, Annecy of 1949, Torquay of 1950 – 1951, Geneva of 1956, and Dillon of 1960 – 1961; which discussed a

common external tariff for the European Economic Community (EEC) countries. The other rounds were the Kennedy Round of 1963 – 1967 where deliberations on the formula for tariff reductions with negotiated exceptions was considered, Tokyo Round of 1973 – 1979, and Uruguay Round of 1986 – 1994. Noteworthy, is that the negotiations in the first five rounds were led by the industrialized countries before other members were incorporated. In contrast, greater participation by developing countries was witnessed in the last three rounds. The Uruguay (8th) Round which culminated in the Marrakesh Agreement in 1994 led to the creation of the World Trade Organisation (WTO) in 1995, which replaced GATT. Under WTO, trade rules were extended to areas including agriculture and services previously considered difficult to liberalize. The opening to trade of the markets in these sectors, which were the most distorted and closed, was perceived to be the future path to raising living standards, and achieving sustainable development (William, 1995; WTO, 2007).

The WTO's major objectives included providing a medium for negotiating and monitoring further trade liberalization in countries, determining and implementing rules for international trade, and resolving trade disputes. Other key objectives were increasing the cooperation with other major international economic institutions involved in global economic management, transparency of decision-making procedures, and assisting developing countries take full advantage of the global trading system (WTO, 2015). The membership in WTO has grown over the years; from 119 countries at inception in 1995 to 164 countries in 2016. In addition, 21 countries are currently negotiating WTO membership. Trade negotiations among WTO members have

continued to influence reductions in tariff levels, and the dismantling of non-tariff barriers to trade, such as licenses, quotas and technical specifications (WTO, 2017).

Under WTO, the first Round of trade negotiations was launched in 2001; referred to as the Doha Development Agenda or the Doha Round. The aim of this round was to realise a reform of the international trading system through revised trade rules and the introduction of lower trade barriers. The central elements of the agenda related to issues on agriculture and services, of which, previous negotiations in these areas that began in 2000 were brought into it. However, since the start of the Doha Round negotiations, significant multilaterally negotiated outcomes were only reached in 2013 (The Bali Package) and 2015 (The Nairobi Package). The "Bali Package" of 2013 became the first major agreement among WTO members since its interception. It provided for the enhancement of least-developed countries' trade and general development, and allowed developing countries more options for providing food security. To this end, a political commitment was made to reduce export subsidies in agriculture to low levels, and to lessen the obstacles to trade when agricultural goods are imported through quotas (WTO, 2014; WTO, 2016).

The "Nairobi Package" of 2015 consisted of a series of decisions on agriculture; including a decision to end export subsidies, and issues related to least-developed countries. Hence, developed countries in the WTO soon removed export subsidies, with exceptions only for a few agriculture products, and developing countries are expected to do same by 2018. However, in the case of developing countries in the WTO, they were permitted some flexibility in order to cover the marketing and transport costs for

agriculture exports which is to last up to the end of 2023. On the other hand, additional time was given to the poorest and food-importing countries in WTO to end export subsidies (WTO, 2016).

Future negotiations of the Doha Round are expected to center on the remaining issues where substantial progress has not been made. Notable in this regard, is the negotiation on increasing market access for non-agricultural products ranging from manufactured goods to fuels and fisheries. The discussions here are intended at reducing tariffs and non-tariff barriers to trade, mostly on goods of export interest to developing countries. Also, WTO members are expected to continue with successive rounds of negotiations of the General Agreement on Trade in Services (GATS) within the Doha Round towards progressively liberalizing trade in services (WTO, 2017).

The formation of various Regional Trade Agreements (RTAs) have also contributed considerably to trade liberalization. The RTAs have been in the form of Free Trade Areas (FTAs) and Custom Unions (CUs). Some of the RTAs established over the years include: Association of South East Asian Nations (ASEAN) in Asia, and Gulf Cooperation Council (GCC) in the Middle East; Andean Common Market (ANCOM) in Latin America; and North American Free Trade Area (NAFTA) in the Americas. Others are; European Free Trade Association (EFTA), and European Union (EU) in Europe; and South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA) in Oceania.

In Africa, the proliferation of RTAs was mainly an offshoot of two major events; the Lagos Plan of Action (LPA) of 1980 and the 1991 Abuja Treaty. The LPA followed the

quest of Africa to achieve significant growth away from a position of economic stagnation and increased susceptibility to the economic and social crises suffered by the industrialised countries. Thus, an extensive regional approach to the restructuring of the continent's economic base established primarily on collective self-reliance was put forward. This was to evolve through five stages of regional economic integration including: free trade area; customs union; a common market; monetary union; and eventually an economic community with a possibility of attaining a political union (UNECA, 1995).

The 1991 Abuja Treaty was a step towards actualising the objectives of the LPA. A major goal of the Treaty was to ensure the realisation of the Africa Economic Community (AEC) for national and collective self-reliance by consolidating the different regional schemes. This was to be achieved through the creation of an African Common Market that would lead to the AEC. Other goals of the Abuja Treaty included effecting a structural transformation of industry and increasing of trade in industrial products as well as enhancing regional and continental economic integration aimed at the promotion of overall social and economic development of African States (UNECA, 1995).

Increased regional cooperation and integration called for by both the LPA of 1980 and the Abuja Treaty of 1991 led to the setting up or strengthening of sub-regional organizations including the Community of Sahel-Saharan States (CEN-SAD), the Common Market for Eastern and Southern Africa (COMESA), and the East African Community (EAC). Others are the Economic Community of Central African States

(ECCAS), the Economic Community of West African States (ECOWAS), the Southern African Development Community (SADC), and the Arab Maghreb Union (AMU).

The formation, expansion or deepening of the RTAs by countries has been ongoing and from about 76 established or modified RTAs in 1998, the number has risen with 319 notifications for formation, expansion and deepening made to WTO in 2012. The RTAs have contributed to world trade with over 50 per cent of trade estimated to be covered by these agreements (WTO, 2013). The RTAs continue to facilitate international trade by supporting non-tariff barrier-free and duty-free trading environment. In some cases, their scopes extend beyond the objectives covered by WTO agreements to include competition, investment, and government procurement (UNCTAD, 2012).

The developments in the direction of freer trade between economies have led to a considerable increase in the growth of world trade proportional to world output. Figure 1.1 shows the trends in the average annual growth rates of world merchandise trade volume (imports and exports) and real GDP over the period 1980 – 2015.

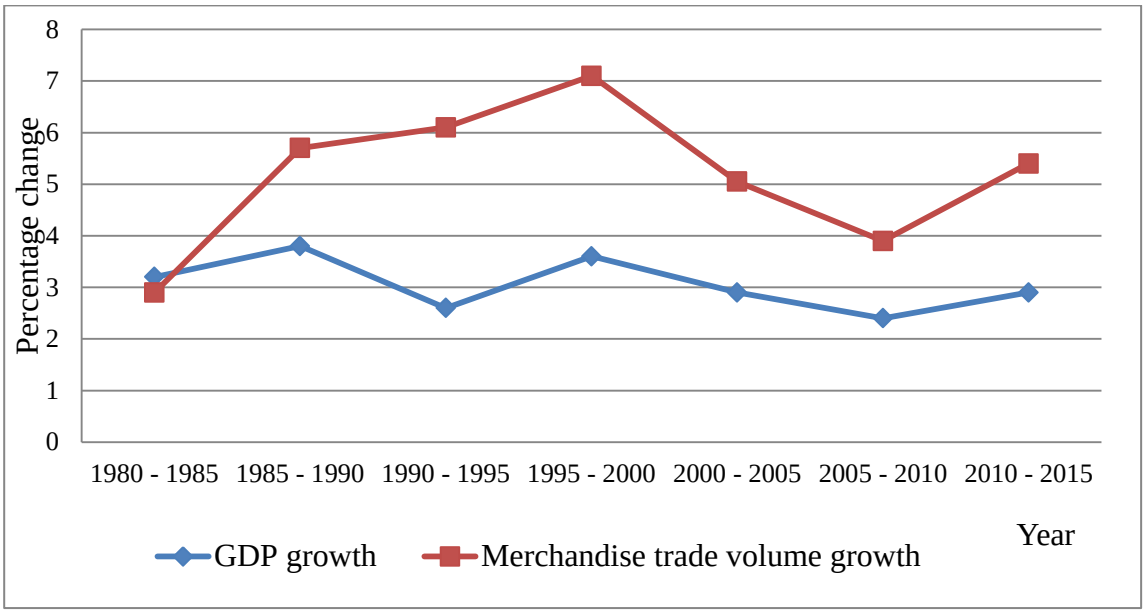

Figure 1.1 Trends in world merchandise trade volume and real GDP, 1980 – 2011 (annual percentage change).

Source of data: World Bank (2016).

The rate of growth in global output as measured by GDP and world merchandise trade volume was nearly the same in the first half of the 1980s; at around 3 per cent per year. Nevertheless, from 1985 to 1995 while the former decline from 3.8 per cent to 2.6 per cent the later went up from 5.7 per cent to 6.1 per cent. However, from 1995 to 2015, world output and world trade in terms of growth seemed to move in the same direction; growth in world real GDP improved and fell with the increase and decline in the growth of world merchandise trade, suggesting that trade is a channel for increasing productivity.

1.1.2 Trade Policies in Nigeria

Prior to 1980 only a few countries embraced free trade policies, amongst which were Japan, Hong Kong, Singapore, South Korea, and Taiwan (Hammouda, 2004). By 1990

a greater number of countries including; Chile, Ghana, Uganda, Kenya and Nigeria had begun liberalizing trade (Mwaba, 2000). The lessening or removal of barriers to the free exchange of goods among nations that ensues from the liberalization of trade widened possible opportunities available to countries for the upgrading of their economic activities, including the development of manufacturing.

Since 1960 Nigeria's trade policy, as observed by Adenikinju (2005), has gone through periods of high protectionism to its current more liberal stance. From 1960 up to the mid-1980s measures such as high import duties and quantitative restrictions were used to support trade policy which was intended to protect local manufacturing industries. This direction of policy was informed by the Import Substitution Industrialization (ISI) and indigenization policy of government towards developing the industrial sector. The design of trade policy in this era was to support domestic production by the discrimination in favour of capital goods against consumer goods.

Between 1985 and 2000, Nigeria's trade policy shifted significantly towards greater liberalization of trade and the pricing system. This was intended at diversifying the export base of the country as well as adding value to the export of agricultural produce (Adenikinju, 2005). The adoption of the International Monetary Fund/World Bank's Structural Adjustment Programme (SAP) in 1986 remarkably influenced the freer posture of international trade in this era.

The introduction of SAP in Nigeria was in response to the economic problems brought about by the collapse of oil prices in the international market in the early 1980s, and the subsequent lowering of the country's Organisation of Petroleum Exporting Countries

(OPEC) output quota. Plummeting crude oil export revenues led to a sharp decline of Nigeria's public finances and balance of payments. As a result, the economy went into recession with a GDP growth of –5.37 per cent in 1983, and –5.18 per cent in 1984 (National Centre for Economic Management and Administration, 2004). Moreover, the worsening state of the economy manifested in shortage of foreign exchange, rising unemployment, and balance of payments deficits and debt crises. SAP was therefore aimed at substantially reducing the dependence on imports while enhancing the non-oil export base through changing and realigning the pattern of aggregate domestic expenditure and production in a bid to restore the steady and balanced growth of the economy (Federal Government of Nigeria, 1986; 1990).

The implementation of SAP led to the removal or abolition of the import and export licensing system, bureaucratic controls on trade, as well as foreign exchange control on all current transactions. In addition, to enhance access to foreign raw materials and intermediate goods for use by exporting firms in the manufacturing sector the duty drawback/suspension scheme was introduced (Omoke, 2007). Also put in place was the Second-tier Foreign Exchange Market (SFEM) allowing market forces determine the exchange rate of the naira. This price determination mechanism ended the use of administrative discretion in the allocation of foreign exchange to end-users (Analogbei, 2000). SAP in Nigeria which was initially intended for the period 1986 – 1988, spanned up to the 2000s, and it has continued to influence policy in recent time.

From 2001 to 2012, international trade was progressively liberalized with emphasis placed on private enterprise-led development and diversification of the export base, in a

bid to enhance non-oil foreign exchange earnings. Accordingly, the major thrust of Nigeria's trade policy was the support of production and distribution of goods and services for both the domestic and international markets with the intention of achieving enhanced economic growth and development. As outlined by Federal Government of Nigeria (2001), amongst the overall objectives of trade policy were: integrating the Nigerian economy into the global market by establishing a liberal market economy; progressive liberalization of the import regime to increase competitiveness of domestic industries; diversification of exports as well as promoting exports in both traditional and non-traditional markets; and enhancing the attainment of national economic gains from regional bilateral arrangements and multilateral trading systems through effective participation in trade negotiations. Other objectives included: putting in place special incentive packages to attract foreign capital inflow into production focused on exports; and promoting the transfer, acquisition and adoption of suitable and sustainable technologies to assure competitive export oriented industries.

The 2013 trade policy sustains Nigeria's commitment to the tenets of trade liberalization as a channel to achieving industrialization and development. The policy outlined three strategic objectives including the advancement of domestic trade through the reduction of the cost of doing business by providing trade related infrastructure, and reducing multiple taxes; and promoting regional trade by ensuring speedy haulage of cargo within ECOWAS, improving standards of products, formalizing informal trade along Nigerian borders, and abiding by the ECOWAS Common External Tariff (CET). Also, international trade was to be supported through the opening up of new exports

markets for the country's value-added products while sustaining existing markets for non-oil exports (Federal Government of Nigeria, 2013).

1.1.3 ECOWAS and Trade Liberalization

ECOWAS was established following the Lagos Treaty of 1975 with the goal of forming a unified economic zone in West Africa through the promotion of economic cooperation and integration, and political stability and regional security. Fifteen countries make up the ECOWAS member states. These are Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea Conakry, and Guinea Bissau. Others are Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Despite its early creation, between 1975 and 1990, the ECOWAS regional integration process progressed only slowly. However, following the Abuja Treaty of 1991 the drive towards the actualisation of the ECOWAS plan for regional integration received a significant boost. Hence, the Lagos Treaty of 1975 setting up ECOWAS was revised in 1993. The 1993 Revised Treaty of Lagos ratified the adoption of the ECOWAS Trade Liberalization Scheme (ETLS) within the sub-region. The ETLS was to develop through four stages; the creation of FTA, CU, a Common Market and, eventually, an Economic and Monetary Union (Group of the Autonoma University of Madrid, 2014).

The ETLS was a strategy towards allowing for the free movement of goods among member states through total removal of customs duties and taxes, elimination of non-tariff barriers, and the establishment of a Common Customs External Tariff. These plans have largely been achieved with the FTA and CU currently in place. Within the community, tariffs on goods from member states have been eliminated, although

complex processes relating to conflicting customs systems and procedures, rules-of-origin of products, problems with insurance and bond guarantees on transit cargo, and other trade barriers such as road blocks and demands for informal payments, have continued to frustrate the FTA's aims (AfDB, 2011).

The CU was realised with the adoption of the ECOWAS CET on 1st January 2008. The ECOWAS CET has a 5 band structure including; a 0 per cent import duty on basic social goods as the first category, and a 5 per cent import duty applied on basic essential goods, raw materials, capital goods and specific inputs in the second category. The third group, for intermediate goods attracts an import duty of 10 per cent; the fourth category which applies to finished goods has an import duty of 20 per cent, and the fifth band attracts an import duty of 35 per cent on finished goods in industries which government needs to protect to encourage domestic production (ECOWAS, 2013). With the ECOWAS CET in place member states apply the same external tariff rates to imports coming from outside the ECOWAS region. The tariff regimes of Nigeria since 2008 have incorporated substantially the ECOWAS CET.

1.1.4 Performance of Manufacturing in Nigeria

The general belief is that, in manufacturing lies the main instrument of rapid growth, structural changes and self-sufficiency (Anyanwu, 1993). Thus, the manufacturing sector in Nigeria has been assigned the crucial role of driving the needed growth and development of the economy. Additionally, the sector has been assigned the major task of transforming the economy away from overdependence on crude oil, and an import dependent economy to a diversified and export oriented economy (Federal Government

of Nigeria, 2001). The country's foreign trade comprises of oil dominated export and non-oil commodities dominated imports. The crude oil and gas sector accounted for over 95 per cent of the earnings from exports in 2011 and 68.88 per cent in 2015. The sector contributed 14.8 per cent to GDP in 2011 and 14.4 per cent in 2015. On the other hand, the share of the non-oil imports in total merchandise imports was 70.26 per cent in 2011 and 81.87 per cent in 2015 alongside its share in GDP of 19.22 per cent and 16.11 per cent in 2011 and 2015, respectively (Nigeria National Bureau of Statistics, 2016).

Relying on crude oil alone portends great risk to the economy as the international market for crude oil is often characterized by price volatility which often affects economic aggregates considerably. Oriakhi and Osaze (2013) put forward the view that crude oil price volatility has a substantial effect on the exchange rate of the naira owing to the fact that crude oil export earnings accounts for about 90 per cent of Nigeria's foreign exchange and thus ultimately determining the country's amount of foreign reserves. Hence, periods of fall in crude oil price have been associated with cuts in budgeted revenue and expenditure. Moreover, the industry employs the use of capital intensive processes which do not support employment generation in the economy.

The manufacturing sector provides the base in which the relative importance of fossil oil to the economy of Nigeria can be reduced; through its potential to advance activities in the secondary and tertiary sectors. In addition, a developed manufacturing sector ensures the enhancement of the economy's productive capabilities to provide an increasing range of manufactured goods thereby decreasing reliance on imports and

providing for diversified exports. This can only be achieved with enhanced productivity and competitiveness of domestic firms as well as improved exports of manufactured goods.

Productivity in the Manufacturing Sector in Nigeria.

Possibly as a result of the complexities involved in constructing productivity index, and the scarceness of collected data on the manufacturing sector there is little or no data on productivity levels of the sector in the Nigeria particularly, a time series one. In the absence of data on productivity in the sector, a "second best" option is considered herein; the manufacturing sector's contribution to GDP. The contribution of manufacturing to GDP indicates the value-added in the sector at any given time hence; increase in this share should partly be driven by a rise in the sector's productivity levels. Figure 1.2 shows the trend of the contribution of manufacturing to GDP between 1981 and 2015.

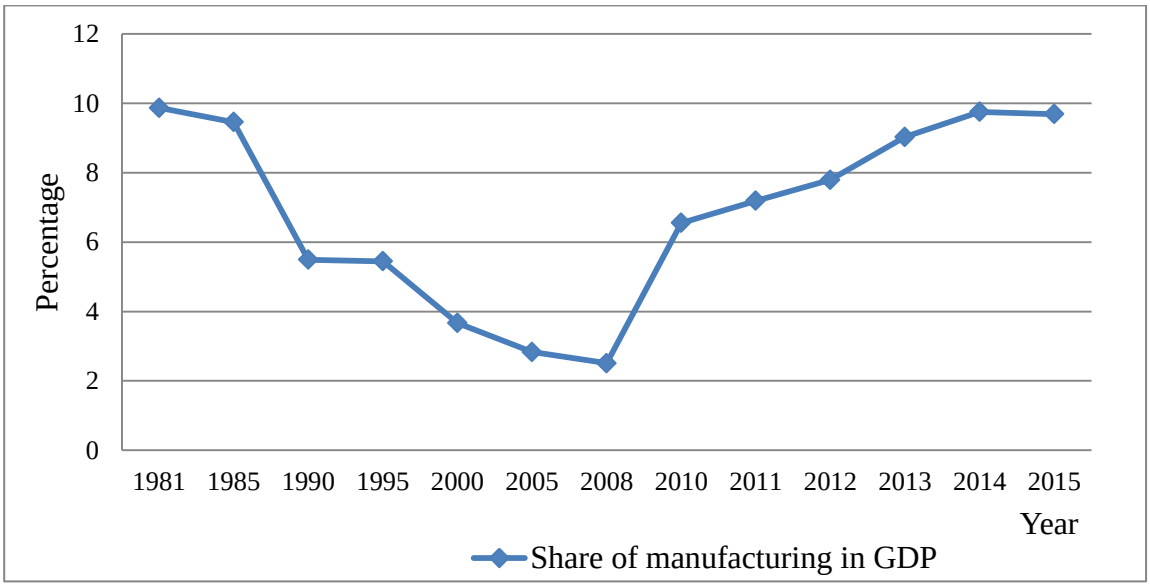

Figure 1.2 Manufacturing Sector contributions to GDP in Nigeria (per cent). Source of data: World Bank (2016).

The share of manufacturing in GDP which was 9.87 percent in 1981 fell to 5.5 per cent in 1990, and remained relatively stable up to 1995 but declined further to 2.51 per cent in 2008.The downward trend of the contribution of the sector to GDP may reflect the emerging role of crude oil in the economy from the early 1980s to its dominance in the economy as the major revenue earner by the early 2000s (Iwuagwu, 2009). Beyond 2008 the manufacturing sector's share in GDP was increasing, and by 2015 it attained 9.69. This could have reflected the renewed effort of government in meeting some of the infrastructural needs in the sector, notably electricity. Nonetheless, the contribution of manufacturing to GDP has fallen short of the anticipated 25 per cent target set for 2010, and the 9.69 per cent reached in 2015 is disappointing given the 23.36 per cent mark expected by 2020 (Federal Government of Nigeria, 1997; 2009).

Exports of Manufactured Goods in Nigeria.

In terms of the performance of manufactured exports, Nigeria has experienced fluctuations as shown in figure 1.3

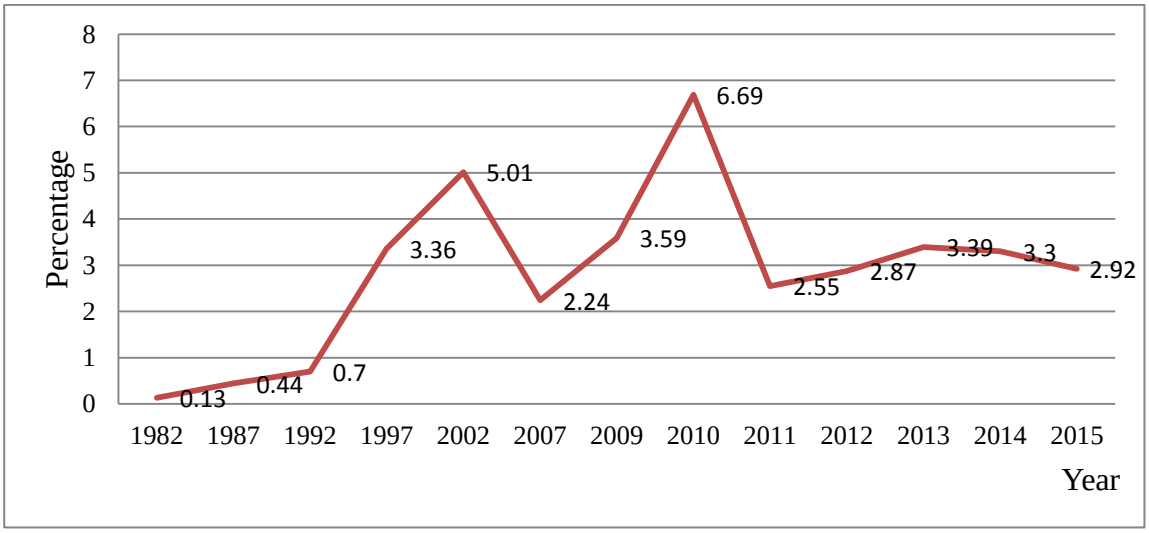

Figure 1.3 Shares of manufactured exports in total merchandise exports in Nigeria (1962– 2015).

Source of data: World Bank (2016).

The manufactured exports share in total merchandise exports increased marginally in the 1980s through to the early 1990s; rising from 0.13 per cent in 1982 to 0.7 per cent in 1992. Then, a remarkable rise began in 1992 and reached 5.01 per cent in 2002. The rise in manufactured exports share in total merchandise exports over this period was perhaps as a result of an expansion in the sector's output possibly due to the renewed efforts by the government to revamp manufacturing activities following the collapse of oil prices in the early 1980s, and the role played by the introduction of the ETLS in reducing trade cost across the West African region (Federal Government of Nigeria, 2004). Beyond 2002 the performance of Nigeria's manufacturing exports fluctuated; from 5.01 per cent

in 2002 to 2.24 per cent in 2007 then to 6.69 per cent in 2010. There was a decline in the share of the manufactured exports in total merchandise exports of 4.14 per cent to 2.55 per cent in 2011, but a marginal improvement to 3.39 per cent in 2013, and again a decline to 2.92 in 2015. Riman, Akpan, and Duke (2012), and Emeka, Oganna, Chinyere, and Idenyi (2016) suggested that such fluctuation may have been tied to the often neglect or sometimes abandonment of government policies in the sector especially in terms of provision of infrastructural support. On the average, the share of manufactured exports in total merchandize export has remained below the target of 8 per cent set for 2010, and far less than the anticipated 35 per cent set for 2020 (Federal Government of Nigeria, 1997; 2009).

Competitiveness in the Manufacturing Sector of Nigeria.

Competitiveness in the manufacturing industry can be captured by the capacity utilization levels in the industry. This is because the larger the number of firms producing for an industry the lower their markups. To raise their profits, firms will engage more intensely resources available to them; this process continues as competition increases, resulting to high levels of capacity utilization in the industry. Figure 1.4 shows the capacity utilizations of firms in the sector between 1970 and 2015.

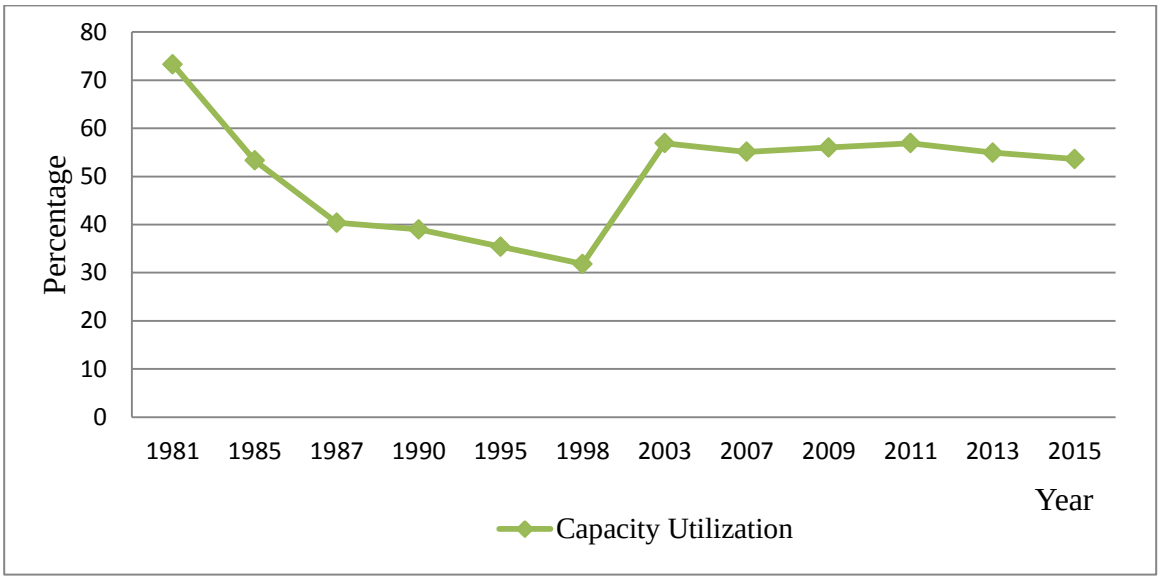

Figure 1.4 Nigeria's manufacturing sector capacity utilizations.

Source of data: Chete *et al.* (2014); NBS (2016).

Manufacturing capacity utilizations fell consistently from 73.3 per cent in 1981 to about 32 per cent in 1998. The downward trend could have been due to the neglect of the manufacturing sector as a result of Nigeria's over-reliance on the oil sector as source of foreign exchange. Therefore, fall in the price of crude oil in the international market beginning in the early 1980s led to paucity of foreign exchange required by firms to obtain vital inputs from abroad. Hence some firms were forced to shed capacity. Moreover, this could have become evident because of the illogical pursuance of the Import Substitution Industrialization (ISI) strategy, which should have led to the domestic production of industrial raw materials to substitute imported inputs (Rodrik, 2007).

Nonetheless, capacity utilization in the manufacturing sector improved from 31.8 per cent in 1998 to 56.9 per cent in 2003 and remained relatively stable up to 2015 with an average of 55.6 per cent. The improvement could have been brought about by renewed

efforts of the government in meeting some of the infrastructural challenges faced by firms in the sector, particularly improved electricity (Okonjo-Iweala & Osafo-Kwaako, 2007). Even so, the capacity utilization level did not attain the 60 per cent target set for 2010, and the 53.6 per cent mark attained in 2015 falls short of the projected 85 per cent for 2020 (Federal Government of Nigeria, 1997; 2009).

1.2 Statement of the Problem

Nigeria has over the years implemented considerable trade liberalization measures including reductions in the average tariff rates and effective rates of protection as a means to achieving industrialization of which manufacturing is key. This has arisen from the need to promote a diversified economy as relying on crude oil alone portends great risk to the economy. Nonetheless, performance indicators in the manufacturing sector have remained low. For instance, the anticipated targets set for 2010 of 25 per cent, 8 per cent, and 60 per cent for the share of manufacturing in GDP, share of manufactured exports in total merchandise exports, and manufacturing sector capacity utilization respectively, were not realized. Instead, only 9.69 per cent average manufacturing share in GDP, 2.92 per cent share of manufactured exports in total merchandise exports, and 53.6 per cent manufacturing capacity utilization were attained in 2015 (Chete *et al.*, 2014; Federal Government of Nigeria, 1997; World Bank, 2016).

From 1985 up to the 2000s Nigeria's trade policy has been liberalized with the expectation of a positive effect of increasing the share of manufacturing in GDP, share of manufactured exports in total merchandise exports, and manufacturing sector capacity utilization in line with the government's projections of the year 1997 for the

year 2010. Therefore, given the specified indicators on performance in 2015, concerns arise as to what the effect of freer trade is on performance of manufacturing in Nigeria.

From the survey of literature, Adenikinju and Chete (2002) provided firm level evidence on the effects of trade liberalization on productivity in the Nigerian manufacturing sector for the period 1988-1990. Beyond 1990, deliberate steps have been undertaken by the government of Nigeria towards greater liberalization of trade whose intended effects is unknown, necessitating additional research. On the influence that productivity has on firms' participation in foreign markets the study by Rankin, Soderbom, and Teal (2006) on Sub-Saharan Africa, found that participation in exports was associated with higher productivity. Nevertheless, their study provides evidence only for the influence of productivity on the probability of exporting but, not on the share of sales exported. Furthermore, while studies by Goldar and Aggarwal (2005), Wong (2007), and Sheikh and Ahmed (2011) supported the import-discipline hypothesis for India, Ecuador and Pakistan, respectively, evidence on this relationship is not available in the case of Nigeria.

Therefore, this study attempted to address the stated gaps by testing the effects of trade liberalization on productivity and competitiveness of manufacturing firms, along with estimating the influence of productivity on the share of sales exported using firm-level data.

1.3 Research Questions

The study sought to provide answers to the following questions:

i. What are the effects of trade liberalization on productivity of manufacturing firms in Nigeria?

ii. How has the level of productivity influenced firms' export participation in the manufacturing industry of Nigeria?

iii. What is the effect of trade liberalization on competitiveness of manufacturing firms in Nigeria?

1.4 Objectives of the Study

The overall objective of this study was to investigate the effects of trade liberalization on the performance of the manufacturing sector in Nigeria. The study sought to empirically establish the inter-relations between policies aimed at liberalizing trade and manufacturing performance in the Nigerian economy.

The specific objectives of the study were as follows:

i. To determine the effects of trade liberalization on productivity of manufacturing firms in Nigeria.

ii. To examine the influence of productivity on firms' export participation in the manufacturing industry in Nigeria.

iii. To evaluate the effect of trade liberalization on the competitiveness of manufacturing firms in Nigeria.

1.5 Significance of the study

Manufacturing is a key sector in an economy. It has been strategic to the wealth creation of developed economies. Through its strong forward and backward linkages with other sectors of the economy, manufacturing is able to raise the general level of economic

activities. Given Nigeria's quest to develop the sector, a study intended at finding out how trade liberalization affects performance of the manufacturing sector is of particular interest, as the findings have implication as to whether the policy path (liberalization) taken is rewarding and worth sustaining. The results of this study provides useful insights to Nigeria's Federal Ministry of Trade and Investment in handling the country's bilateral and multilateral trade negotiations, and guides the Federal Ministry of Finance in managing tariff administration in the country. Also, the findings of the study are relevant to the Manufacturers Association of Nigeria (MAN) as it offers important alternatives to improving the activities of firms. More so, the study sought to add to the existing literature on the association between trade liberalization and manufacturing performance in Nigeria.

1.6 Scope of the Study

This study mainly investigated the effects of freer trade on performance of Nigeria's manufacturing sector. Three sub-sectors, namely, the Foods, Beverages and Tobacco; Non-Metallic Mineral Product; and the Woods, Wood Products and Furniture were considered. The study covered the period, 2008 to 2010. This range falls within the period when international trade in Nigeria is adjudged liberalized. In addition, the period under review provided documented and reliable data on the variables employed in the study.

1.7 Organization of the Study

The thesis starts by providing an overview of the background of the study focusing on the factors that have shaped world trade and regional trade, various trade policy reforms

undertaken by Nigeria, the ECOWAS trade liberalization scheme, the performance of the manufacturing sector in Nigeria, in addition to specifying the research questions. Chapter two undertakes a review of the theoretical literature on productivity, exports, and competition, along with theories of trade as they relate to performance. The chapter also made a review of the empirical literatures related to the specified research questions to identify gaps to be filled. Chapter three presents the methodology employed in addressing the objectives of the study. It provides the research design used in the study, the theoretical frameworks in which the study was based on, and a description of the sources and nature of the data used. In chapter four, results from the data analyzed are presented as well as discussed, as it relate to the thesis focus. Lastly, chapter five provides a summary of the study, the conclusions reached, alongside the policy implications for Nigeria based on the study findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter undertakes an examination of the theoretical and empirical domain of the association between trade liberalization and industrial development. It begins with the review of theories of production, exports, and competition. Then, trade theories from the context of their early development to their modern state were reviewed in an attempt to explain the theoretical arguments of the link between trade liberalization and performance of manufacturing. Next, a review of empirical evidence on such relationship was carried out. Thereafter, a synopsis of the evidence from practice on the link between trade liberalization and manufacturing performance was undertaken with a view to identifying the gaps in literature.

2.2 Theoretical Literature

2.2.1 Theory of Production

Production refers to the process by which inputs are transformed into outputs. In economics, inputs may generally be considered to include labour, capital, and intermediate inputs. Firms make choices on various combinations of these inputs to produce outputs conditional on their technical production possibilities (Jehle & Reny, 2011). The quantity produced by a firm as well as how it may be produced is based on the production technology. The production technology specifies the feasible set of outputs that are obtainable with a given choice of inputs. Usually, the production function is used when describing the production technology. Assuming the case of a

firm producing a single product from many inputs, the production function is specified by:

$$Y = f(X) \qquad (2.1)$$

where Y represents the output of a particular product in a given period, and $X = (x_1, x_2 \dots \dots \dots x_N)'$ is an $N \times 1$ vector of inputs. The production function defines the maximum amount of output that can be produced with a given set of inputs, while holding technology constant at some predetermined state. Therefore, at the given state of technology the level of output can only be varied by changing the amounts of one or all inputs.

Brown and De-cani (1962) elucidated that the productivity of a single factor and/or the productivity relating to all factors can be assessed from the production function. The single factor productivity is often in terms of partial productivity indices of factors including labour, capital, and intermediate materials input indices. In literature, there are two concepts of single factor productivity that can be derived from the production function; marginal productivity and average productivity (Besanko & Braeutigam, 2010). The marginal productivity measure refers to the change in output resulting from an addition of one unit in the use of an input. It therefore represents the slope or rate of change in the production function as a result of an incremental change in the usage of a particular input while holding other inputs constant (Debertin, 2012).

In practice, amongst the single factor productivity analysis, the simple ratio of output to factor inputs (average) is a prevalent indicator to measure productivity at the industry

level. These ratios show the amount of output attributable to a unit of labour, capital and intermediate materials and if they rise, then the productivity of that factor (labour, capital or intermediate material) has increased. The inverse of these productivity ratios indicates for a firm the units of the factor used in producing one unit of its output. Increase in any of the partial productivity ratios implies high productivity, meaning that a large amount of output is produced with less of a particular input.

Most often, partial productivity for firms relate to output secured for a given amount of labour. In this case, productivity also denoted to as output-labour ratio, refers to physical volume of output attained per worker or per man-hour. Changes in output-labour ratio represent changes in the efficiency of labour as a factor input. The output-labour ratio would be influenced by among other factors, the skill of the work force, capital-labour substitution, and technical improvements.

Technological conditions may however change over time, an occurrence known as technological progress, and the production function may then shift. In this case, either greater output can be obtained with the same input set or the same output can be obtained with lesser inputs. Assuming the gross output based production function, this scenario can be depicted as in figure 2.1.

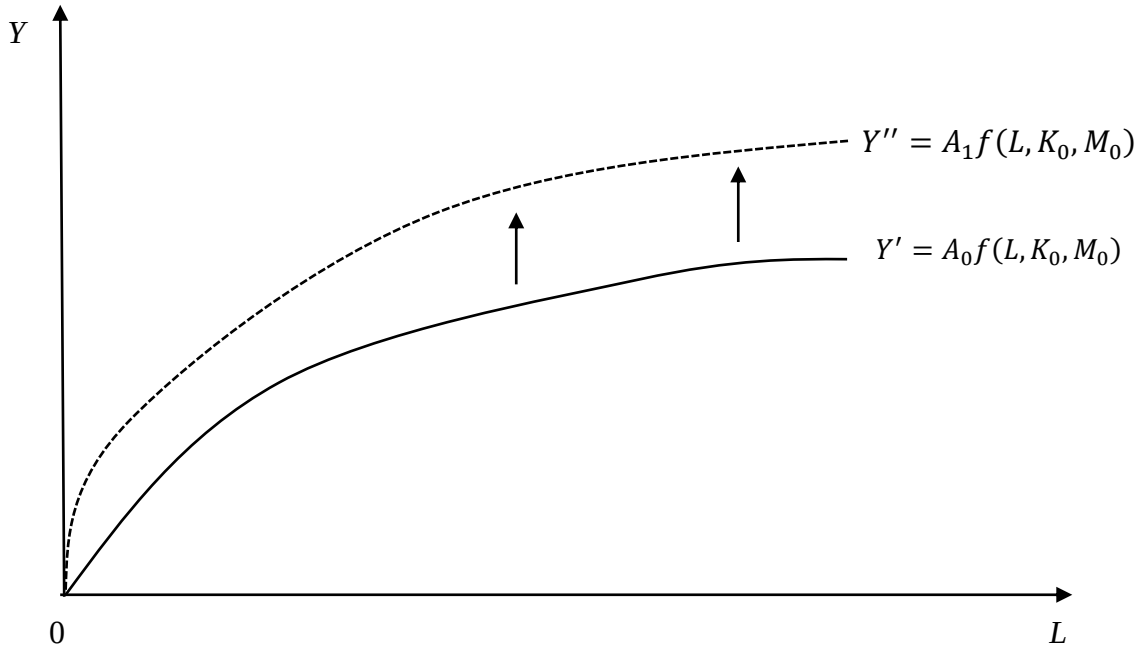

Figure 2.1 The effect of technological progress on Output.

Figure 2.1 shows that gross output Y, depends on labour input L, for given amounts of capital K, intermediate materials M, and technology A. Thus, gross output can be changed but, not beyond the feasible level Y', by only varying the amount of labour . Nonetheless, there may be a growth in output resulting to a shift in the production function from Y' to Y'', for the same given input combination, when technology improves from A_0 to A_1. The rate of growth in output, holding labour, capital and intermediate material inputs constant defines the rate of productivity growth and it is referred to as total factor productivity. The total factor productivity can be derived from the production function as follows:

$$Y = Af(L, K, M) \qquad (2.2)$$

Taking the total derivative of equation (2.2) with respect to time:

$$\frac{dY}{dt} = \frac{\partial Y}{\partial A} \cdot \frac{dA}{dt} + \frac{\partial Y}{\partial L} \cdot \frac{dL}{dt} + \frac{\partial Y}{\partial K} \cdot \frac{dK}{dt} + \frac{\partial Y}{\partial M} \cdot \frac{dM}{dt} \quad (2.3)$$

Without loss of generality, units can be chosen to normalize $\partial Y/\partial A = 1$ (Syverson, 2011). Thus, when observed inputs are fixed $(dL = dK = dM = 0)$, differential shifts in total factor productivity, dA, create changes in output dY. From the foregoing, total factor productivity measures the output per combination of all factor inputs over time hence, reflecting the efficiency with which all inputs are used in a production process.

The productivity measures were relevant to the present study as it built on and derived from the theory of production, by means of empirical production functions where the ratio of real output to individual real labour input were calculated to obtain labour productivity; and the real gross output in relation to all associated real inputs were estimated to obtain total factor productivity.

2.2.2 Theory of Exports

The theory of exports draws from the theory of profit maximization behavior where firms aim to maximize their residual income over and above normal profits. Firms select optimal combinations of factor inputs to produce output. A firm looks at the goods markets and decides what quantity of the final good to supply for every possible price, implying that a firm makes its scale decision given its costs and market price of the good. Assuming the case where the firm produces for both the domestic and foreign markets and that the firm faces perfect competitive markets for its output and factor inputs, it's revenues would be derived from the sales in both the domestic and foreign markets. Thus, its profit (π) maximization problem would be:

$$\pi(p^y, p^x, H) \equiv max\ [p^y \cdot Y + p^x \cdot X : (L, K, M,)] \quad (2.3)$$

where p^y is domestic price, p^x is export price, and H is the vector of factor inputs prices. Y and X indicate production for the domestic market, and exports respectively. L represents labour input, K denotes capital input, and M represents intermediate materials input, used in producing the firm's output at a given period. The firm maximizes profits by selecting the optimal quantity and allocating between the domestic and foreign markets; given factor market prices, the firm's technology, and the domestic and international goods prices. Assuming that π is differentiable, Hotelling's lemma can be used to derive the profit maximizing output to be sold in the domestic and export markets as follows:

$$Y = \frac{\partial \pi}{\partial p^y}(p^y, H): \quad \text{domestic supply function} \quad (2.4)$$

$$X = \frac{\partial \pi}{\partial p^x}(p^x, H): \quad \text{export supply function} \quad (2.5)$$

Whereas the domestic supply function is obtained by differentiating the restricted profit function with respect to p^y, differentiating the restricted profit function with respect to p^xyields the export supply function. The derived supply functions are functions of the goods price in the respective markets and the vector of factor input prices. Realized prices play an important role in determining the firm's production and allocation between domestic and foreign markets. While domestic price implicitly is all that is needed to capture domestic supply once a firm has selected its cost minimizing factor inputs, the "effective" (adjusted for exchange rate) price for exports is considered for the case of export supply. The amount of output allocated for export would depend on

the international price competitiveness of the country where the firm is situated. An appreciation of the domestic currency will imply a loss in price competitiveness which may result to a firm earning lower revenues from sales in foreign markets thus, negatively influencing export supply and vice versa.

The firm's production irrespective of the market where the goods would be sold negatively depends on factor input prices. The higher the costs involved in employing units of factor inputs, the less output will be produced. However, in the case of supply of goods in foreign markets the associated costs to the firm are not limited to factor input prices but, also trade costs; sunk and/or variable costs. While the sunk costs are typically linked to modifying domestic products for foreign consumption, searching markets, transportation, and the setting-up of foreign distribution channels; tariffs characterize the source of variation in variable trade costs. These costs are negatively related to the amount sold in foreign markets (Roberts and Tybout, 1997; Dalgic, Fazhoglu and Gasiorek, 2015).

In view of the role of trade costs across firms, the self-selection theory emerged (Bernard & Jensen, 1995). The theory posits that on average, firms that enter export markets have higher productivity, relative to non-entrants. Therefore, the internationalization plan of firms entails expansion to a position of strength in order to handle the difficulties of selling in export markets. This theory submits that, owing to the existence of sunk costs and/or variable costs of trading, and different productivity levels within the same industry, only the most productive firms are able to incur the costs associated with producing for the foreign markets yet make profits. The corollary

of this is that firms have to raise their productivity before they enter foreign markets. The contributions to the self-selection theory include the seminal works of Melitz (2003) and Bernard, Eaton, Jensen, and Kortum (2003).

According to Melitz (2003) additional costs for the firms selling in export markets referred to as sunk costs, are extra costs above that incurred when serving just the domestic market. They constitute entry barriers, and thus only the most productive firms self-select into exporting as only sufficiently high productive firms would be able to make adequate variable profits to offset the costs.

Bernard *et al.* (2003) advocated that self-selection into international markets ensues through variable trade costs regardless of sunk costs. The variable trade costs ensure that productive firms self-select into foreign markets. Therefore, firms update beliefs about their productivity as they consciously adopt measures to improve it and to overcome the higher entry costs of foreign markets. This is expected to generate a dynamic process where more productive firms tend to participate in both the domestic and export markets whereas less productive firms participate only in the domestic market. In this case, participation in exports is determined by a firm's productivity, and its size characteristics.

The self-selection theory was relevant to this study as the influence of productivity on exports participation of firms operating in the manufacturing industry of Nigeria was tested.

2.2.3 Theories of Competition

This section reviews theoretical literature on competition amongst firms. It begins with the Classical conception of competition to the Neoclassical and Marx views.

(i) Classical Theory of Competition

Classical economists including Smith (1776) and Ricardo (1817) viewed competition as a process of rivalry among firms in their continuous battle for survival. Accordingly, they envisioned that firm behavior may include predatory pricing, collusion, and advertisement in an attempt to increase their share of the market compared to rival firms. To the classical economists, competition is characterized by a particular belief of equilibrium which is governed by the costs of reproduction of goods and the center of gravity for market prices. The values of goods were taken to be dependent on the costs involved in their reproduction, and those costs in turn determine the center of gravity of market prices. The classical economists then argued that the center of gravity for market prices defines the point where actual prices fluctuate. The point of divergence between Smith (1776) and Ricardo (1817) centered on their perceptions on what constitutes the costs of reproduction of goods. Whereas Smith (1776) considered wages, profit to the investor, and rent paid to the landlord as factors of production, Ricardo (1817) upheld that the costs of reproduction of goods comprised of the direct and indirect costs of labour, thus changes in the spread of income among labour and capital determine relative prices.

In general, the classical economists analyzed competition based on variables reflecting production conditions. Competition was regarded as a process, not a state described by

means of free mobility of labour and capital, in consort with firms pursuing conflicting self-interests, but with attendant tendency of attaining the equalization of the rate of profit, together with that of demand and supply between industries. Accordingly, any high profitable industry will experience influx of firms together with more capital inflow, thereby resulting in demand falling short of supply. In this case, prices will fall until the excess profits are eliminated and the profit rates become more or less equivalent to the economy's average. Conversely, an industry with a profit rate lower than the economy's average will experience outflow of firms along with capital until the excess demand created increases prices, and successively profits rise nearer to the average rate in the economy. Thus, inter-industry profits rates always converge towards the economy's average in the long run. Shaikh (1980) and Semmler (1982) submit that this process results in different profit margins across industries, which is dependent on the production conditions including the capital-output ratios and labour cost differences.

The classical analysis therefore implies that competition is determined by the capital-output and the labour/intermediate input to output ratios. The more capital is employed per output unit, the more the production process is technologically advanced and hence, the better the chances for higher profits implying less competition. On the other hand, the ratio of labour/intermediate costs to output relates inversely with profits as lesser input usage suggests more efficiency in production and thus, the higher the profitability.

While the classical theory may be relevant in explaining competition amongst firms in an industry, it appears to be narrow in its conception. The theory leaves out important factors including the concentration within an industry and the barriers to entry. The

concentration within an industry shows the level of dominance of the market by leading firms, and the market entry barriers suggests less than free accessibility of the market to new firms. These factors are key in the analysis of competition in an industry.

(ii) Neoclassical Theory of Competition

Walras (1889) and Marshal (1890) both as cited in Tsaliki and Tsoulfidis (1998), pioneered the neoclassical discussion on competition. In their analysis, they both focused on comparing static equilibrium positions and their belief in the "law of one price" where firms were assumed to be price takers. Competition was regarded as an equilibrium state of relative tranquility that would prevail if there were free entry and exit of firms. The firm was assumed to be a distinct organizational unit that occupies an infinitesimal space in the total market such that it is unable to increase its profits by influencing market price as its actions will be exactly countered by an equal and contrary reaction from its rival. It is assumed that the competitive forces in play will ensure that prices and quantities always converge to equilibrium. Therefore, any exogenous distortion to supply and demand will be eliminated in the course of time. Even in such cases of innovation or the adoption of cost saving techniques by firms or a change in their structure, a new competitive equilibrium will emerge after a short adjustment time. Thus, equilibrium is always brought about by an unceasing process of convergence. Deviations from these idealized market conditions are considered to result in imperfect or monopolistic competition (Semmler, 1982).

The neoclassical view postulate that the intensity of competition is dependent on an industry's concentration allowing for a greater share of the market to be controlled by

leading firms, less inter-industry mobility of factors and collusion and coalitions among players in the market. In the case where there are a large number of firms, and less market entry barriers and collusion among firms, more competition will ensue. On the other hand, the fewer the firms, and the larger the market entry barriers and collusion among firms the more oligopolistic and monopolistic would be the behaviour of firms within and between industries (Tsaliki & Tsoulfidis, 1998).

The analysis of competition in the context of the neoclassical theory predicates that the convergence of prices and quantities and thus, profits to an equilibrium state is a phenomenon of perfect markets. In such a case, profitability of firms in the market would naturally be uniform. However, in other instances where market imperfections are present, abnormal profits will persist. Hence, profitability of firms would vary across industries as some prices would be higher than marginal cost. Therefore, the persistence of abnormal profits within a market would define the level of competition among firms in the market.

The neoclassical theory is relevant to this study as it helps to explain competition amongst firms in the manufacturing industry in Nigeria. The theory recognizes particularly, concentration and market entry barriers as competition parameters in an industry. Hence, in testing the effects of trade liberalization on competitiveness of firms the aforementioned variables were considered in the current study.

(iii) Marx Theory of Competition

In Marx's (1894) analysis as cited in Tsoulfidis and Tsaliki (2005), competition is seen to result in deviations and disequilibria from the center of gravity rather than a smooth

process of adjustment in which prices always converge towards an equilibrium. Furthermore, competition between and within industries is clearly distinguished. Between different industries, competition promotes the mobility of capital thereby resulting in a common level of profitability with different prices of production. When the profit rate exceeds the economy-wide average in an industry capital is attracted and the result is an accelerated capital accumulation, leading to a growth in the industry which is higher than the growth in demand. This brings down the market price and thus reducing the rate of profit in the industry closer to the general profit level. In contrast, when an industry's profit rate is lower than the economy's average there would be deceleration of capital accumulation, leading to less growth in the industry in comparison to its demand and thus market price rises, increasing the profit rate to the level of the economy's average. The analysis of competition across industries implies that profits rates are never zero since its spread around the economy-wide average occurs often.

Within industries, competition leads to the equalization of prices but with different rates of profits between firms. This follows because firms in an industry do not all use the same production techniques. Therefore, firms that are able to reduce unit costs by employing better techniques become more successful with larger profits. This justifies the differential rates of profit within an industry and this is not identical with, and does not imply imperfect competition (Semmler, 1982). Therefore, competition within industries is reflected in the struggle to make goods cheaper.

The analysis suggests that competition among firms between industries and within an industry, accounted for by the difference in profit rates is attributed mainly to the disequilibrium of supply and demand. In this case, excess demand increases the profit margins of firms and vice versa. Other sources of the differences in rates of profit include disparity in the productivity of different firms and the entry and exit conditions of the market, where more efficient firms become more successful than less efficient ones and more barriers to entry and exit increases firms' profits, respectively.

Karl Marx's theory of competition may be applicable to the current study as it explains the persistence of differences of prices and differences in firms' profits between and within industries respectively. Within this notion, the examination of the effects of trade liberalization on competitiveness of firms in the manufacturing sector should include the firms' demand conditions, their productivity, and market entry barriers in addition to the trade variable.

2.2.4 Theories of Trade

The discussion of trade theories in this section of the study focused on their relevance, significance and link to the focus of the thesis. That is, the potential that these theories have and the impact they exert on the industrial and economic development of nations. This was undertaken in an attempt to appreciate the various arguments for trade liberalization. The trade theories are classified into two; the traditional trade theories and the new trade theory. The traditional trade theories include mercantilism, classical theory and neoclassical theory. While the new trade theories refer to those developed and used by Krugman (1979), Melitz (2003) and Melitz and Ottaviano (2008).

(i) Mercantilism

Mercantilism developed during the sixteenth and seventeenth centuries with the basic principle that a state should maximize its wealth through one-way trade with other countries. This theory attributed mainly to Mun (1664), suggested that a strong foreign trade sector is crucial for any nation to promote its interest which could be achieved through a favourable trade balance (Cains & Silwa, 2008). To support the favourable trade balance, the mercantilists advocated the regulation of trade by government through such measures as quotas, tariffs, and other commercial policies aimed at reducing imports in order to protect a nation's trade position (Carbaugh, 2008).

The mercantilists' idea meant that the country that exported its goods should be the beneficiary of any exchange, at the expense of the importer. Hence, as a country sought to maximize it exports, it also endeavored to keep imports to a minimum. This was to be achieved through imposition of tariffs and other import restrictions and provision of subsidy for exports. Thus, mercantilism presupposed that economic performance in an economy would be improved upon with the imposition of higher restrictions on imports in the form of higher tariffs alongside export liberalization measures such as the issuance of subsidy or grants for exports.

(ii) Classical Trade Theory

A major weakness of Mercantilism is that the discrimination against imports would lead to exports becoming expensive in the long run thus, it was not sustainable. The accumulation of wealth resulting from surplus exports would increase money supply in the economy leading to increased domestic prices thereby making exports more

expensive and imports cheaper, otherwise referred to as the "price-specie flow mechanism" (Hume, 1752). Moreover, the imposition of restrictions on imports by a country may elicit retaliatory measures from trading partners. These weaknesses of mercantilism and limitations on the quantity and variety of available goods in the economy led to the development of the classical trade theory. The evolution of the classical theory of international trade followed Smith (1776) and Ricardo (1817). The theories argue in support for free trade as a route for countries to achieve production efficiency.

Smith's (1776) theory of absolute advantage is grounded in the "labour theory" of value, which assumes that the value of a good is a function of the amount of labour expended in its production. According to the theory, trade liberalization promotes the international division of labour thereby enabling nations to concentrate on the production of only those goods that they produce most cheaply. This view posited that cost differences govern the international movement of goods. Therefore, each nation benefits by specializing in the production of that good that it produces at a lower cost and importing the good it produces at a higher cost and thus, absolute advantage in labour productivity was paramount. The implication is that productivity in an economy is to increase with more liberalization of trade policy in the form of reductions in tariff levels on exportation of goods.

The theory of absolute advantage however did not explain why countries with no absolute advantage could engage in trade. To explain this, Ricardo (1817) emphasized comparative cost differences in the technology of production rather than absolute cost

differences among nations as basis for trade (Carbaugh, 2008). The basic proposition of Ricardo's (1817) theory was that international trade could occur if comparative costs differences exist. With such differences, a country would benefit if it specialized in the production of the good in which it has the relatively better advantage, and to obtain the other commodity through trade (Gondolfo, 2007). Such specialization would result in improvements in production efficiency as cost effective methods of production are adopted (Cains and Sliwa 2008). Therefore, liberalizing trade through the adoption of lower tariff rates and reductions in the tax rates on export goods would lead to higher performance for a country as long as international trade is dictated by differences in technology.

(iii) Neoclassical Trade Theory

The neoclassical trade theory was first developed by Marshall (1879). Unlike in the Ricardo's comparative advantage theory where countries could benefit from trade due to technological differences in production, the neoclassical trade theory explains why trade could still be beneficial even if the technology between countries was identical. The theory posited that patterns of trade are determined simultaneously by the differences in: factor endowments, technologies, and the tastes of different countries (Zhang, 2008). In contrast to the classical theory that only considered the supply side (cost) factors relating to trade, the neoclassical theory held that the utility of a product is also important and therefore, preference account for the existence of trade among nations even if their factor endowments and technologies are entirely similar. Thus, under the neoclassical trade theory, productivity will be improved upon with increased

trade liberalization measures provided that any one factor such as taste, technologies, or factor endowments differ among trading partners.

A particular case of the neoclassical trade theory that developed eventually was the H-O model which originated from Heckscher (1919) and his student, Ohlin (1933). The H-O model assumes that preferences and the production technology between countries are identical. Hence, factor endowments are the source of comparative advantage among nations. Also, within the framework of the model perfect competition in both the goods and factor markets as well as homogeneity of goods within industries is assumed. As a result, only inter-industry trade is considered to occur across countries. The model suggests that trading in goods across countries is capable of alleviating the discrepancy in relative factor endowments. This would take place indirectly as countries export only those goods in which their production involves the intensive usage of the factors available in relative abundance. For example, trade simultaneously provides an avenue for a labour abundant country to increase its wage and/or employ more fully labour, and earn scarce foreign exchange required to import necessary capital goods. And in that way, higher efficiency can be achieved in the factor intensive sector. Therefore, according to the H-O model productivity increases with greater trade liberalization (lower tariff and export tax rates) when trading partners have different factor endowments.

(iv) The New Trade Theory

Development of the New Trade Theory followed the findings from studies of Balassa (1967), and Grubel and Lloyd (1975) where contrary to the tenets of the traditional

trade theories it was established that, intra-industry trade took place. Besides, a large portion of the intra-industry trade occurred with few costs of adjustment. Therefore, the new trade theory emerged in an attempt to describe why intra-industry trade is possible. The first contribution was that from Krugman (1979), in which it was argued that trade could occur within imperfect markets, and that trade results from economies of scale instead of differences in technology or factor endowments, and product differentiation. Increasing returns to scale makes it possible for firms to lower their average costs as they increase production, and product differentiation allows firms to produce and export their unique variety to other countries. Thus, trade can occur even if economies have similar tastes, technology, and factor endowments, and improve the productivity of firms. Accordingly, measures aimed at liberalizing trade will not only ensure that individuals are offered a wider range of choice thereby increasing the competition among firms, but also result in mutual growth in productivity of firms in the different economies.

Later development of the new trade theory incorporated firm heterogeneity in addition to the assumptions of economies of scale, differentiated products, and imperfect competition. A notable contribution in this regard is Melitz (2003). In the analysis, international trade was considered a mechanism for reallocations between firms in an industry. The reduction or elimination of barriers to international trade would lead to the reallocation of market share in the direction of more productive firms from less productive ones whereas firms with the least productivity will exit the market. This process would result in increases to average industry productivity, alongside growth in the market share of the most productive firms. In addition to improvement in

productivity, Melitz (2003) suggested that higher productive firms self-select into export markets. This view by Melitz (2003) was adopted in the present study in order to provide guidance in addressing the concern; whether trade liberalization leads to increases in productivity of firms operating in the manufacturing industry of Nigeria.

Another contribution to the new trade theory literature is that by Melitz and Ottaviano (2008). Their analysis focused on the "toughness" of competition across markets as trade liberalization is implemented. Maintaining the assumptions of economies of scale, differentiated products, and imperfect competition Melitz and Ottaviano (2008) predicated that mark-ups of firms varied with market size and trade integration. As import competition increases, it was envisioned that mark-ups in the liberalized import market would reduce hence, describing the pro-competitive effects of trade liberalization in an economy. According to the Melitz and Ottaviano's (2008) concept the present study examined whether trade liberalization led to increased competitiveness of firms operating in the manufacturing industry of Nigeria.

2.3 Empirical Literature

2.3.1 Approaches to Measuring Total Factor Productivity

In the case of a single output and many inputs, total factor productivity can be measured using several methods including; the index numbers non-parametric approach, stochastic frontier parametric method or production frontier semi-parametric approach (Sulimierska, 2014).

(a) Index numbers approach

The index numbers method is applied to measure price and quantity changes across time and across individual units such as firms, industries, regions, and countries. The analysis of index numbers clearly distinguishes between total factor productivity index and measurement of changes in total factor productivity. In the case of total factor productivity index, one of methods that can be used is the Hick-Moorsteen index. This index measures the growth in output net of growth in inputs. It is obtained by the following formula:

$$TFP = \frac{Growth\ in\ output}{Growth\ in\ input} = \frac{Output\ quantity\ index}{Input\ quantity\ index} \tag{2.6}$$

where *TFP* denotes total factor productivity. This index has been formulated to accommodate a variety of forms including the Cobb-Douglas function. However, despite the simplicity of the Hick-Moorsteen index identifying the main source of productivity growth is difficult.

(b) Stochastic Frontier Method

Stochastic frontier analysis originated with Aigner and Chu (1968) through the application of a Cobb-Douglas production function in firm-level analysis. The analysis provides an alternative approach for estimating the production function, and it assumes a given functional form for the relationship between inputs and output:

$$ln(Y_i) = \alpha_0 + \sum_{k=1}^{N} \beta_c\ ln(X_{ki}) - u_i \tag{2.7}$$

where *Y* represents output, *X* represents a vector for *k*th-inputs, and *u* is a non-negative error term associated with technical inefficiency. Subscript *i* and *k* represents a

particular firm, and number of inputs respectively. The concept of the stochastic frontier analysis implies that the production function will be moved down if the firm is unable to attain maximum output from given inputs. A negative sign of the random variable suggests a downward shift. The whole concept of stochastic frontier analysis is then expanded through the construction of a symmetric random error (γ_i) as follows:

$$ln(Y_i) = \alpha_0 + \sum_{k=1}^{N} \beta_c \, ln(X_{ki}) + \gamma_i - u_i \qquad (2.8)$$

where $\gamma_i$is the random noise, $u_i$denotes technical inefficiency.

For panel data analysis, Coelli, Rao, O'Donnell and Battese (2005) suggest the stochastic frontier model can be specified in general form as:

$$lnY_{it} = X'_{it}\beta + \gamma_{it} - u_{it} \qquad (2.9)$$

where the additional subscript *t*, represents time.

(c) Semi-parametric method

The semi-parametric method uses either the gross or value-added measure of output to derive total factor productivity. In the gross output base, the production function includes the parameters of labour, capital stock, and material inputs while the value-added base production function comprises parameters of labour and capital stock. Assuming a Cobb-Douglas gross output based function and doing a logarithmic transformation, total factor productivity is obtained as follows:

$$y_{it} = \alpha + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \varphi_{it} + \varepsilon_{it} \qquad (2.10)$$

where y denotes the logarithm of gross output, $l, k, and\ m$ are the logarithms of labour, capital, and raw material inputs respectively. α represents the mean efficiency point across firms and over time, β_l, β_k, and β_m are the gross output elasticities corresponding to labour, capital and material inputs respectively. The subscripts *i* and *t* are the firm and time period, respectively. ε_{it} is white noise, and φ_{it} represents the total factor productivity, and both $\varphi_{it}\ and\ \varepsilon_{it}$ are part of the residual.

An important point to note is that total factor productivity in equation (2.10) is a state variable (only known to the firm), and thus impacts the firm's decision rules leading to biased estimates. The techniques by either Olley and Pakes (1996) or Levinsohn and Petrin (2003) provide solution for this problem. They achieved this by including a proxy for unobserved productivity. The difference between the two approaches is the proxy used to control for the correlation between input levels and unobserved productivity shocks. While Olley and Pakes (1996) used firms' investment stock Levinsohn and Petrin (2003) employed intermediate inputs. The preference for intermediate inputs rather than investment stock was informed by the estimation problem that could arise due to the costs of adjusting investment stock; the estimation routine truncates observations with zero-investment for the firms that make irregular investments.

To estimate total factor productivity, suppose energy costs (intermediate input) was used to correct for simultaneity in the firm's production function as follows:

$$n_{it} = f(\varphi_{it}, k_{it}) \tag{2.11}$$

where the energy input demand n_{it}, is stated as an unknown function of productivity φ_{it}, and capital k_{it}. n is assumed to be monotonic in φ, hence equation (2.11) can be inverted as follows:

$$\varphi_{it} = f(n_{it}, k_{it}) \tag{2.12}$$

Two estimation steps are used to get the productivity measures. In the first step, the coefficient of labour (β_l) and material (β_m) are obtained by substituting equation (2.12) into equation (2.10):

$$y_{it} = \beta_l l_{it} + \beta_m m_{it} + \phi_{it}(n_{it}, k_{it}) + \varepsilon_{it} \tag{2.13}$$

where $\phi_{it}(n_{it}, k_{it})$ is partially linear (nonlinear in energy and capital but linear in variable inputs) as follows:

$$\phi_{it}(n_{it}, k_{it}) = \alpha + \beta_k k_{it} + \varphi(n_{it}, k_{it}) \tag{2.14}$$

In the second step, the estimate for capital (β_k) is obtained by defining a parameter $P_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_m m_{it}$ and estimating as follows:

$$P_{it} = \beta_k K_{it} + g\left(\phi_{t-1} - \beta_k k_{i,t-1}\right) + \eta_{it} + \xi_{it} \tag{2.15}$$

where $g(\cdot)$ is a non-linear function of previous values ofϕ and k estimated by third-order polynomial expression in $\phi_{t-1}$and k_{t-1}.

Given estimates $\hat{\beta}_l$, $\hat{\beta}_m$ and $\hat{\beta}_k$, total factor productivity is obtained by substituting them into equation (2.16).

$$\hat{\varphi}_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_m m_{it} - \hat{\beta}_k k_{it} \tag{2.16}$$

Given that technology vary across sub-sectors, and the concept of productivity also relates to the technology used, separate production functions are estimated for different industries. The present study employed the semi-parametric technique as implemented by Levinsohn and Petrin (2003) to compute the total factor productivity estimates used to examine the effects of trade liberalization on productivity of manufacturing firms in Nigeria.

2.3.2 Trade Liberalization and Productivity

A number of studies have presented empirical results estimating the contribution of freer trade to productivity performance. Harrison (1994) examined the link between productivity increases and structural changes in Cote d'Ivoire. Specifically, the study was interested in providing evidence of the benefits from trade at the micro level following the 1985 trade reform in Cote d'Ivoire. To explore the changes in productivity plant-level data was used. The productivity estimates were modified to cater for changes in markups thereby incorporating the imperfect nature of the market that existed. Two approaches were employed; the panel data and time series analysis. The time-series approach was used to compare the behavior of productivity before and after 1985. Both approaches showed a positive relationship between freer trade policies and increases to productivity. Thus, the study concluded that there is a positive effect of free trade policies on productivity growth. The present study is similar to Harrison (1994) as it also estimated the effects of freer trade on productivity using firm-level data while accounting for market structure.

Adenikinju and Chete (2002) employed a similar methodology to Harrison (1994). They explored the relationship between trade liberalization and firms' productivity performance in the Nigerian manufacturing sector while controlling for market structure. The study covered the immediate period of the implementation of Structural Adjustment Programme (1988 – 1990). The study used simple average tariffs rate, quota weighted effective protection rate, and import and export penetration indexes as proxy for trade liberalization while controlling for market structure. From the results obtained, both the average nominal tariff rates and the effective rate of protection had a negative and significant effect on productivity. While the export growth index influenced the level of productivity positively the estimated import growth coefficient was statistically insignificant. Based on this finding, the study concluded that significant pay-offs accrue through trade liberalization, but cautioned the pace of import liberalization since an import policy may have negative effects on productivity. The present study also examined how trade liberalization affects firms' productivity in Nigeria. However, it differed from Adenikinju and Chete (2002) in the approach used to obtain the productivity index. The Levinsohn and Petrin (2003) method was employed in place of the fixed effects method adopted by Adenikinju and Chete (2002). The Levinsohn and Petrin (2003) technique unlike the fixed effects method allows for variability of total factor productivity over time. It also used a more recent dataset which covered a period when trade policy in Nigeria assumed a more liberal stance.

Njikam and Cockburn (2011) assessed the effects of trade liberalization on firm productivity growth in Cameroon's manufacturing industry for the period 1988/89 to 2001/02. The study employed firm-level data to derive the productivity for the firm

using the method by Levinsohn and Petrin (2003). Afterwards, the effects of trade liberalization on firm productivity growth was determined by a regression framework; with variables including import penetration, export shares, and effective protection measuring the extent of trade liberalization. The results from the estimation showed that increases in export shares, and reductions in effective protection led to improvements in the productivity of Cameroon's manufacturing firms. On the other hand, import penetration did not have significant effect on firm productivity growth. The study concluded that trade liberalization was beneficial to the improvement of firm productivity growth rates. The current study adopted the same methodology as Njikam and Cocburn (2011) in obtaining the productivity index as well as incorporating similar variables to measure trade liberalization.

Ackah, Aryeetey, and Morrissey (2012) used panel data of Ghanaian manufacturing firms to analyze the country's trade policy from 1993 to 2002. During this period, trade liberalization was alternated with high trade protection in varied ways across industries. The study aimed to find out how trade liberalization and protection affected firm productivity. Firm productivity was obtained by estimating production functions using the System-GMM estimator, and the effect of trade liberalization and protection analyzed in a regression framework. The results revealed a positive effect of export intensity on firm productivity but, a negative effect of nominal tariffs on productivity of manufacturing firms. Based on the findings, they concluded that trade liberalization increases productivity while over-protection in the form of high import tariffs gives rise to lower levels of productivity for manufacturing firms. The present study also used tariff rates and export intensity as measures of trade liberalization, but unlike Ackah *et*

al. (2012) firm productivity was estimated through the use of Levinsohn and Petrin (2003) semi-parametric approach.

Bigsten, Gebreeyesus, and Söderbom (2016) analyzed the impact of trade policy reforms on manufacturing firms in Ethiopia. The study using firm-level panel data and commodity-level data on imports and tariffs focused on the import liberalization aspect of the trade policy reforms. The results indicated that the reduction in input tariff was statistically significant in explaining increases in firm productivity. But, the estimate of the output tariff was insignificant. In this light, the study concluded that there would be productivity losses if domestic producers are protected through high tariffs thus, stressing the point that imports could be an important alternative source for improving productivity. Worthy of note was their conclusion that output tariffs are economically insignificant. The present study differed from this as it did not only use tariffs to represent the measure of trade liberalization but incorporated other variables; import and export penetration that may capture the extent of free trade.

2.3.3 Productivity and Exports

Among the studies surveyed as regards the influence of a firm's productivity on its export performance are: Bernard and Jensen (1999) for the United States of America; Aw, Chun, and Roberts (2000) for Taiwan and South Korea; Van Biesebroeck (2005) for 9 low-income Sub-Saharan African countries; Burundi, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Tanzania, Zambia, and Zimbabwe; and Rankin, Soderbom, and Teal (2006) for 5 Sub-Saharan African countries: Nigeria, Ghana, Kenya, South Africa, and Tanzania. Others are Fafchamps, El Hamine and Zeufack (2008) for

Morocco, Bigsten and Gebreeyesus (2009) for Ethiopia, Lee and Choi (2012) for Korea, and Serti and Tomasi (2012) for Italy. Also, studies by Deshmukh and Pyne (2013) for India, Reis and Forte (2016) for Portugal, and Ayadi and Mattoussi (2014) for Tunisia were reviewed.

Bernard and Jensen (1999) were interested in analyzing the interaction between firm performance and exporting in the United States of America. Their investigation considered the structure and performance of firms before, during and after exporting. In finding out how firms performed before and during exporting, the export premia and binary choice model were estimated where variables including total factor productivity, labour productivity, total employment, number of shipments, average wage, production wage, and capital per employee were considered. The results of their study indicated that prior to exporting, and during exporting exporters were more productive than non-exporters. However, the study found no evidence that after exporting, exporters were better than non-exporters in productivity. Therefore, they concluded that higher productivity firms self-select themselves into foreign markets. The present study followed the lead of Bernard and Jensen (1999) in examining self-selection in the case of manufacturing firms in Nigeria. In addition, the present study probed further the effects of productivity on share of output exported.

Aw, *et al*. (2000) examined the link between plants' productivity and the probability of their participation exports. Their study employed micro-data of manufacturing surveys in South Korea and Taiwan. The study grouped plants according to those that exported, exited the export market and entrants into the export market and comparisons made

through the estimation of export premia regression models. The results obtained for Taiwan revealed that plants that remained in the export market recorded higher productivity than plants that exited, and the productivity difference of entrants were linked to their decision to enter the export market. The findings for South Korea showed that while on the average the productivity of entrants prior to entry was higher than non-exporters, plants' average productivity between those that exit the export market and the plants that remained in the export market were nearly the same. The study concluded that for Taiwan, the patterns were in agreement with self-selection. The same study concluded that for South Korea, the patterns were weakly in support of self-selection. The present study examined similar patterns as Aw, *et al.* (2000) using the export premia, but in addition, it estimated the effects of firms' productivity on the actual share of exports in total sales.

Van Biesebroeck (2005) assessed the relationship between trade openness and productivity by looking at productivity differences for exporters over non-exporters in nine low-income sub-Saharan African countries; Burundi, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Tanzania, Zambia, and Zimbabwe. Estimating the export premia for exporters in comparison to non-exporters and future-exporters relative to never-exporters the study found that labour productivity and total factor productivity were higher in exporters and future-exporters. The study further found out that the differences in productivity between exporters and non-exporters was larger than the differences before they began exporting. Besides, productivity differences decreased prior to their exit from the export market and decreased further when they stopped exporting. The study concluded that exporters in sub-Saharan Africa have a higher level

of productivity in comparison to non-exporters, and that the productivity gap is not solely as a result of self-selection but also learning by exporting. The current study differed from Van Biesebroeck (2005) in that it extended the analysis of self-selection in Nigeria's manufacturing sector beyond estimating just the export premia by also determining the causal relationship between productivity and exporting.

Rankin *et al.* (2006) employed variables including technical efficiency and labour productivity as determinants of export participation in their assessment of self-selection. Using a binary choice regression framework for exporting status, the study analyzed micro data for manufacturing firms in 5 Sub Saharan African countries; Nigeria, Ghana, Kenya, South Africa, and Tanzania. The findings showed that increases in labour productivity as represented by firm size increased the probability of observing participation in exports. The study further concluded that self-selection based on labour productivity was most important in determining export participation. While the present study also estimated self-selection in the manufacturing sector in Nigeria using the binary choice model, it further used the export premia to evaluate the structure and performance of firms prior to and during participation in foreign markets. Moreover, the current study examined the effects of firms' productivity on their share of output exported as well as employing a more recent set of data.

Fafchamps, El Hamine and Zeufack (2008) examined two alternative models of learning to export; that relating to productivity learning and the other market learning. The study employed a panel data on 859 manufacturing firms in Morocco from 1985 to 1999. The results obtained from the analysis of productivity learning revealed that in all

sectors except heavy industry exporters compared to non-exporters were more productive. Also, firms that eventually export were more productive prior to exporting. On the other hand, the results from the market learning estimation showed that the relationship between export experience and productivity was weak; exporters' productivity did not improve significantly export experience. The study concluded that the relationship between exports and productivity is that of self-selection (productivity learning) and not market learning. The present study examined productivity learning for manufacturing firms in Nigeria in a similar manner.

Bigsten and Gebreeyesus (2009) evaluated the causal relationship between exporting and productivity in the manufacturing sector in Ethiopia. They used a 10 year unbalanced panel data of plants from 1996 to 2005. Results from the estimation of the export premia for exporters showed that in comparison to non-exporters firms that sold their output in foreign markets were on the average 1.6 times more labour productive. Similarly, new entrants into foreign markets were found to have higher total factor productivity and labour productivity before exporting, compared to those that never exported. Also, new entrants continued to improve their productivity when exporting, relative to non-exporters. The study concluded that both self-selection and learning-by-exporting occurred given that entrants' productivity was higher prior to the time they began to export and increased even higher in the post-export period. The current study also evaluated self-selection in the manufacturing sector in Nigeria but unlike in Bigsten and Gebreeyesus (2009), it considered the export intensity of exporters in addition to their decision of a firm to export.

Lee and Choi (2012) analysed the relationship between export intensity, mark-up and productivity of plants in the Korean manufacturing sector over the period 1992 – 2002. The study after estimating a generalised propensity score model obtained results suggesting that higher productivity level increased the share of products sold by firms in foreign markets. However, the same did not hold true for mark-up. On the effects of export intensity on productivity and mark-up, it was found that higher export intensity neither brought about improved productivity growth nor higher mark-up among exporters. The study therefore concluded that export intensity at that given time was a weak measure to capture the trade benefits associated with learning-by-exporting. The present study was concerned only with the self-selection benefits of trade with regards to productivity however, unlike Lee and Choi (2012) it considered not just the effects of productivity on the share of exports in total sales but such effects on the probability of exporting.

Serti and Tomasi (2012) estimated the self-selection hypothesis alongside the post-entry effects hypothesis. The study used a sample of firms from the Italian manufacturing industry during the period 1989 – 1997. The study estimated for self-selection by regressing export dummy on measures of productivity, size, and other firm characteristics including workforce composition and labour cost competitiveness, and capital endowment in a binary choice model framework as well as estimating export premia regression models. The results obtained affirmed that firms with higher productivity serve foreign markets. The current study differs from Serti and Tomasi (2012) in that it probed further the effect of productivity on the shares of exports in total sales and not just whether the firm exports or not.

Deshmukh and Pyne (2013) assessed the determinants of productivity as well as the effect of productivity on export intensity of firms in India. The study used an unbalanced panel data set on a sample of 686 exporting manufacturing firms for the period 1991 – 2009. The analysis involved the estimation of a simultaneous equation system model following a 2-Stage Least Squares approach. The results showed that raw materials and firm size significantly contributed to labour productivity at the firm level. On the other hand, labour productivity was found to have a positive and significant effect on the export intensity of exporting firms. The study concluded that more productive firms would participate better in foreign markets. The current study also examined the effects of productivity on the share of exported sales employing similar variables. In addition, it considered the effects of productivity on the decision of a firm to export.

Ayadi and Mattoussi (2014) also estimated the effects of productivity on exporting and vice versa. In their study, firm level data was obtained on manufacturing firms in Tunisia from 2004-2006. Firms were organized into clusters of those exporting and those not exporting. In the modeling, to test for the effects of productivity on participation in foreign markets, the probability of exporting for each firm in a particular period was regressed on the lagged values of exporting status, sales and other firm characteristics. From the findings, although previous exporting was said to increase current exporting there was no evidence attesting to the influence of productivity on exporting. However, the finding of their study may be wanting since sales was used as the proxy for productivity. Although sales represent the output of firm from the use of factors, it says little about the efficiency in which such output is produced. The current

study overcame this by employing instead the amount of output attributed to an employee.

Reis and Forte (2016) examined the effects of firm and industry characteristics on the share of exports in total sales of Portuguese firms over the period 2008 – 2010. The study specifically regressed firms' export intensity on labour productivity, capital intensity, R&D intensity, concentration level, and export orientation employing a panel data estimation technique. The findings from the analysis indicate that an increase in a firm's labour productivity would raise its share of exports in total sales. Similarly, industry level productivity was found to have positively effects on firms' share of exports in total sales. Thus, the study concluded that both firm and industry level productivity are significant determining factors of a firm's export intensity. The present study akin to Reis and Forte (2016) employed similar variables in order to establish the determinants of firm's export intensity in Nigeria. However, the present study did not just estimate the effects of productivity and other firm characteristics on export intensity but, also on the probability of exporting.

2.3.4 Trade Liberalization and Competitiveness

Various empirical studies have attempted to test the effects of trade liberalization on firm competitiveness. The studies have estimated the import penetration effects on the markups of firms. This effect due to trade liberalization is referred to as the "import-discipline hypothesis". The "import-discipline" hypothesis alleges that, trade liberalization allows the flow of foreign products into the domestic market, which tends

to reduce the market share of local producers. Thereby, removing excess profits of firms operating in the domestic market; this may result in a relatively competitive market.

Yalçin (2000) examined the effects of trade liberalization on competitiveness of firms in Turkey during the period 1983 – 1994. The study regressed price-cost margins on import penetration and market structure variables for firms in the public and private sectors separately. The results obtained revealed substantial different effects of trade liberalization for the private and public sectors. In the public sector, price-cost margins declined with higher import penetration. On the other hand, import penetration led to increases in price-cost margins in the private sector. The study suggested that the inconsistency could have arisen from the existence of an implicit collusion among foreign firms and domestic oligopolies. Alternatively, there was the possibility that importers and domestic firms are one and the same in the private sector. Another contradiction from the findings of the study was that price-cost margins reduced generally in the private sector but, in the public sector they increased. Therefore, the study concluded that a freer trade regime is not sufficient for a competitive domestic market. The present study also employed similar variables as Yalçin (2000) in examining the pro-competitive effects of trade liberalization in the manufacturing sector in Nigeria.

Goldar and Aggarwal (2005) examined the effect of trade liberalization on price-cost margins using a panel data of Indian firms for the period 1980/81 to 1997/98. Tariffs and quantitative restrictions were used as measures of trade liberalization in addition to other control variables including the Herfindahl concentration index and the capital to

output ratio. The findings indicated a positive and significant relationship between tariffs/quantitative restrictions and price-cost margins. The study concluded that the lowering of tariffs and non-tariff barriers to imports had a pro-competitive effect on manufacturing firms in India. The present study differed from Goldar and Aggarwal (2005) in that it employed import penetration as a proxy for trade liberalization. This is because tariffs and quantitative restrictions are just means to restricting the flow of imports, but may not capture the actual extent to which the domestic market is satisfied by imports.

Wong (2007) analyzed the pro-competitive effects of trade liberalization in Ecuador's manufacturing sector during the period 1997 to 2003. The study used panel data of establishments and regressed price-cost margin (PCM) on import penetration. The findings showed an inverse relationship between import penetration and PCM which implied that trade liberalization brought about market discipline effects in Ecuadorian manufacturing industries and establishments. Thus, the study reached the conclusion that trade policies oriented to liberalization could constitute an important element towards fostering a pro-competitive environment in domestic markets. The current study employed a similar methodology as Wong (2007) to test the effects of trade liberalization on the competitiveness of firms in the manufacturing sector of Nigeria using similar variables.

Another contribution to the empirical literature on the pro-competitive effects of freer trade is the paper by Sheikh and Ahmed (2011). The study examined the structure, conduct and performance of firms in Pakistan's agro-based industries in relation to trade

reforms and the degree of openness. Using a panel data of 11 agro-based industries the effective tariff rate was taken to represent the degree of openness, and the unemployment rate was taken as proxy for domestic reforms. The results supported the suggestion that domestic reforms strengthened with freer trade had a reducing effect on markups. Nevertheless, a point of note concerning this study is that while the effects of the degree of openness, and domestic reforms on performance was captured by the methodology, the effects on structure and conduct were not clearly demonstrated. The present study differs from Sheikh and Ahmed (2011) in that it employed import penetration as trade variable rather than tariff rate in order to adequately capture the procompetitive effects of trade liberalization.

Unlike Sheikh and Ahmed (2011), Noria (2013) found varying results on the effects of trade liberalization on competition for Mexico. The study analyzed the effect of NAFTA's second round trade liberalization on the price-cost margins (PCMs) over the period 1994 – 2003. In the analysis, industries were categorized into two; those in which trade liberalization was implemented over 5 years and industries where trade liberalization was applied over 10 years. Evidence from the analysis showed that for industries that liberalized over a 10-year period, there was no effect of trade liberalization on PCMs; and for industries where trade liberalization was implemented over a 5-year period, the relationship between trade liberalization and PCMs was weak. Therefore, the study concluded that trade liberalization is not sufficient in enforcing competition in less protected industries. The present study just like Noria (2013) examined the effect of trade liberalization on the price-cost margins of firms in different sectors of the manufacturing sector in Nigeria.

2.4 Overview of Literature

The theoretical literature on production, exports, and competition suggest that firms are interested in attaining technically efficient production given a combination of factor inputs, only sufficiently high productive firms participate in exports, and competition is determined by an industry's concentration and entry barriers, respectively. On the other hand, the literature on trade suggest that trade liberalization is a channel through which these firm performance indices can be enhanced.

The empirical evidence linking trade liberalization and firm productivity was supported by Harrison (1994) for Cote d'Ivoire; Njikam and Cockburn (2011) for Cameroon; and Ackah *et al.* (2012) for Ghana. Other studies by Adenikinju and Chete (2002), and Bigsten *et al.* (2016) obtained results suggesting that the import penetration aspect of freer trade impeded firm productivity gains in Nigeria, and Ethiopia, respectively. In the case of Nigeria, Adenikinju and Chete (2002) provided this evidence for the period 1988 – 1990. Beyond this period, deliberate steps have been undertaken by the government of Nigeria towards greater liberalization of trade whose intended effects is unknown. The present study therefore provides empirical evidence at the firm level in Nigeria using data for a period when the country's trade policy took on a more liberal stance. Also, the current study employed the Levinsohn and Petrin (2003) method in place of the fixed effects method employed in Adenikinju and Chete (2002) in computing firms' total factor productivity, which allowed for variability in productivity over time.

The evidence on the influence of productivity on exports have reported different results. Bernard and Jensen (1999), and Bigsten and Gebreeyesus (2009) found a positive influence of total factor productivity, and labour productivity on firms' decision to export in the case for USA and Ethiopia respectively. However, Aw, *et al*. (2000) for Tawain and South Korea, Van Biesebroeck (2005) and Rankin *et al.* (2006) for some Sub-Saharan African countries, Fafchamps, *et al.* (2008) for Morocco, and Serti and Tomasi (2012) for Italy associated the decision by firms to export to their labour productivity. Contrary to the findings of the others, Ayadi and Mattoussi (2014) found no evidence attesting to self-selection for Tunisia. For the influence of productivity on export intensity, Lee and Choi (2012), Deshmukh and Pyne (2013), and Reis and Forte (2016) found that more productive firms sold a higher share of their output in foreign markets, in the studies for Korea, India and Portugal respectively.

Among the studies surveyed regarding the influence of productivity on exports, Rankin *et al.* (2006) was the only study that considered Nigeria, where the influence of productivity on firms' decision to export was examined. The current study extended the assessment of the influence of productivity on firms' export participation in the manufacturing sector in Nigeria to include not just the decision to export but, also the export intensity of exporters.

In substantiating whether international trade affects firm competitiveness, Goldar and Aggarwal (2005), Wong (2007), and Sheikh and Ahmed (2011) supported the import-discipline hypothesis in studies conducted in India, Ecuador, and Pakistan respectively. That is, increased level of imports reduces market share of domestic producers thereby

inducing competitiveness. However, findings from Yalçin (2000) for Turkey; and Noria (2013) for Mexico varied across the different sub-sectors. So far, no empirical evidence of this link is available for Nigeria. Therefore, the question of whether or not trade liberalization increases competition remained unanswered in the case of Nigeria. The urge to fill this gap also provided a motivation for the current study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section presents the technique the study employed in providing answers to the research questions posed. The chapter is organized as follows: first, the research design is presented followed by the theoretical framework which identified the channels through which trade liberalization was expected to affect the performance of manufacturing. Next, appropriate empirical models were specified and relevant estimation techniques discussed. Then, a provision of the sources of the data used, and a description of the data was done. The chapter concludes with a plan on the procedure of data analysis.

3.2 Research Design

The study employed pseudo-panel data in a non-experimental research design to address the stated objectives. Specifically, the quantitative research design was adopted. The quantitative non-experimental research design was the most appropriate given that the study was focused on examining the effects of trade liberalization variables on firms' performance. The non-experimental research design has the advantage of having a high level of external validity allowing for a generalization of the results to a larger population, given that the predictor variables cannot be manipulated or controlled (Reio, 2016). The pseudo-panel data methodology allowed for trade liberalization effects on firms' performance to be observed over time. This design made it possible for the patterns in productivity, export, and mark-ups of manufacturing firms in Nigeria to be

distinguished. It also permitted the establishment of the direction of relationship and the magnitude of the effects of the trade liberalization variables on the selected performance indicators. Data from the Survey of Manufacturing Industry (SMI) in Nigeria, conducted quarterly for the period 2008 to 2010 was used.

3.3 Theoretical Framework

3.3.1 Trade Liberalization and Productivity

The first objective of the study was to examine the effects of trade liberalization on productivity of firms in the Nigerian manufacturing sector. In addressing this objective, the theoretical framework was based on the theory of production, and the new trade theory. In the first instance, the analysis of the productivity of firms necessitates the understanding of the production technology in the sector, under which firms are assumed to be interested in attaining technically efficient production given a combination of factor inputs. A production function characterizes this production technology which can be represented as:

$$Y = Af(L, K, M) \tag{3.1}$$

where Y denotes gross output, L is labour input, K is capital input, and M represents material inputs. A is total factor productivity. The production function in equation (3.1) shows the firm's maximum possible output obtainable with a given set of inputs and provides the basis for deriving the total factor productivity used in analyzing the effects of trade liberalization on productivity of firms in the Nigerian manufacturing sector. From growth analysis, changes in Y over time due to changes in $A, L, K,$ and M can be as shown in equation (3.2).

$$\frac{dY}{dt} = \frac{dA}{dt} + \frac{\partial Y}{\partial L} \cdot \frac{dL}{dt} + \frac{\partial Y}{\partial K} \cdot \frac{dK}{dt} + \frac{\partial Y}{\partial M} \cdot \frac{dM}{dt} \quad (3.2)$$

Equation (3.2) shows that the rate of growth of gross output can be factored into the rates of growth of the various factors of production, and the total factor productivity, A. The weights corresponding to the respective factors of production represent their output elasticities that is, the percentage change in gross output that would result due to a 1 per cent increase in each input. However, while changes in $L, K,$ and M for a firm are directly observable, the output elasticities and changes in A cannot be directly observed, the corresponding parameters and A are obtained by means of econometric techniques (OECD, 2001).

Given that the results of the test for model selection presented in Chapter four indicated that the Cobb-Douglas production function is appropriate for the present study, equation (3.1) takes on a specific form as expressed in equation (3.3).

$$Y_{it} = A_{it} L_{it}^{\beta_l} K_{it}^{\beta_k} M_{it}^{\beta_m} \quad (3.3)$$

where $\beta_l, \beta_k,$ and β_m represent the gross output elasticities of labour, capital, and intermediate material inputs, respectively. Subscripts i and t stand for the firm and time period, respectively. Taking logarithms, equation (3.3) becomes:

$$y_{it} = \alpha + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \varphi_{it} \quad (3.4)$$

where:

y_{it} = logarithm of gross output of firm i in period t.

α = constant

l_{it} = logarithm of labour input employed by firm i in period t.

k_{it} = logarithm of capital input utilized by firm i in period t.

m_{it} = logarithm of materials inputs utilized by firm i in period t.

φ_{it} = residual term.

The individual contributions of $L, K,$ and M in output Y at a given time can be estimated from equation (3.4) and the estimated sum of the constant and the residual $(\hat{\alpha} + \widehat{\varphi_{it}})$ gives the total factor productivity estimate, where α is common across firms in a sample (typically technology is estimated at the industry level), and φ is idiosyncratic to a particular producer (Syverson, 2011). Total factor productivity is therefore that portion of output not accounted for by factor inputs. The estimation of equation (3.4) requires a technique that is not prone to endogeneity and simultaneity problems (Marschak & Andrews 1944). This study obtained total factor productivity through the semi-parametric approach as implemented by Levinsohn and Petrin (2003).

In linking trade liberalization and total factor productivity the new trade theory applies according to Melitz (2003). The work of Melitz (2003) relates firms' productivity improvements within an industry to the adoption of trade liberalization measures. The argument is that, since fixed production costs exist firms are required to operate at a productivity level above some lower threshold in order to make profits. Otherwise, the firms will choose to exit the market. The productivity cut-off needed to serve the domestic market and that required for exports are distinguished, and they are assumed

to be inversely related. In the case of an economy with enormous trade restrictions infinitely large trade costs are applied. Consequently, the exporting cut-off productivity tends to be very high, while the productivity cut-off needed to serve the domestic market is low. When trade restrictions are removed or reduced, the exporting cut-off productivity decreases. Accordingly, the domestic market cut-off productivity rises leading to improvements in average industry productivity.

In this study, firm total factor productivity obtained from equation (3.4) is modeled as a function of industry variables that account for the ease in which trade occurs.

$$TFP_{ijt} = f\left(TAR_{jt}, MP_{jt}, XP_{jt}\right) \tag{3.5}$$

where:

TFP = total factor productivity.

TAR = tariff rates.

MP = import penetration.

XP = export penetration.

$i, j,$ and t = subscripts for the firm, industry, and time, respectively.

Equation (3.5) refers to the case where total factor productivity depends on tariff rates, import penetration, and export penetration. These variables prominently stand out from literature, as variables that proxy trade liberalization (Harrison, 1994; Adenikinju and Chete, 2002; Njikam and Cockburn, 2011; Ackah *et al.*, 2012; and Bigsten *et al.*, 2015).

3.3.2 Productivity and Exports

The second objective of the study was to determine the influence of firms' productivity on their exports. The theoretical foundation utilized in addressing this objective is anchored on the self-selection theory as advanced by Melitz, (2003). The theory which is closely related to the concept of profit maximization has it that a firm only exports when the expected profit from doing so exceeds the variable costs for exporting. According to Melitz (2003) if firm i, at period t, produces and sells in foreign markets then, it produces at the quantity q_{it}^{*}; the level of exports that maximizes its profits. Therefore, the firm's profit will be:

$$\pi_{it}(Z_{it}) = P_{it}q_{it}^{*} - C_x \qquad (3.6)$$

where:

P = price of goods sold in foreign markets.

C_x = trade costs of producing the profit maximizing level of exports.

Z = vector of firm specific factors.

The profitability of firm depends positively on firm-specific characteristics including productivity and size (Melitz, 2003; Bernard *et al.*, 2003). This is because the production of a good for exports is assumed to involve a fixed production cost of units of labour and iceberg trade costs so that firms that export are on the average of higher productivity than firms that do not export; only sufficiently high productive firms would be able to make adequate profits to offset the costs of trading. Hence, denoting firm i's export status at period t, by X_{it}, the following relationship can be expressed:

$$X_{it} = \begin{cases} 1 & if\ \pi_x(productivity, size) > 0 \\ 0 & otherwise \end{cases} \quad (3.7)$$

hence,

$$X_{it} = f(productivity, size) \quad (3.8)$$

From literature, Bernard and Jensen (1999); Aw, *et al.* (2000); and Serti and Tomasi (2012) employed other firm-specific characteristics including production wage, capital per employee, capital-output ratio and growth rate of value-added as factors affecting profitability. Therefore, the vector of the firm-specific factors that influence profitability of the firm can be expanded to include the aforementioned variables. This generates a new equation for the decision to export expressed by equation (3.9).

$$X_{it} = f(productivity_{it}, size_{it}, PW_{it}, K/E_{it}, K/Y_{it}, GRVADD_{it}) \quad (3.9)$$

where:

PW = production wage.

K/E = capital per employee.

K/Y = capital to output ratio.

$GRVA$ = growth rate of value-aded.

3.3.3 Trade Liberalization and Competition

The third objective of the study sought to analyze the competitive effects of trade liberalization on firms in the manufacturing sector of Nigeria. The theoretical framework employed in addressing this objective was constructed based on the

neoclassical theory of competition put forward by Walras and Marshal (as cited in Tsaliki and Tsoulfidis, 1998). The neoclassical theory of competition postulate that in a perfect competition setting, prices and quantities are assumed to converge towards an equilibrium and therefore, profits of firms within an industry should converge to zero. Deviations from this are considered to result in imperfect competition or monopolistic competition. Such a deviation might occur as a result of factors including increasing returns to scale, price discrimination through product differentiation and cross subsidization causing spillover effects from one concentrated market to another (Bikker & Bos, 2008).

The deviation from the perfect competition setting is evident in Nigeria as there exist a variety of differentiated goods in the market supplied by a range of firms implying some form of monopolistic competition. Hence, the firms may not be price takers as such, different prices may be charged and profits spread over the competitive one. According to the neoclassical theory of competition, the competitive landscape within an industry comprises of industrial concentration and barriers to entry.

$$\theta = f(CR4, BE) \tag{3.10}$$

where:

θ = measure of competition

$CR4$ = industry concentration ratio

BE = barriers to entry

However, barriers to entry is conceived as a vector comprising the capital requirements for the operation of a firm and its efficient size (Semmler, 1982). Equation (3.10) can therefore be expressed as:

$$\theta = f(CR4, K/E, SIZE) \quad (3.11)$$

where:

K/E = the capital per employee.

$SIZE$ = number of workers engaged by a firm in the production process.

It is expected that competition will reduce with increase to the concentration ratio in an industry, and increase in size. On the other hand, competition will increase with reductions in a firm's capital to employee ratio.

In an attempt to provide the theoretical explanation for competition resulting from trade liberalization, the study relied on Melitz and Ottaviano (2008) in which it was put forward that competition in an industry also responds to increased import penetration from foreign markets. Thus, highlighting the pro-competitive effect associated with trade liberalization. Therefore, the general functional form for evaluating the effect of trade liberalization on competitiveness of firms can be expressed as:

$$\theta = f(MP, CR4, K/E, SIZE) \quad (3.12)$$

where MP is import penetration.

3.4 Empirical Models

Three empirical models have been specified to address the three specific objectives outlined in the study.

3.4.1 Effect of Trade Liberalization on Productivity.

From equation (3.5) total factor productivity of firms in the industry increases with reductions in barriers to trade. Hence, following Adenikinju and Chete (2002) and Njikam and Cockburn (2011) the empirical model employed in this study was specified as:

$$TFP_{ijt} = \Upsilon' X_{jt} + \varepsilon_{ijt} \quad (3.13)$$

where $TFP_{ijt}$is total factor productivity of firm i, in a 2-digit industry j, at time period t. $X_{jt}$is a vector of k regressors observed in a particular 2-digit industry over the period. The regressors include indices of simple average tariff rate (ATAR), import penetration (MP) and export penetration (XP). In addition, the concentration ratio (CR4) was included to cater for market structure. ε_{ijt} is the error term.

The variables used in equation (3.13) are defined and measured as specified in table 3.1.

Table 3.1: Definition and Measurement of Variables for the Effects of Trade liberalization on Productivity

Variable	Definition	Measurement
Total factor productivity *(TFP)*	The portion of output of firms belonging to a particular sub-sector in a given time which is not accounted for by factor inputs.	Computed through the semi-parametric approach as implemented by Levinsohn and Petrin (2003).
Simple average tariff rate *(ATAR)*	Effectively applied rates for all products subject to tariffs for a sub-sector in a given time.	The recorded un-weighted average tariff rates. It is expressed in percentage.
Import penetration *(MP)*	The extent to which domestic demand is satisfied by imports in a particular sub-sector in a given time.	The ratio of imports to the gross domestic product (GDP) adjusted for the foreign trade balance (difference between exports and imports) in a 4-digit industry. Measured in percentage.
Export penetration *(XP)*	The degree to which domestic production of a sub-sector penetrate foreign markets in a particular time.	The percentage of real exports to real output ratio in a 4-digit industry.
Concentration ratio *(CR4)*	The relative power of competing units in an industry in a given time.	The share of sales controlled by the four largest firms in a 4-digit industry.

3.4.2 Influence of Productivity on Firms' Export.

Drawing from the functional relationship between firm-specific characteristics and the firm's decision to export in equation (3.9) this study followed the approach by Bernard and Jensen (1999); and Serti and Tomasi (2012) to examine the influence of productivity on firms' export in the manufacturing sector of Nigeria.

In the first instance, comparison of the differentials in firm-specific characteristics between exporters and non-exporters using the export premia (β) in equation (3.14) was done.

$$lnZ_i = \alpha + \beta EXP_i + \delta STATE_i + \gamma TYPE_i + \epsilon_i \quad (3.14)$$

where *Z*, stands for firm-specific characteristic, *EXP* is a dummy for current export status, *STATE* is a dummy for region where a firm is situated, *TYPE* a dummy representing scale of operation, and ϵ is the error term. Subscript *i* represents a firm. $\beta$is the export premium which reflects the average percentage difference between exporters and non-exporters.

Next, the export premia of future exporters and future non-exporters in equation (3.15) in periods preceding entry into foreign markets was estimated to enable comparison of the differentials in ex ante firm-specific characteristics.

$$lnZ_{i,t-p} = \alpha + \beta STARTER_{it} + \delta STATE_i + \gamma TYPE_{i,t-p} + \epsilon_i \quad (3.15)$$

where $0 \leq p \leq 3$. *STARTER* is the dummy representing whether or not a firm is currently exporting and $\beta$is the export premium showing the average percentage difference between future exporters and future non-exporters.

Then, a comparison of the differentials in the growth rate of ex ante firm-specific characteristic between exporters and non-exporters was done. This was informed from the estimated relationships in equation (3.16)

$$ln(Z_{i,t-s}) - ln(Z_{i,t-p}) = \alpha + \beta STARTER_{it} + \delta STATE_i + \gamma TYPE_{it} + \epsilon_i \quad (3.16)$$

where $0 \leq p \leq 3 \; and \; 0 \leq s \leq 2$.

Lastly, to test the effects that the firm-specific characteristics have on firms' exports the discrete choice model in equation (3.17) and the truncated model in equation (3.18) were estimated.

$$X_{1it}^{*} = Z_{1it}\beta_1 + e_{1it}; \quad (3.17)$$

$$X_{1it} = \begin{cases} 1 & if X_{1it}^{*} > 0 \\ 0 & if X_{1it}^{*} \leq 0 \end{cases}$$

$$X_{2it}^{*} = Z_{2it}\beta_2 + e_{2it} \quad (3.18)$$

$$X_{2it} = X_{2it}^{*} \text{ if } X_{2it}^{*} > 0$$

where X_{1it}^{*} is the unobserved probability that a firm exports. Z_{1it} is a vector of firm-specific characteristic making up the explanatory variables. β_1 is a vector of coefficients estimated including the intercept, and e_{1it} is the error term. X_{2it}^{*} is the share of exports in total sales from participation in foreign markets. Z_{2it} is a vector of independent variables (firm-specific characteristics). β_2 is a vector of coefficients including the intercept, and e_{2it} is the random error.

The variables used in addressing the second objective were defined and measured as stated in table 3.2:

Table 3.2: Definition and Measurement of Variables for the Influence of Productivity on Firms' Exports

Variable	Definition	Measurement
Share of exports in total sales (*XSHARE*)	Exports of firms in a given period.	The ratio of exports sales to total sales of a firm.
Labour productivity (*LP*)	Productivity per employee in a particular sub-sector in a given time.	Value added per employee in a firm's production process. It is expressed in millions of naira.
Capital-output ratio (*K/Y*)	Capital intensity involved in a firm's production process in a given period.	The amount of capital input divided by the value-added in production. It is expressed in units.
Capital per employee (*K/E*)	Capital intensity employed by firms in production in a given period.	The ratio of capital input costs to the number of employees. It is expressed in thousands of naira.
Growth rate of value-added (*GRVADD*)	Growth in a firm's demand in a particular period.	The percentage change in value added.
Production wage (*PW*)	Incurred labour costs in production of a firm in a particular period	The wage paid to employees, expressed in thousands of naira.
Size	Scale of operation of a firm in a given time	The number of persons engaged in production.

3.4.3 Effect of Trade liberalization on Competitiveness.

Based on the relationship in equation (3.12) competition is dependent on import penetration (MP), the concentration ratio (CR4) of the industry, capital to employee ratio (K/E), and number of employees (SIZE). Besides these variables, this study following Yalcin (2000) included the interaction between concentration ratio and import penetration (CRMP), export penetration (XP), growth rate of value-added output (GRVADD), and output per employee (Y/E). Thus, providing an inclusive picture of

the industry structure as regards competition. Consequently, the model used in addressing the third objective was specified as:

$$\theta_{ijt} = f\left(MP_{jt}, CR4_{jt},\ CRMP_{jt}, XS_{jt}, GRVADD_{ijt}, Y/E_{ijt}, K/E_{ijt}, SIZE_{ijt}\right) + U_{ijt} \qquad (3.19)$$

where θ_{ijt} is the measure of competitiveness, and U_{ijt} denotes the error term. $i,\ j,$ and t represent the firm, 2-digit industry, and time subscripts respectively.

Table 3.3 defines the variables used in equation (3.19) and their measurement.

Table 3.3: Definition and Measurement of Variables for the Effects of Trade liberalization on Competitiveness

Variable	Definition	Measurement
Competitiveness (θ)	degree of domestic competition among firms in a sub-sector in a given time.	It is measured by the price-cost margin; the ratio of sales revenue minus the sum of labour and material cost to sales revenue
Import penetration *(MP)*	The extent to which domestic demand is satisfied by imports in a particular sub-sector in a given time.	The ratio of imports to the gross domestic product (GDP) adjusted for the foreign trade balance (difference between exports and imports). Measured in percentage
Concentration ratio *(CR4)*	The relative power of competing units in an industry in a given time.	The share of sales controlled by the four largest firms in a sub-sector.
Interaction between concentration ratio and import penetration (*CRMP*)	The disciplining effect of import penetration on firms' market share in more concentrated industries.	The product of Concentration ratio and import penetration.
Capital per employee (*K/E*)	Capital intensity employed by firms in production in a given period.	The ratio of capital input costs to the number of employees. It is expressed in thousands of naira.
Size	Scale of operation of a firm in a particular sub-sector in a given time	The number of persons engaged in production.
Export penetration *(XP)*	The degree to which domestic production of a sub-sector penetrates foreign markets in a particular time.	The percentage of real exports to real output ratio in a 4-digit industry.
Growth rate of value-added (*GRVADD*)	Growth in a firm's demand in a particular period.	The percentage change in value added.
Output per employee *(Y/E)*	Output attributed to a firm's employee in a particular sub-sector in a given time.	The ratio of value-added output to the number of employees, expressed in millions of naira.

3.5 Data Types and Sources

The study used secondary data obtained from the Nigeria National Bureau of Statistic. This included the firm level data from Survey of Manufacturing Industry (SMI) conducted in 2008 – 2010. This was the third survey carried out in Nigeria; the next is expected to be done for 2018 – 2020. The SMI in Nigeria for the period 2008 – 2010 provides information on 596 firms located in the different states of Nigeria on a quarterly interval. In each of the quarters, information including capital investment, type of business ownership, the number of employees and amount paid as wages, amounts of capital input, value of raw materials (local and imported), installed capacity utilized, energy costs, other operating costs, and the value of sales (domestic and exported) were collected. More so, the sampled firms' activities cut across a broad range from light agricultural-based industries to heavy iron and steel companies.

Other information including those on the implicit price deflator used to remove price effects on the data, and imports of finished goods for each sub-sector of the manufacturing industry in Nigeria, used in computing import penetration were obtained from the Central Bank of Nigeria. The data on simple average tariff rates relating to specific industries of the manufacturing industry in Nigeria were sourced from the Federal Ministry of Finance.

3.6 Data Analysis

3.6.1 Data Cleaning and Classification of Firms into Cohorts

The SMI in Nigeria identified each firm's activity by a four digit-code following the International Standard Industrial Classification (ISIC). Whereas, the first two digits

identify the particular division a firm's activity falls, the last two digits identify the item under that division. Going by the ISIC categorization of firm activities, the information on firms from the SMI in Nigeria were organized into eleven manufacturing sub-sectors including: Food, Beverages and Tobacco, Textiles; Machinery and Motor Vehicle, Wearing Apparel, Rubber and Plastic Products, and Fabricated Metal Products. Other sub-sectors include Leather and Related Products, Paper Products, Printing, Publishing and Reproduction, Wood, Wood Products and Furniture, Chemical and Pharmaceutical Products, and Non-metallic Mineral Products. Although the necessary information identifying firms and tracing them over time were not provided, the information for repeated cross-section observations to track cohorts was considered would yield consistent estimates following Deaton (1985), Moffitt (1993), Nijman and Verbeek (1992), Collado (1997); (1998), and Verbeek and Vella (2005).

In transforming the data into a pseudo panel data set, the study grouped firms according to region, industry and size characteristics following the procedures in studies by Heshmati and Kumbhakar (1997), Kang, Heshmati and Choi (2008), Dwenger, Rattenhuber and Steiner (2011), Bruneau and Renzetti (2014), Niringiye (2014) and Bardazzi and Duranti (2015). The regional level considered the 36 states in Nigeria, the 4-digit ISIC classification of economic activities constituted the industry type, and size was defined by a firm's number of employees. The grouping of firms according to size is as described in table 3. 4.

Table 3.4: Classification of Firms by Size

Number of Employees	Classification
Less than 10	Micro scale
10 – 100	Small scale
101 – 300	Medium scale
Above 300	Large scale

It was assumed that a firm's industry activity, location and size decision do not change in a short time period.

To account for price fluctuations in the data all variables recorded in monetary units were deflated to remove the price effect in each period. After that, a synthetic identity number based on the time invariant identified firm characteristics (state, industry activity and size) was assigned to each firm. This was done in order to permit individual firms to be traced and the dependency of observations over time to be accounted for. Then, the means of the variables were computed according to the identity and time. Next, in order to cater for the differences in the size of the cohorts and to solve for possible discrepancy in the distribution of the data, in each group the square root of the number of observations was multiplied by each cell mean variable as a weighting factor following Deaton (1985). This resulted to an unbalanced pseudo panel dataset consisting of cohorts spread across the eleven manufacturing sub-sectors as presented in table 3.5.

Table 3.5: Distribution of Cohorts by Sub-sector

Manufacturing Sub-sector	Number of Cohorts
Food, Beverages and Tobacco	51
Non-Metallic Mineral Products	38
Wood, Wood Products and Furniture	31
Chemical and Pharmaceutical Products	7
Paper Products, Printing, Publishing and Reproduction	6
Wearing Apparel	5
Rubber and Plastic Products	5
Fabricated Metal Products	5
Leather and Related Products	2
Textiles	1
Machinery and Motor Vehicle	1

The sub-sectors that had less than 30 cohorts observed over the survey period were dropped, in order to obtain consistent estimates in the analysis. Therefore, only 3 sub-sectors; Foods, Beverages and Tobacco, Non-Metallic Mineral Products and Woods, Wood Products and Furniture were analyzed in the study with a total of 120 cohorts which had data for at least 6 quarters in the period considered.

3.6.2 Model Estimation and Diagnostic Tests

To address the first objective of the study, equation (3.13) was estimated. However, before the estimation the variables were checked for stationarity, and the Chow test done to determine whether the data of the three sub-sectors in the study could be pooled together. Then, to ensure that the appropriate estimation procedures were followed and to validate the results that were obtained, diagnostic tests appropriate for panel data

analysis were carried out. These included the tests to check for multicollinearity, regression specification error, specification of the unobserved firm effects, variance of the residuals, and whether the residuals were serially correlated. In the end, the effect of trade liberalization on productivity of firms in the manufacturing industry in Nigeria were determined by the sign and magnitude of the coefficients and levels of significance of the specified trade liberalization variables in the estimated equation (3.13), following the random effects estimation method.

For the second objective, the empirical procedure involved conducting the test for heteroscedasticity on the estimated export premia in equations (3.14), (3.15) and (3.16). This was done to ensure that all the estimations done thereof were consistent as well as efficient. The panel unit root test to check whether the variables used were stationary, and Chow test to determine whether the data from the different sub-sectors could be pooled were performed. In addition, regression specification error test, and the test to determine whether the predictor variables were highly correlated were conducted on equations (3.17) and (3.18). Next, the likelihood ratio test was performed to ascertain whether the Cragg's two-equation model is appropriate. Afterwards, tests to check whether the residuals in the models were uncorrelated and their variance constant were done. Finally, to gauge the influence of firms' productivity on their export participation, the, sign, magnitude and significance of the export premia in the estimated equations (3.14), (3.15) and (3.16), and the marginal effects in the estimated Cragg's two-equation model, relating to labour productivity were considered.

In addressing the third objective, the same pre-estimation and diagnostic tests carried out in estimating the relationships for the first objective were performed. It was only after the tests were carried out that the interpretations of the results obtained were done. Employing a fixed effects estimation technique, the effect of trade liberalization on competitiveness was based on the sign and magnitude of the coefficients and levels of significance of the import penetration variable in equation (3.19).

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings and discussions of empirical results of the study. First, an exploration of the variables used in the estimation of the models was done with a view to understanding the variability of the key variables used in the analysis as well as their differences across the different sub-sectors of the manufacturing industry in Nigeria. Afterwards, different models; each addressing a specific objective of the study were estimated, necessary diagnostic tests conducted, and the results presented alongside a detailed discussion of the findings.

4.2 Descriptive Statistics

Based on the firm level quarterly data from the Survey of Manufacturing Industry (SMI) in Nigeria for the period 2008 – 2010 a summary statistic on the variables used in the study are as presented in table 4.1. The detailed summary statistics of the variables are provided in tables A1, A2, and A3 in Appendix I.

Table 4.1: Summary Statistics

Variable	Sub-Sector								
	Foods, Beverages and Tobacco			Non-Metallic Mineral Products			Wood, Wood Products and Furniture		
	Mean	SD	No. of Obs.	Mean	SD	No. of Obs.	Mean	SD	No. of Obs.
Gross Output	60.5610	58.5014	428	32.1115	22.4958	239	53.7409	45.0180	228
Share of Exports in Total Sales	0.0187	0.0909	428	0.0008	0.0059	239	0.0115	0.0799	228
Price-Cost Margin	0.7350	0.1679	428	0.6398	0.1822	239	0.6181	0.2123	228
Number of Employees	49	27	428	34	22	239	46	35	228
Production Wage	2.1404	1.6860	428	1.8235	1.3559	239	3.3170	2.4154	228
Value-Added per Employee	0.9497	0.6681	428	0.8857	0.6751	239	1.0518	0.8250	228
Material Input	8.5808	7.5425	428	6.6738	4.3262	239	10.2307	8.1442	228
Capital Input	0.7548	0.7440	428	0.3871	0.3537	239	1.3847	0.9677	228
Capital per Employee	0.0159	0.0148	428	0.0159	0.0152	239	0.0337	0.0252	228
Capital-Output Ratio	0.0202	0.0179	428	0.0234	0.0220	239	0.0510	0.0443	228
Concentration Ratio	0.7251	0.1594	428	0.54	0.19	239	0.4739	0.2335	228
Simple Average Tariff Rate	15.76	0.22	428	15.62	0.29	239	28.63	0.26	228
Import Penetration	50.48	15.24	428	91.03	7.81	239	51.70	14.18	228
Export Penetration	6.52	5.25	428	0.35	0.30	239	3.89	5.11	228

Variables are in ₦ '000 000 where relevant. SD = Standard deviation; No. of Obs. = Number of Observations.
Source: Computations from Study Data (2016)

As shown in table 4.1, the average gross output of the Foods, Beverages and Tobacco sub-sector was ₦60.6 million. This amount is the highest compared to the two other sub-sectors. In contrast, the Non-metallic Mineral Product sub-sector recorded the lowest mean of gross output (₦32.1 million). Moreover, the spread of gross output from the mean followed the same order. Similarly, the largest average share of exports in total sales (0.0187) was that of the Foods, Beverages and Tobacco followed by the Wood, Wood Products and Furniture with 0.0115; and the Non-metallic Mineral Product with 0.0008. Worthy of note here is that a substantial number of firms across the three sub-sectors reported zero amounts of their sales exported. The Non-metallic Mineral Product sub-sector had the largest number of firms with zero amounts of their sales exported. In contrast, the sub-sector with the least number of firms with zero amounts of their sales exported were in the Foods, Beverages and Tobacco.

In terms of competition, firms in all the sub-sectors on the average sold their output at above 50 per cent of their respective competitive prices. The sub-sector with the least competition as measured by the price-cost margin was observed to be Foods, Beverages and Tobacco with a mean of 0.73 as the fraction of price over the competitive price. This was followed by the Non-metallic Mineral Product with a mean of 0.64 as the fraction of price over the competitive price. The relatively more competitive sub-sector of the three was Wood, Wood Products and Furniture with 61 per cent of its price above the competitive price. With regards to the dispersion around the mean of price-cost margins, the reverse order was the case.

Firms in the Foods, Beverages and Tobacco sub-sector employed on the average 49 persons thus leading the other sub-sectors. In contrast, the Non-metallic Mineral Product sub-sector recorded the lowest average of employed labour (34). In the case of average production wage, payment to labour as a cost item is seen to be more important in the Wood, Wood Products and Furniture sub-sector in comparison to the other sub-sectors. In the sub-sector, an average of ₦3.3 million was paid to labour. Whereas the Foods, Beverages and Tobacco sub-sector paid labour an average of ₦2.1 million; the Non-metallic Mineral Product sub-sector paid labour an average of ₦1.8 million. In the same way, the highest mean for the value-added per employee of ₦1.1 million could be traced to the Wood, Wood Products and Furniture sub-sector; followed by the Foods, Beverages and Tobacco sub-sector with ₦0.95 million; then the Non-metallic Mineral Product sub-sector with ₦0.89 million. Raw material inputs were used the most in the Wood, Wood Products and Furniture sub-sector with a mean value of ₦10.23 million. In contrast, the Non-metallic Mineral Product sub-sector used the least raw material inputs with an average value of ₦6.67 million.

The variables indicating the capital intensity employed show that the Wood, Wood Products and Furniture sub-sector used the most capital intensive processes than the Non-Metallic Mineral Products, while the Foods, Beverages and Tobacco sub-sectors employed the least capital intensity. In the Wood, Wood Products and Furniture sub-sector the mean value of capital input was ₦1.38 million; in the Foods, Beverages and Tobacco sub-sector the mean value of capital input was ₦0.75 million; and in the Non-metallic Mineral Product sub-sector the mean value of capital input was ₦0.39 million. Similarly, in the Wood, Wood Products and Furniture sub-sector the average capital per

employee and capital to output ratio were ₦33, 000 and 0.05 respectively. In the other two sub-sectors the average capital per employee and capital to output ratio were ₦15, 900 and 0.02 respectively.

With regards to concentration, while Woods, Wood Products and Furniture sub-sector was the least concentrated with only 47 per cent of its sales controlled by its four largest firms; the Foods, Beverages and Tobacco sub-sector was the most dominated by a few firms as depicted by the share of sales (73%) of its four largest firms. The largest variation around the mean value of concentration ratio was that in Woods, Wood Products and Furniture; followed by Non-Metallic Mineral Products; and Foods, Beverages and Tobacco with 0.23; 0.19; and 0.16 respectively.

The Woods, Wood Products and Furniture sub-sector enjoyed the highest protection as shown by the mean of simple average tariff rate which was 28.63; followed by Foods, Beverages and Tobacco with a mean of 15.76 and Non-Metallic Mineral Products with a mean of 15.62. All the three sub-sectors experience high import penetration with the highest average of 91 per cent recorded in the Non-Metallic Mineral Products sub-sector. The lowest mean for import penetration was recorded in Foods, Beverages and Tobacco with a value of 50 per cent. For export penetration, Foods, Beverages and Tobacco had the highest mean of 7 per cent. Conversely, Non-Metallic Mineral Products recorded the least mean with only 0.4 per cent of its output sold in foreign markets. The Woods, Wood Products and Furniture had the second highest mean of export penetration, which was 4 per cent.

4.3 Results of the Panel Unit Root Test

In panel data analysis, the literature on unit root and non-stationarity place emphasis on datasets with a large number of panels and many time periods (Cameron & Trivedi, 2005). For unbalanced panel data, available tests to check for unit root include the Fisher-type (Choi 2001) and Im–Pesaran–Shin (2003). While the Im–Pesaran–Shin (2003) requires the average number of periods to be greater than 10, the Fisher-type (Choi 2001) allows for less number of periods. Given that the dataset of this study has an average time period of 8 quarters in the Foods, Beverages and Tobacco sub-sector; and 7 quarters each in the Non-Metallic Mineral Products and Wood, Wood Products and Furniture sub-sectors the Fisher-type test of unit root was conducted to investigate if the variables used in the analysis were non-stationary. The test, which gives results for both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), has as its null hypothesis that all panels contain unit root. From the results obtained (see table A4 in Appendix II), the probability values of the test statistics for all variables at levels were less than 0.05, thus the null hypothesis that all panels contain unit root was rejected. The results attest to the assertion of Pedroni (2007) that amongst the variable properties of micro panels is stationarity.

4.4 Effects of Trade Liberalization on Productivity in the Manufacturing Industry in Nigeria.

The first objective of this study sought to analyze the effects of trade liberalization on productivity of manufacturing firms in Nigeria. Hence, the course of action was to regress total factor productivity (TFP) on the trade liberalization variables and a market structure variable. The market structure variable was included to gauge the relative

power of the competing firms since productivity may be affected by differences in mark-up (Amiti & Konnings, 2007). To address this objective, TFP had to be obtained first before estimating the effects of trade liberalization variables and the market structure variable on productivity in the manufacturing industry in Nigeria.

4.4.1 Total Factor Productivity of the Different Sub-Sectors

In order to obtain TFP for each firm, the production functions of the different sub-sectors were estimated. The production function was expressed as gross output being a function of labour, capital, and material inputs. Before the estimation, the likelihood ratio test for model selection was carried out to decide between the Cobb-Douglas specification and the Transcendental Logarithmic (Translog) specification of the production function. The null hypothesis of the test is that the Cobb-Douglas specification is appropriate otherwise, the Translog specification is appropriate. The test statistic, which has a chi-square distribution with degrees of freedom equal to the number of regressors, is compared with the chi-square critical value; if the test statistic exceeds the critical value the null hypothesis is rejected. In each one of the models for the Foods, Beverages and Tobacco, Non-Metallic Mineral Products and Woods, Wood Products and Furniture sub-sectors the test statistic was less than the critical value (see table A5 in appendix II).Therefore, in all cases the study failed to reject the null hypothesis that the Cobb-Douglas function specification is appropriate.

Not only was the test for model selection performed prior to the estimation but also the test to check for multicollinearity within the explanatory variables. The results of the test as presented in table A8 in appendix III, show that in all the models the variance

inflation factor (VIF) was less than 10 and the tolerance (1/VIF) was greater than 0.1. Hence, the study concluded that the degree of multicollinearity was not serious in any of the models.

Table 4.2 presents the results of the estimated production functions for each sub-sector obtained from Levinsohn and Petrin (2003) semi-parametric method.

Table 4.2: Production Function Estimates

Independent Variable	**Dependent Variable: Log of Gross Output**		
	FBT	**NMMP**	**WWPF**
Log of Labor	0.1691*** (3.15)	0.1734** (2.22)	0.3261*** (4.08)
Log of Capital	0.1301** (2.18)	0.02 (0.49)	0.01 (0.26)
Log of Materials	0.3763*** (9.33)	0.3896*** (4.02)	0.4413*** (6.66)
Probability (Wald test of RTS)	0.0583	0.2900	0.0861
Probability (Modified Wald test for GH)	0.0000	0.0000	0.0000
Probability (Wooldridge test for Autocorrelation)	0.3143	0.9220	0.2831
Number of Observations	428	239	228

Note: FBT = Foods, Beverages and Tobacco; NMMP = Non-metallic Mineral Products;
WWPF = Woods, Wood Products and Furniture.
RTS = Returns to scale; GH = Group wise heteroskedasticity
**** significant at 1%; ** significant at 5%.*
Z-statistics in parentheses.
Source: Computations using Study Data (2016).

The estimated production functions were evaluated for heteroscedasticity and serial correlation using the Modified Wald test for group wise heteroscedasticity and the Wooldridge test respectively. The results of the group wise heteroskedasticity test had probability values less than 0.05 which implied the presence of heteroscedasticity in the models. This notwithstanding, the presence of heteroscedasticity is catered for in the models since the estimation approach used employs bootstrap that uses the cluster option to construct the standard errors for the estimates (Petrin, Poi and Levinshon, 2009). On the other hand, the Wooldridge test for autocorrelation had probability values greater than 0.05 indicating that serial correlation was not present in any of the models.

From table 4.2, the sum of the elasticities of gross output with respect to the inputs were less than 1. However, the returns to scale are not significantly different from constant returns to scale. This is shown by the probability value of the Wald Test of returns to scale; in all three sub-sectors the study failed to reject the null hypothesis of constant returns to scale at 5 per cent level of significance.

The coefficients of the logs of labour, capital and materials are all statistically significant in the production function of the Foods, Beverages and Tobacco sub-sector. This indicates that growth in the three inputs contribute to growth in the gross output of the sub-sector. The results show that a growth in labour, capital and materials of 1 per cent will increase gross output by 0.17, 0.13 and 0.38 per cent respectively. This suggests that materials explain much of the growth in gross output in the Foods, Beverages and Tobacco sub-sector.

In the Non-Metallic Mineral Products sub-sector, the coefficients of the logs of labour and materials are statistically significant. On the other hand, the coefficient of the log of capital is statistically insignificant. A growth in labour of 1 per cent will increase gross output by 0.17 per cent, and a growth in materials of 1 per cent will increase gross output by 0.39 per cent. Similarly, in the Woods, Wood Products and Furniture sub-sector whereas the coefficients of the logs of labour and materials are statistically significant the coefficient of the log of capital is not. The results show that gross output will increase by 0.33 per cent and 0.44 per cent in response to a 1 per cent increase in labour and material inputs respectively.

Overall, the results indicate that growth in materials contributed more to increase in gross output in all the sub-sectors. These results are similar to those obtained by Njikam and Cockburn (2011) for Cameroon; and Ackah *et al.* (2012) for Ghana. Also, comparing labour and capital the results suggest that the manufacturing industry in Nigeria is more labour intensive than capital intensive. This finding contradicts that of Adenikinju and Chete (2002) in which they indicated that the Nigerian manufacturing industry was capital intensive. This contradiction may have arisen from the perpetual inventory method Adenikinju and Chete (2002) used to compute the capital stock variable; where their study admitted that the said approach introduces biases into the estimates which was likely to overstate the capital coefficient while understating the coefficient in labour. However, other studies involving Sub-Sahara Africa countries obtained results attesting to the labour intensive nature of the manufacturing industry (see Njikam and Cockburn (2011) for Cameroon; and Ackah *et al.* (2012) for Ghana).

Having obtained the estimates of the production functions, TFP was computed as the difference between the observed output and the predicted output for each firm. Table 4.3 presents the means of TFP for the different sub-sectors.

Table 4.3: Mean of Total Factor Productivity by Sub-Sector.

Sector	No. of Obs.	Mean	Standard Deviation	Minimum	Maximum	KW Rank Sum
FBT	428	6.2726	0.5735	5.1402	9.1595	249014.00
NMMP	239	5.7886	0.7273	4.4891	10.0469	87862.00
WWPF	228	5.4876	0.6194	4.0558	7.2937	64084.00
Probability (KW Chi-square) = 0.0001						

Note: KW = Kruskal-Wallis
Source: Computations using Study Data (2016).

The Kruskal Wallis Test to ascertain whether pairwise comparisons of the computed TFP among the three sub-sectors would be appropriate was performed. The test has as its null hypothesis that there is no significant difference between TFP in the three sub-sectors. Given that the probability value of the test is 0.0001, the null hypothesis was rejected implying that there were differences in the computed TFP across sub-sectors. Hence, it is noted that the highest average of TFP was recorded in the Foods, Beverages and Tobacco sub-sector with 6.2726, followed by the Non-metallic Mineral Products sub-sector with 5.7886, then the Wood, Wood Products and Furniture sub-sector with 5.4876. On the other hand, whereas the Wood, Wood Products and Furniture sub-sector had the least deviation from the maximum TFP, the Non-metallic Mineral Products sub-sector had the largest deviation from the maximum TFP. TFP clustered around the mean

the most in the Foods, Beverages and Tobacco sub-sector. The largest deviation from the average TFP is observed in the Non-metallic Mineral Products sub-sector.

4.4.2 Results for the Second Step Model

In the second step of the analysis, equation (3.13) was estimated to determine the effects of the trade liberalization on productivity. Therefore, TFP estimated in section 4.2.1 was regressed on simple average tariff rate, import penetration, export penetration and the Herfindahl concentration ratio.

Before the estimation, two tests were conducted. Firstly, the Chow test was done to examine whether the data of the three sub-sectors in the study could be pooled by verifying whether the parameters of any one of the sub-sectors were equal to those of the other sub-sectors. The test was based on the null hypothesis that; the slopes and intercepts of the different sub-sectors are equal. The result of the chow test as shown in table A7 in appendix II had a probability value of 0, thus the null hypothesis that the slopes and intercepts of the different sub-sectors are equal was rejected. Consequently, the estimation was carried out for each sub-sector separately.

Secondly, the test to check for multicollinearity within the explanatory variables was performed. The results of the test as presented in table A9 in appendix III show that in the Non-Metallic Mineral Products; and Woods, Wood Products and Furniture models the VIF for each variable was less than 10 and the tolerance (1/VIF) was greater than 0.1 implying that the variables did not suffer from serious multicollinearity. On the other hand, the VIF relating to simple average tariff rate in the Foods, Beverages and

Tobacco sub-sector was 20.32. Nonetheless, this could be allowed since the mean VIF for all the variables combined together was below 10.

In order to validate the results of the different models estimated, several diagnostic tests were carried out. The tests included the Ramsey regression specification error test (RESET) to detect specification error in the models, the Hausman test to determine the specification of the unobserved firm effects, the Modified Wald test for group wise heteroscedasticity to check whether the variance of the residuals was constant, and the Wooldridge test for autocorrelation to determine whether the residuals were serially correlated.

The Ramsey RESET test was based on the null hypothesis that the model is correctly specified. The results of the test presented in table A12 in appendix III had probability value greater than 0.05 in all the three sub-sectors hence, the study failed to reject the assumption that the models relating to each one of the three sub-sectors were specified correctly. The Hausman test results as presented in tables A13, A14, and A15 in appendix III had probability value of 0.9402, 0.4858, and 0.7375 for each of the models relating to Foods, Beverages and Tobacco, Non-Metallic Mineral Products, and Woods, Wood Products and Furniture respectively. Therefore, in all cases the null hypothesis that the RE model is appropriate was not rejected. Accordingly, the Breusch-Pagan Lagrange Multiplier (LM) Test for RE was carried out to decide between the pooled OLS regression and the random effects regression. The results of the Breusch-Pagan LM test presented in table A16 in appendix III show that in all the models the test was significant at 1% level. Thus, the study rejected the null hypothesis that there is no

significant difference among firms and concluded that the RE regression was appropriate.

The results of the Modified Wald test for group wise heteroscedasticity as shown in table A17 in appendix III had probability values less than 0.01 in all the models. Thus, the null hypothesis of homoscedasticity was rejected for all the models. To cater for this problem, the heteroscedasticity-robust standard errors option was employed in the estimations.

The Wooldridge test results for autocorrelation as presented in table A18 in appendix III had probability values of 0.0044, 0.0388 and 0.1637 for the models in the Foods, Beverages and Tobacco, Non-Metallic Mineral Products, and Woods, Wood Products and Furniture respectively. Thus, in all cases except the Woods, Wood Products and Furniture sub-sector, the null hypothesis that there is no autocorrelation is rejected. However, since for all sub-sectors the random effects (RE) model was appropriate, serial correlation would not compromise the efficient estimation of the models (Waldinger, 2015).

Table 4.4 shows the results obtained from the random effects estimations for the Foods, Beverages and Tobacco; Non-metallic Mineral Products; and Woods, Wood Products and Furniture sub-sectors.

Table 4.4: Estimation Results of the Effect of Trade Liberalization on Total Factor Productivity.

Independent Variable	Dependent Variable: Log of Total Factor Productivity		
	FBT	**NMMP**	**WWPF**
Log of Simple Average Tariff Rate	36.0594 *** (4.72)	77.8661* (1.87)	-6.5353 *** (-3.98)
Log of Import Penetration	-0.4465 *** (-4.87)	-0.6424** (-2.16)	-0.4940*** (-11.06)
Log of Export Penetration	0.0399*** (19.42)	0.2294** (2.19)	0.2619*** (3.16)
Log of Concentration Ratio	0.6588* (1.74)	-0.0298 (-0.08)	-0.1518** (-2.15)
Constant	-91.2510*** (-4.38)	-25.4227* (-1.80)	28.9745*** (5.24)
Prob. (Wald Chi-square)	0.0000	0.0060	0.0000
Rho	0.3741	0.3479	0.6011

*Note: Z-values from the robust standard errors estimation are in parentheses; *** significant at 1%; ** significant at 5%; * significant at 10%*
Source: Computations using Study Data (2016).

The values of the intra-class correlation *rho*, were 0.3741 for Foods, Beverages and Tobacco, 0.3479 for Non-Metallic Mineral Products and 0.6011 for Woods, Wood Products and Furniture. This indicates that the share of the estimated total variance accounted for by the individual effect in the respective sub-sectors were 37 per cent, 35 per cent, and 60 per cent. The probability of the Wald chi-square statistic in all the sub-sectors is less than 1 per cent, implying that at least one of the regression coefficients in each of the models is not equal to zero.

From the results of the RE estimations in table 4.4, the coefficient of simple average tariff rate in the Foods, Beverages and Tobacco and Non-Metallic Mineral Products

sub-sectors, contrary to expectation is positive and statistically significant at 1 per cent and 10 per cent level of significance respectively. By contrast, the coefficient of simple average tariff rate in the Woods, Wood Products and Furniture sub-sector is negative and statistically significant at 1 per cent. While in the Foods, Beverages and Tobacco sub-sector, total factor productivity would improve by 36 per cent in response to an increase in simple average tariff rate of 1 per cent, in the Non-Metallic Mineral Products sub-sector a rise in simple average tariff rate of 1 per cent would lead to an increase in total factor productivity by 78 per cent. Within the Woods, Wood Products and Furniture sub-sector, a rise in simple average tariff rate of 1 per cent would lead to a decline in total factor productivity by 7 per cent.

The results imply that whereas higher protection in the form of higher simple average tariff rates improved the total factor productivity of firms in the Foods, Beverages and Tobacco and Non-Metallic Mineral Products sub-sectors, it impeded total factor productivity in the Woods, Wood Products and Furniture sub-sector. The finding that total factor productivity improves with higher simple average tariff rates contrasts with the results found in studies by Harrison (1994) for Cote d'Ivoire; Ackah *et al.* (2012) for Ghana; and Adenikinju and Chete (2002) for Nigeria. These studies found that higher simple average tariff rates decrease productivity.

A possible explanation for the contrary results may be that some of the firms in the Foods, Beverages and Tobacco and Non-Metallic Mineral Products sub-sectors were themselves involved in the importation of finished goods such that higher tariffs meant it was no longer profitable importing those goods hence, they had to re-organize and

improve their productivity in order to fill the gap in demand. Alternatively, this could have arisen from the varied ways these different nations have managed their trade and industrial policies over time, especially with regards to the assiduous implementations of their trade and industrial policies.

The coefficient of the import penetration variable was negative in all sub-sectors and statistically significant. In the Foods, Beverages and Tobacco sub-sector, a rise in import penetration of 1 per cent would decrease total factor productivity by 0.45 per cent. Also, an increase in import penetration by 1 per cent would result to a decline in total factor productivity of firms equivalent to 0.64 per cent in the Non-metallic Mineral Products sub-sector. Likewise, in the Woods, Wood Products and Furniture sub-sector total factor productivity would diminish by 0.49 per cent if import penetration rose by 1 per cent. This means that, the more similarly produced goods from abroad enter the domestic market the less the productivity of the firms in the manufacturing sector. Although this finding contrasts with expectation, similar results were reported in Adenikinju and Chete (2002) for Nigeria, Njikam and Cocburn (2011) for Cameroon, and Bigsten *et al.* (2016) for Ethiopia. This may suggest the case where the firms yet to mature require more protection to cope with higher inflow of imported goods.

The export penetration variable had a positive and statistically significant effect on total factor productivity in all the three sub-sectors. The results indicate that total factor productivity in Foods, Beverages and Tobacco would rise by 0.04 per cent if export penetration increased by 1 per cent. Similarly, an increase in export penetration by 1 per cent would lead to improvement in total factor productivity of 0.23 per cent and 0.26

per cent in the Non-metallic Mineral Products; and Woods, Wood Products and Furniture sub-sectors respectively. These results validate the claim that measures targeted at promoting exports would lead to growth in productivity for firms in the manufacturing industry in Nigeria. This finding agrees with those of Harrison (1994) for Cote d'Ivoire; Ackah *et al.* (2012) for Ghana; Adenikinju and Chete (2002) for Nigeria; and Njikam and Cockburn (2011) for Cameroon.

The coefficient of the Herfindahl concentration ratio was statistically significant in all the sub-sectors except the Non-Metallic Mineral Products sub-sector. Whereas the relationship between the Herfindahl concentration ratio and total factor productivity was positive in the Foods, Beverages and Tobacco sub-sector, it was negative in the Woods, Wood Products and Furniture sub-sector. An increase in the Herfindahl concentration ratio by 1 per cent would increase total factor productivity by 0.66 per cent in the Foods, Beverages and Tobacco sub-sector but, reduce total factor productivity by 0.15 per cent in the Woods, Wood Products and Furniture sub-sector.

The results relating to the Herfindahl concentration ratio indicate that while dominance of the market by few firms enhanced productivity in Foods, Beverages and Tobacco sub-sector the reverse was the case in Woods, Wood Products and Furniture sub-sector. The result implies the presence of learning-by-doing across firms in the first sub-sector. Larger firms often adopt efficient operating processes which may be imitated by the rest of the firms within the sub-sector thus, improving total factor productivity over time. Similar results were obtained by Adenikinju and Chete (2002) for Nigeria and Njikam and Cockburn (2011) for Cameroon.

4.5 Influence of Productivity on Firms' Exports in the Nigerian Manufacturing Industry.

The second objective of the study was intended to provide evidence as to whether more productive firms self-select into exporting, alongside analyzing the effect of firms' productivity on their export intensity. To that end, the study examined the performance of firms for the periods before and during exporting. The study first estimated the export premia of exporters and non-exporters such that a comparison of the differentials in performance characteristics between the firms that exported and those that did not was possible. After which, the differentials in performance characteristics of future exporters and future non-exporters was estimated. This was done in order to provide evidence on whether exporters already had the desirable performance characteristics prior to entry into foreign markets. Finally, the study estimated the effects of the identified performance characteristics on firms' share of exports in total sales.

4.5.1 Performance of Exporters and Non-Exporters in the Nigerian Manufacturing Industry.

The study organized the firms into exporters and non-exporters. While exporters referred to firms that sold a portion of their sales in export markets in the period under consideration non-exporters were those that reported zero export sales in the same period. Then, the study went on to probe whether there were unique significant differences between exporters and non-exporters, through the estimation of equation (3.14). This was done by considering three periods, one each representing the start, middle, and end points of the data where substantial information were reported for

exporters. The differences obtained from the estimation of the export premia are as presented in table 4.5.

Table 4.5: Export Premia: Exporters in Comparison to Non-Exporters.

Performance Characteristic	**Sub-Sector**	**2008Q4**	**2009Q4**	**2010Q4**
Labour Productivity	FBT	-3.8.35 (-0.50)	70.97 (1.11)	101.64** (2.34)
	NMMP	63.94 (0.41)	-33.70 (-0.09)	
	WWPF			-70.43 (-0.67)
Number of Employees	FBT	41.10*** (6.42)	-78.17 (-1.69)	67.11 (1.05)
	NMMP	34.68 (0.76)	17.42 (1.16)	
	WWPF			129.28 (1.75)
Growth Rate of value-added	FBT	-44.49 (-0.66)	84.94* (2.02)	-74.92* (-1.76)
	NMMP	-64.82 (-0.40)	52.75* (3.78)	
	WWPF			28.19 (0.42)
Production Wage	FBT	47.00*** (4.64)	-80.03 (-1.44)	15.66* (1.89)
	NMMP	179.84 (0.87)	-30.03 (-0.19)	
	WWPF			-112.10 (-1.01)
Capital per Employee	FBT	274.70** (2.39)	162.19* (1.82)	77.17 (0.54)
	NMMP	490.80 (0.83)	-221.06 (-1.37)	
	WWPF			-216.82 (-1.17)
Capital-Output Ratio	FBT	7.37** (2.37)	6.27 (0.85)	1.16 (0.61)
	NMMP	2.92 (0.33)	-1.86 (-0.77)	
	WWPF			-0.20 (0.05)

*Note: *** significant at 1%; ** significant at 5%; * significant at 10%.*
t-values are in parentheses;
Estimates were transformed in exact percentage values.
Source: Computation using Study Data (2016).

From table 4.5, it can be observed that the export premia for the Foods, Beverages and Tobacco sub-sector were obtained for all the three periods considered. On the other hand, the export premia for the Non-Metallic Mineral Products sub-sector were obtained only for the fourth quarters of 2008 and 2009; while that of the Woods, wood Products and Furniture sub-sector were obtained only for the fourth quarter of 2010. For the periods where the export premia are not presented, no firm in the relevant sub-sector reported sales in foreign markets greater than zero.

Comparing the productivity differentials between exporters and non-exporters, the study considered the labour productivity of firms. As expected, in Foods, Beverages and Tobacco, the export premia for the fourth quarter of 2010 was positive and statistically significant. Specifically, the result indicates that in Foods, Beverages and Tobacco firms that participated in exports were 102 per cent more labour productive than those firms that did not participate in exports in the fourth quarter of 2010. This indicates that firms participating in foreign markets are more productive relative to those participating only in the domestic market. This result concurs with those of Aw *et al.,* (1999) for Taiwan and South Korea, Bernard and Jensen (1999) for the United States of America (USA), Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, Fafchamps *et al*. (2008) for Morocco, Bigsten and Gebreeyesus (2009) for Ethiopia, and Serti and Tomassi (2012) for Italy.

Considering the scale of operation, the number of employees and the growth rate of value-added were considered. The export premia relating to the number of employees for the fourth quarter of 2008 was positive and statistically significant in the Foods,

Beverages and Tobacco sub-sector. The result shows that exporting firms employed 41 per cent more workers than non-exporting firms. With regards to the growth rate of value-added in production, the export premia for the fourth quarter of 2009 and 2010 for the Foods, Beverages and Tobacco sub-sector were statistically significant. However, while the export premia of the fourth quarter of 2009 was positive that of the fourth quarter of 2010 was negative. Also, the export premia for the Non-Metallic Mineral Products sub-sector was positive and statistically significant in the fourth quarter of 2009.

The export premia reveal that in the fourth quarter of 2009, the growth rate of value-added in production for exporting firms was higher by 85 per cent and 53 per cent in Foods, Beverages and Tobacco, and Non-Metallic Mineral Products respectively. These results suggest that exporting firms operated on a larger scale than those firms that did not. This finding is similar to the results obtained by Aw *et al.*, (1998) for Taiwan and South Korea, Bernard and Jensen (1999) for the United States of America (USA), Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, Bigsten and Gebreeyesus (2009) for Ethiopia, and Serti and Tomassi (2012) for Italy. On the contrary, the growth rate of value-added in the fourth quarter of 2010 for exporting firms was 75 per cent lower than that of non-exporting firms in Foods, Beverages and Tobacco. This could have been as a result of contraction of foreign demand of the Nigerian exports.

The differences in the production wage between exporting firms and non-exporting firms for Foods, Beverages and Tobacco were positive and statistically significant in the fourth quarters of 2008 and 2010. In the other two sub-sectors, the production wage of

exporting firms was not significantly different from those of non-exporting firms. In the Foods, Beverages and Tobacco sub-sector, the production wage of exporting firms was higher than that of non-exporters by 47 per cent and 16 per cent in the fourth quarters of 2008 and 2010 respectively. The results show that higher wages were paid by firms that exported compared to firms that did not export. This finding is similar to those of Bernard and Jensen (1999) for USA, Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, Bigsten and Gebreeyesus (2009) for Ethiopia, and Serti and Tomassi (2012) for Italy.

In the case of the capital endowment, firms' capital to employee ratio and capital to output ratio were considered. In the Foods, Beverages and Tobacco sub-sector, while the export premia of both variables were positive and statistically significant in the fourth quarter of 2008 only that of capital to employee ratio was positive as well as significant in the fourth quarter of 2009. The results reveal that in the Foods, Beverages and Tobacco sub-sector, exporting firms had 275 per cent and 162 per cent more capital per employee in the fourth quarters of 2008 and 2009 respectively. In the same sub-sector, firms that participated in foreign markets in the fourth quarter of 2008 had 7 per cent more capital to output than firms that only participated in the domestic market. This is indicative that exporting firms have higher capital endowments as compared to firms that do not export. This result is in line with the findings of Aw *et al*., (1998) for Taiwan and South Korea, Bernard and Jensen (1999) for the USA, Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, Bigsten and Gebreeyesus (2009) for Ethiopia, and Serti and Tomassi (2012) for Italy.

4.5.2 Performance of Future Exporters and Future Non-Exporters in the Nigerian Manufacturing Industry.

The purpose of the ensuing discussion is to analyze how productivity and the other identified performance characteristics influence the exports of firms. Hence, the study organized firms into those that started exporting within the period considered, referred to as future exporters, and those that never exported, mentioned as future non-exporters. The period considered for starters (new entrants) was the first quarter of 2010. Then, the performance characteristics of future exporters in relation to those of future non-exporters were examined following the estimation of equation (3.15). Table 4.6 presents the export premia of future exporters in comparison to future non-exporters; three quarters ($t - 3$), two quarters ($t - 2$) and one quarter ($t - 1$) preceding their entry into foreign markets.

Table 4.6: Export Premia: Future Exporters in Comparison to Future Non-Exporters.

Performance Characteristic	**Sub-Sector**	***t – 3***	***t – 2***	***t – 1***
Labour Productivity	FBT	63.21 (0.42)	167.53 (1.14)	65.16 (0.40)
	NMMP			
	WWPF	8.51 (0.05)	31.68 (0.16)	3.14 (0.03)
Number of Employees	FBT	-188.99 (-1.59)	-184.80 (-1.59)	-185.46 (-1.56)
	NMMP			
	WWPF	-129.93*** (-6.70)	-129.02 (-1.20)	-120.40 (-1.11)
Growth Rate of value-added	FBT	159.61 (-1.65)	-50.99*** (-4.40)	279.66*** (3.94)
	NMMP			
	WWPF	-116.08 (-0.75)	14.07 (0.93)	39.57*** (7.40)
Production Wage	FBT	-84.13 (-0.58)	-54.00 (-0.37)	-43.24 (0.29)
	NMMP			
	WWPF	-3.65 (-0.03)	23.08 (0.17)	23.08 (0.17)
Capital per Employee	FBT	170.21 (0.84)	238.79 (1.11)	186.89 (0.83)
	NMMP			
	WWPF	111.90 (0.48)	107.24 (0.41)	-3.24*** (-2.80)
Capital-Output Ratio	FBT	-2.09 (-0.68)	-7.13 (-1.19)	-1.34 (0.38)
	NMMP			
	WWPF	3.14 (0.65)	4.24 (0.56)	-0.30 (-0.05)

*Note: *** significant at 1%; t-values are in parentheses*
Estimates were transformed in exact percentage values.
Source: Computation using Study Data (2016).

Table 4.6 provides the percentage differentials relating to the different performance characteristics for three ex ante periods for new entrants into foreign markets for both the Foods, Beverages and Tobacco and the Woods, Wood Products and Furniture sub-sectors. The ex ante export premia for the Non-Metallic Mineral Products sub-sector could not be obtained because no new entrants into foreign markets were recorded in the sub-sector during the first quarter of 2010. The export premia relating to labour productivity of future exporters were statistically insignificant for Foods, Beverages and Tobacco and Woods, Wood Products and Furniture sub-sectors in all the three ex-ante periods considered. Therefore, in terms of ex ante productivity, it can be said that the desirable attributes in future exporting firms were also found in future non-exporting firms.

In the case of scale of operation, the export premia relating to number of employees for the third quarter preceding entry into foreign markets was negative and statistically significant in the Woods, Wood Products and Furniture sub-sector. This result indicates that three quarters before entry into foreign markets future exporters in the sub-sector employed 130 per cent less labour than future non-exporters. Also, the export premia relating to the growth rate of value-added for the second quarter preceding entry into foreign markets was negative and statistically significant in the Foods, Beverages and Tobacco sub-sector implying that the growth rate of value-added was 51 per cent less for future exporting firms relative to future non-exporting firms. On the contrary, in the first quarter preceding participation in exports, the growth rate of value-added was positive and statistically significant for both the Foods, Beverages and Tobacco; and Woods, Wood Products and Furniture sub-sectors. Whereas in the first sub-sector,

growth rate of value-added of future exporting firms was higher by 280 per cent in comparison to that of future non-exporting firms, in the other sub-sector the growth rate of value-added was 40 per cent higher in comparison to future non-exporting firms. This means that future exporters operated on a larger scale than future non-exporting firms. The finding is in unison to the results obtained in Bernard and Jensen (1999) for USA, Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, and Serti and Tomassi (2012) for Italy.

For production wage, the export premia for all the periods preceding entry into foreign market in both the Foods, Beverages and Tobacco and Woods, Wood Products and Furniture sub-sectors were not statistically significant. Thus, ex ante production wage of future exporting firms was not different from future non-exporting firms. In terms of capital endowment, only the export premia for Woods, Wood Products and Furniture in the first quarter prior to entry into foreign market was significant. The result indicates that capital per employee was 3 per cent lower in future exporting firms relative to future non-exporting firms. This contradicts the findings in Bernard and Jensen (1999) for USA, Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, and Serti and Tomassi (2012) for Italy. The smaller capital endowments of future exporters in relation to future non-exporters might have resulted from possible costs advantages available in foreign markets when less capital-intensive procedures are employed.

To further provide more insight into the differences between future exporters and future non-exporters a comparison of the growth rates of the performance characteristics of future exporting firms against those of the future non-exporting firms is made after

estimating equation (3.16). Table 4.7 presents the growth rates export premia of future exporting firms.

Table 4.7: Export Premia of Future Exporters: Growth Rates.

Performance Characteristic	**Sub-Sector**	***t – 3/t – 2***	***t – 2/ t – 1***	***t – 1/ t***
Labour Productivity	FBT	104.32*** (4.37)	-102.37** (-2.58)	-148.96*** (-3.55)
	WWPF	23.17*** (1.90)	-28.54 (-0.36)	16.40 (0.48)
Number of Employees	FBT	4.19 (0.69)	-0.66 (-0.11)	132.99*** (7.51)
	WWPF	0.91 (0.16)	8.62 (1.09)	50.11 (0.70)
Production Wage	FBT	30.13*** (12.84)	10.77*** (6.09)	-69.95 (-0.42)
	WWPF	26.74** (4.65)	0.22 (0.05)	-49.01 (-0.58)
Capital per Employee	FBT	68.58*** (3.38)	-51.90** (-2.95)	-136.75 (-0.50)
	WWPF	-4.66 (-0.18)	-110.48 (-0.68)	-177.49 (-1.98)
Capital-Output Ratio	FBT	-5.04 (-1.72)	5.79** (2.61)	13.66 (1.08)
	WWPF	1.11 (0.36)	-4.55 (-2.18)	-5.15 (-0.82)

*Note: *** significant at 1%; ** significant at 5%. t-values are in parentheses. Estimates were transformed in exact percentage values.*
Source: Computations using Study Data (2016).

As shown in table 4.7, the growth rate export premia of future exporters in comparison to future non-exporters for labour productivity were positive and statistically significant in the second quarter before entry into foreign markets in both the Foods, Beverages and Tobacco and Woods, Wood Products and Furniture sub-sectors. The results reveal

that in the second quarter preceding entry into foreign markets, labour productivity of future exporting firms grew 104 per cent and 23 per cent higher than that of future non-exporting firms in the Foods, Beverages and Tobacco and Woods, Wood Products and Furniture sub-sectors respectively. However, in the first quarter prior to entry as well as the quarter of entry into foreign market labour productivity of future exporting firms in the Foods, Beverages and Tobacco sub-sector grew behind that of future non-exporting firms by a margin of 102 per cent and 149 per cent respectively. Thus, implying that in the fourth quarter of 2009 and in the first quarter of 2010, productivity grew less in future exporting firms relative to future non-exporting firms. This finding contradicts those of Aw *et al.*, (1998) for Taiwan and South Korea and Bernard and Jensen (1999) for the USA, and Van Biesebroeck (2005) for some countries in Sub-Saharan Africa.

With regards to the scale of operation, the growth rate in the export premia for number of employees in the first quarter of 2010 was positive and statistically significant in the Foods, Beverages and Tobacco sub-sector. The growth rate export premia show that in the Foods, Beverages and Tobacco sub-sector, employment grew 133 per cent higher in future exporting firms compared to future non-exporting firms. Therefore, the study noted that employment grows faster in firms that become exporters. This result is similar to those of Bernard and Jensen (1999) for USA, Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, and Serti and Tomassi (2012) for Italy.

Considering the production wage, the growth rate of export premia in the third and fourth quarters of 2009 were positive and statistically significant in the Foods, Beverages and Tobacco sub-sector. Precisely, while production wage of future

exporters grew 30 per cent more than that of future non-exporters in the third quarter of 2009, the same grew 11 per cent more in the fourth quarter of 2009. Similarly, in the Woods, Wood Products and Furniture production wage of future exporters grew 27 per cent more than that of future non-exporters in the third quarter of 2009. This suggests that wages paid to employees grew more in future exporting firms. The result concurs with that of Bernard and Jensen (1999) for USA, and Van Biesebroeck (2005) for some countries in Sub-Saharan Africa.

Regarding capital endowment characteristics, the growth rate export premia for capital per employee in the Foods, Beverages and Tobacco sub-sector were statistically significant in the second pre-entry and first pre-entry periods respectively. Although in the second period before entry to foreign markets capital per employee grew 69 per cent more in future exporting firms, in the first period before entry into foreign markets capital per employee in future exporting firms grew 52 per cent behind future non-exporting firms. Nonetheless, the growth rate of export premia for capital to output ratio in the Foods, Beverages and Tobacco sub-sector was positive and statistically significant in the first pre-entry period. In this sub-sector, future exporting firms grew 6 per cent more. On the average, for the ex-ante periods to entry into foreign markets capital endowment of future exporting firms grew more relative to that of non-exporters. This result is consistent with the findings of Van Biesebroeck (2005) for some countries in Sub-Saharan Africa, and Serti and Tomassi (2012) for Italy.

4.5.3 Effects of Performance characteristics on Exporting.

The discussion thus far offers some evidences on whether exporters have some of the required performance characteristics. However, it did not determine the causal effect of the said characteristics on firms' exports. To do this, the study employed the Cragg's two-equation model specified in equations (3.17) and (3.18). The two-equation model estimated the effect of firms' performance characteristics on their exporting in two parts: the probit regression and the truncated regression models. While in the probit regression model the decision of whether a firm participated in exports was regressed on its performance characteristics, in the truncated regression model firms' share of exports in total sales were regressed on their performance characteristics. The second regression only involved firms with their share of exports in total sales greater than zero.

Prior to the estimation, it was important to find out whether the data from the three different sub-sectors could be treated jointly hence the Chow test was performed. The test results, which are presented in table A7 in appendix II had probability values less than 0.01, implying that the intercepts and slopes of the three sub-sectors are different thus; estimations were carried out for each one of the sub-sectors separately. Also, multicollinearity was probed among the independent variables in the models. The results of the test as shown in table A10 in appendix III reports a variance inflation factor (VIF) less than 10 and the tolerance (1/VIF) greater than 0.1 in all the models. Therefore, the predictor variables included in the models were not highly correlated.

The likelihood ratio test was then performed to ascertain whether the Cragg's two-equation model would be appropriate for the estimations. For the Foods, Beverages and Tobacco sub-sector, the Likelihood ratio statistic presented in table A6 in appendix II has a value of 30.5512, which is greater than the chi-square critical value of 14.0671. Therefore, Cragg's two-equation model was considered appropriate. However, in the case for the Non-Metallic Mineral Products; and Woods, Wood Products and Furniture sub-sectors the likelihood ratio test was not feasible. This was because both sub-sectors reported very few observations for the share of sales exported that were greater than zero; 5 for Non-metallic Mineral Products and 6 for Woods, Wood Products and Furniture. Consequently, only the probit models were estimated for these sub-sectors.

The estimated models were subjected to some diagnostic tests. First, the Ramsey RESET test was conducted to detect specification errors. The results of the test presented in table A12 in appendix III shows probability values of 0.16, 0.5, and 0.40 for Foods, Beverages and Tobacco, Non-Metallic Mineral Products and Woods, Wood Products and Furniture respectively. Thus, in each one of the three sub-sectors the models were specified correctly. Second, the Modified Wald test for group wise heteroscedasticity was done to check whether the variance of the residuals was constant. The probability values of the test as shown in table A17 in appendix III were less than 0.01 implying that the variances of the residuals were heteroskedastic. To control for this problem, the heteroscedasticity-robust standard errors option was employed in the estimations.

Last, the Wooldridge test to check whether the residuals were serially correlated was performed. The results of the test as presented in table A18 in appendix III shows probability values of 0.15, 0.14 and 0.0 for the models in the Foods, Beverages and Tobacco, Non-Metallic Mineral Products and Woods, Wood Products and Furniture respectively. The results suggest that serial correlation was only present in the model relating to the Woods, Wood Products and Furniture sub-sector. This notwithstanding, the result obtained was efficient since the probit model used assumes random effects; which is efficient even when residuals are serially correlated (Waldinger, 2015).

Table 4.8 presents the marginal effects of labour productivity and other performance characteristics on the share of exports in total sales from the estimations of the probit and truncated models.

Table 4.8: Marginal Effects of Labour Productivity and Other Performance Characteristics on Share of Exports in Total Sales.

Independent Variable	Dependent Variable: Share of Exported Sales			
	Probit Model			Truncated Model
	FBT	NMMP	WWPF	FBT
Log Labour Productivity	-3.7962 (-0.27)	-7.2535 (-0.01)	-2.5016 (-0.71)	0.7673*** (3.20)
Log of Number of Employees	-4.1093 (-0.26)	-1.8738 (-0.02)	0.2093 (0.05)	0.7639*** (3.91)
Growth Rate of Value-added	-0.0151 (-0.24)	0.0076 (0.00)	0.0061 (0.42)	0.0030*** (2.73)
Log of Production Wage	4.8956 (0.23)	6.0974 (0.01)	-0.8482 (-0.07)	-0.6983*** (-4.05)
Log of Capital per Employee	-0.9497 (-0.22)	6.2494 (0.01)	2.5956 (2.36)	0.0727 (0.92)
Capital-Output Ratio	15.3893 (0.49)	-99.8904 (-0.01)	-80.3954 (-4.31)	-0.8424 (-0.57)
Prob. (Wald Chi-square)	0.0000	0.0640	0.5224	0.0018
Number of Observations	377	195	197	36

Note: Z-values from the robust standard errors estimation are in parentheses;
*** significant at 5%*

Source: Computations using Study Data (2016).

In the case of the probit regression model, the probability values of the Wald chi-square test for Foods, Beverages and Tobacco and Non-Metallic Mineral Products were less than 1 per cent and less than 10 per cent respectively. This means that for the two sub-sectors, the null hypothesis that the coefficients of the performance characteristics used as independent variables were simultaneously equal to zero was not valid. Thus,

including the particular independent variables leads to a statistically significant improvement in the fit of the model. Even so, the marginal effects of all the predictor variables were not statistically significant.

For the truncated regression model, the probability of the Wald chi-square test was less than 1 per cent. Hence, the ability of the performance characteristics in explaining the share of exports in total sales for firms participating in foreign markets was statistically significant. Considering the performance characteristic that relates to productivity that is, labour productivity, the marginal effects has a positive sign and it is statistically significant. This finding conforms to expectation. Specifically, the result shows that for firms that participated in exports, if labour productivity increased by 10 per cent their share of exports in total sales would increase by 0.08 units. The result, thus, indicates that for firms participating in exports, labour productivity positively influenced their sales in foreign markets. These results are consistent with those of Lee and Choi (2012), Deshmukh and Pyne (2013) and Reis and Forte (2016) for Korea, India and Portugal respectively.

With regards to the scale of operation, as the marginal effects obtained for the number of employees shows a positive and statistically significant relationship between number of employees and the share of exports in total sales. Likewise, the marginal effect for the growth rate of value-added was positive and significant. These findings conform to expectation. Thus, for the firms that participated in exporting, a rise in the number of employees in firms by 10 per cent would increase their share of exports in total sales by 0.08 units. Also, an increase in the growth rate of value-added by 1 unit would lead to a

rise in the share of exports in total sales of 0.003 unit for firms already exporting. In general, these results suggest that for firms already participating in foreign markets; the larger their scale of operation the larger would be their share of exports in total sales. This finding supports those of Lee and Choi (2012) for Korea, Deshmukh and Pyne (2013) for India and Reis and Forte (2016) for Portugal.

In the case of production wage, the marginal effects from the truncated regression model as expected, was negative and statistically significant. An increase in the production wage by 10 per cent would reduce the share of exports in total sales by 0.07 units for firms participating in foreign markets. This attests to the postulate that higher real wages reduces the competitiveness of domestic firms in foreign markets hence, resulting in a decreased share of their exported output sold in export markets. This result is in consonance with that of Bernard and Jensen (1999) for USA, but contrasts that of Serti and Tomasi (2012) for Italy.

Taking into consideration the effects of capital endowment on the share of exports in total sales, the marginal effects attributed to capital per employee and capital-output ratio were not statistically significant. Thus, changes in the share of exports in total sales could not be attributed to capital endowment for firms participating in foreign markets.

4.6 Effects of Trade Liberalization on Competitiveness of Firms in the Nigerian Manufacturing Industry.

To examine the effects of trade liberalization on competitiveness of firms in the manufacturing industry in Nigeria, the study estimated equation (3.19). Herein, price-

cost margins were regressed on import penetration and other control variables including; concentration ratio, interaction between concentration ratio and import penetration, and export penetration. Also, the growth rate of value-added, output to employee ratio, capital to employee ratio, and number of employees were included as other control variables. These variables were included since they may influence price-cost margins thus, ensuring that the effect of import penetration on price-cost margins is adequately isolated.

Preceding the estimation, the Chow Test was done to determine whether data from the three sub-sectors could be pooled. The result of the Chow test as presented in table A7 in appendix II has a probability value of less than 0.01 indicating that the parameters of any one of the sub-sectors were not equal to those of the other sub-sectors. Hence, three separate models; one each for the Foods, Beverages and Tobacco, Non-Metallic Mineral Products and Wood, Wood Products and Furniture sub-sectors were considered. The Multicollinearity tests results in table A11 in appendix III indicate that the variables included in the models were not highly correlated.

The following diagnostic tests were conducted: the Ramsey RESET test to detect specification error, the Modified Wald test for group wise heteroscedasticity, the Wooldridge test for autocorrelation, and the Hausman test to determine the specification of the unobserved individual effects were conducted. The regression specification error test results presented in table A12 in appendix III were based on the null hypothesis that the panel model is specified. The test has probability values of 0.2194, 0.0594 and 0.5499 for the Foods, Beverages and Tobacco, Non-Metallic Mineral Products; and

Wood, Wood Products and Furniture sub-sectors respectively. Therefore, the study failed to reject the null hypothesis that the models were correctly specified.

The results of the Modified Wald test for group wise heteroscedasticity as shown in table A17 in appendix III is significant at 1 per cent in all the models indicating the presence of heteroscedasticity. Therefore, in the estimations for each of the three sub-sectors the heteroscedasticity-robust standard errors option was employed. The probability values of the Wooldridge test for autocorrelation as presented in table A18 in appendix III were 0.7706, 0.4326, and 0.2144 for the models corresponding to the Foods, Beverages and Tobacco, Non-Metallic Mineral Products, and Wood, Wood Products and Furniture sub-sectors. Thus, the study failed to reject the null hypothesis that the residuals in the models were not serially correlated. The results of the Hausman diagnostic test presented in tables A19, A20 and A21 in appendix III had probability values less than 0.01 implying that the Fixed Effects (FE) model was appropriate in all the sub-sectors. Hence, the Least Squares Dummy Variable (LSDV) estimation was employed and the results presented in table 4.9.

Table 4.9: Parameter Estimates of the Effects of Import Penetration and Other Variables on Price-cost Margins.

Independent Variable	Dependent Variable: Log of Price-Cost Margin		
	FBT	**NMMP**	**WWPF**
Log of Import Penetration	-0.1187* (-1.72)	-0.1004 (-0.36)	0.0021 (0.03)
Log of Concentration Ratio	0.5085*** (5.00)	0.0699 (0.95)	0.1139** (2.37)
Log of interaction between concentration ratio and import penetration	-0.4360*** (-4.72)	0.0477 (0.77)	0.0771 (0.60)
Log of Export Penetration	0.0585** (2.98)	0.1866** (2.62)	0.1667** (2.01)
Growth Rate of Value-added	0.0005** (2.46)	0.0001 (0.36)	0.0005** (2.01)
Log of Output per Employee	0.1029*** (3.77)	0.4179*** (7.65)	0.3553*** (5.34)
Log of Capital per Employee	-0.0628*** (-6.19)	-0.0821*** (-4.38)	-0.0851*** (-2.83)
Log of Number of Employees	-0.0864** (-2.36)	-0.0099 (0.14)	-0.0389 (-0.53)
Constant	-1.3611*** (-3.06)	-5.1016*** (-3.83)	-4.3722*** (-4.36)
Number of Observations	377	199	197
Prob (F-statistic)	0.0000	0.0000	0.0000
R^2	0.6812	0.7609	0.7365

Note: t-values from the robust standard errors estimation are in parentheses.
**** significant at 1%; ** significant at 5%; * significant at 10%.*
Source: Computations using Study Data (2016).

In the three models, the probability value of the overall F-statistic was 0. Thus, the study rejected the null hypothesis that the coefficients of the independent variables were simultaneously equal to zero. In addition, the measure of the goodness of fit show that in the Foods, Beverages and Tobacco sub-sector 68 per cent of total variations in price-

cost margin were attributable to the explanatory variables included in the model. Similarly, 76 per cent of total variations in price-cost margins were said to be explained by the independent variables in the model for the Non-Metallic Mineral Products sub-sector; and in the model for the Woods, Wood Products and Furniture sub-sector 74 per cent of total variations in price-cost margin were explained by the included predictor variables.

From the results, the coefficient of the log of import penetration was negative and statistically significant at 10 per cent in the Foods, Beverages and Tobacco. The value of the coefficient shows that an increase in import penetration by 1 per cent would lead to a decline in price-cost margins equal to 0.12 per cent. The result gives credence to the notion that import liberalization leads to a more competitive domestic market through its effect in curtailing prices and excess profits of domestic firms. This finding concurs with those of Yalçin (2000) for Turkey, Wong (2007) for Ecuador, and Noria (2013) for Mexico. For both the Non-Metallic Mineral Products and Woods, Wood Products and Furniture sub-sectors the coefficients of the log of import penetration were not significant implying that trade liberalization did not influence the competitiveness of firms in these two sub-sectors.

The coefficient of the log of concentration ratio was positive and significant at 1 per cent and 5 per cent, respectively, in the models for the Foods, Beverages and Tobacco, and Woods, Wood Products and Furniture sub-sectors. The coefficient of the log of concentration ratio was not significant in the Non-Metallic Mineral Products sub-sector. An increase in the concentration ratio by 1 percent would raise price-cost margins by

0.51 per cent and 0.11 per cent in the Foods, Beverages and Tobacco and Woods, Wood Products and Furniture sub-sectors respectively. These results support the stance that lower concentration leads to lesser market power, hence increasing competitiveness. These results are consistent with the findings of previous studies of Yalçin (2000) for Turkey, Goldar and Aggarwal (2005) for India, and Sheikh and Ahmed (2011) for Pakistan.

In the case of the interaction variable between the industry concentration ratio and import penetration, the results obtained show a negative and statistically significant relationship between it and price-cost margins in the model for the Foods, Beverages and Tobacco. For the models relating to the Non-Metallic Mineral Products and Woods, Wood Products and Furniture sub-sectors, the relationship is not significant. In the Foods, Beverages and Tobacco sub-sector an increase in the interaction between the industry concentration ratio and import penetration by 1 per cent would reduce price-cost margins by 0.44 per cent. This result implies that as import penetration due to trade liberalization increases, there would be higher reductions in price-cost margins of higher concentrated industries. The finding is similar to the results of Yalçin (2000) for Turkey and Goldar and Aggarwal (2005) for Pakistan.

Export penetration had a positive and statistically significant effect on price-cost margins in all the three models corresponding to each of the sub-sectors. The results indicate that an increase in export penetration by 1 per cent would increase price-cost margins by 0.06 per cent in Foods, Beverages and Tobacco; 0.19 per cent in Non-Metallic Mineral Products; and 0.17 per cent in Woods, Wood Products and Furniture.

Therefore, it could be said that export penetration comes with increased cost to exporting firms and therefore did not improve competitiveness. This result is similar to that obtain in Yalçin, 2000 for Turkey.

The coefficient of the growth rate of value-added was positive and statistically significant at 5 per cent in all the sub-sectors except that of the Non-Metallic Mineral Products sub-sector. In the Foods, Beverages and Tobacco, and Woods, Wood Products and Furniture sub-sectors an increase in the growth rate of value-added by 1 per cent would increase price-cost margin by 0.05 per cent. This finding concurs with that of Yalçin (2000) for Turkey. Also, the coefficient of output per employee was positive and statistically significant at 1 per cent in the three models corresponding to the three sub-sectors showing that increase in the output per employee by 1 per cent would increase price-cost margins by 0.10 per cent, 0.42 per cent, and 0.36 per cent in the Foods, Beverages and Tobacco, Non-Metallic Mineral Products and Woods, Wood Products and Furniture sub-sectors, respectively. These results are similar to those obtained by Yalçin (2000) for Turkey, Wong (2007) for Ecuador, and Noria (2013) for Mexico.

The coefficients of capital per employee were negative and statistically significant at 1 per cent in all the models. In the Foods, Beverages and Tobacco sub-sector; a rise in the capital per employee by 1 per cent would reduce price-cost margins by 0.06 per cent; and in the Non-Metallic Mineral Products sub-sector, an increase in capital per employee by 1 per cent would reduce price-cost margins by 0.08 per cent. Likewise, in the Woods, Wood Products and Furniture sub-sector a rise in the capital per employee by 1 per cent would decrease price-cost margins by 0.09 per cent. Therefore, price-cost

margins were decreasing in capital intensity. This finding is in consonance with that of Yalçin (2000) for Turkey.

The number of employees had a negative and significant influence on the price-cost margins of firms in the model for the Foods, Beverages and Tobacco sub-sector. In the models for the other two sub-sectors, the effect of the number of labour employed on price-cost margins was not significant. From the results, an increase in the number of labour employed by 1 per cent would cause a reduction to price-cost margins of about 0.09 per cent in the Foods, Beverages and Tobacco sub-sector. This implies that the employment of labour imposes a cost to firms and hence, there exist a tradeoff between price-cost margins and size of employment. The finding is similar to that of Yalçin (2000) for Turkey and Goldar and Aggarwal (2005) for India.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Introduction

This chapter presents the summary of the study and the conclusions reached. The policy implications, the study's contributions to knowledge, and areas for further research are also presented.

5.2 Summary

Nigeria's official policy desires to transform her economy away from over-dependence on crude oil, and an import dependent economy to a diversified and export oriented economy by means of attaining an enviable level of structural transformation, with manufacturing being an integral component. Price volatility which is characteristic of the international market for crude oil has made over-reliance on this sector risky. Periods of low oil prices have repeatedly led to deficits in the budget and spending cuts by the government. Furthermore, during such times dwindling foreign exchange earnings become insufficient in sustaining the high level of imports. The manufacturing sector provides the base on which reduction in dependence of fossil oil can be built by Nigeria.

To achieve the needed growth in the manufacturing industry the government has over the years tied trade policy to its industrialization strategy both of which have gone through considerable liberalization. Accordingly, targets were set for 2010: GDP share of manufacturing projected to reach 25 per cent; share of manufactured exports in total merchandise exports projected to attain 8 per cent; and the level of capacity utilization

projected to reach 60 per cent. However, by 2015 the GDP share of manufacturing was only 9.69 per cent, below the projected 25 per cent by 2010; the share of manufactured exports in total merchandise exports in 2015 was 2.92 per cent instead of the projected 8 per cent by 2010; and the level of capacity utilization in the sector stood at 53.6 per cent in 2015, instead of the target of 60 per cent set for 2010. Hence, prompting an inquiry into the effects of trade liberalization on the performance of the manufacturing industry in Nigeria.

The study set out to examine the contribution of trade liberalization to performance in the manufacturing sector in terms of productivity, exports, and competitiveness of firms. Therefore, the study estimated a variety of empirical models based on the quarterly firm-level data from the Survey of Manufacturing Industry in Nigeria for the period 2008 to 2010.

To examine the effects of trade liberalization instruments on productivity of manufacturing firms in Nigeria, total factor productivity was first computed following the estimation of the production functions of different sub-sectors. The total factor productivity obtained were then regressed on trade liberalization variables as well as a market structure variable. The findings of the study showed that higher simple average tariff rates increased total factor productivity of firms in the Foods, Beverages and Tobacco and Non-Metallic Mineral Product sub-sectors. By contrast, higher simple average tariff rates decreased total factor productivity of the firms in the Woods, Wood Products and Furniture sub-sector.

Regarding import penetration, the findings revealed that increased accessed to the domestic market by finished goods of similar kind led to a decline in total factor productivity of firms in the Foods, Beverages and Tobacco, Non-Metallic Mineral Product and Woods, Wood Products and Furniture sub-sectors. On the other hand, export penetration was found to enhance total factor productivity of firms in all the three sub-sectors. Also, higher concentration ratio increases total factor productivity of firms in the Foods, Beverages and Tobacco sub-sector. On the contrary, higher concentration ratio decreases total factor productivity of firms in the Woods, Wood Products and Furniture sub-sector. The effect of concentration ratio on productivity was not significant in the Non-Metallic Mineral Product sub-sector.

The study analyzed the differentials in productivity of exporters relative to non-exporters before and during exporting, along with the effects of productivity on their share of exports in total sales. This was done to determine the effects of productivity on exports of firms. The results obtained show no difference between the productivity of exporters and non-exporters prior to exporting in the Foods, Beverages and Tobacco; and Woods, Wood Products and Furniture sub-sectors. Besides, it was found that productivity did not have significant effect on the decision of a firm to enter foreign markets in all the three sub-sectors. However, the findings indicate that higher labour productivity increased the share of exports in total sales for firms already participating in foreign markets in the Foods, Beverages and Tobacco sub-sector.

To establish the effect of trade liberalization on competitiveness of manufacturing firms in Nigeria, empirical models testing the import discipline aspect of trade liberalization

were estimated for different sub-sectors of the manufacturing industry in Nigeria. The results reveal that the larger the amounts of finished goods penetrating the domestic market as a result of trade liberalization the lower the price-cost margin of firms in the Foods, Beverages and Tobacco sub-sector. For the other two sub-sectors the effect of import penetration on price-cost margins was not significant.

5.3 Conclusions

The study has recognized that the effect of simple average tariff rates on total factor productivity of firms differs across different sub-sectors. This is because higher simple average tariff rates enhanced total factor productivity of firms in the Foods, Beverages and Tobacco and Non-Metallic Mineral Product sub-sectors, but impeded total factor productivity of firms in the Woods, Wood Products and Furniture sub-sector. Thus, while higher protection would be beneficial to improving productivity in some sub-sectors of the manufacturing industry, in other sub-sectors it would be disadvantageous to productivity growth. However, the effects of import penetration on total factor productivity is detrimental across sub-sectors. That is, increases to import penetration decreases total factor productivity of firms implying that protection aimed at reducing the amounts of imported finished goods is important in enhancing the productivity of manufacturing firms in Nigeria. Succinctly, the liberalization of imports in Nigeria has inhibited productivity growth of firms in the manufacturing sector.

The study has established that the export component of trade liberalization is beneficial to Nigeria in terms of improving productivity in the manufacturing industry. In all the sub-sectors, further increase to export penetration led to growth in total factor

productivity of firms. Hence, trade liberalization measures towards increasing access to foreign markets are vital to ensuring increased productivity in the manufacturing industry in Nigeria.

The study concludes that while productivity does not influence the decision by a firm to export, for those firms already participating in foreign markets, productivity increases their export sales. This is indicated by the results that found no significant influence of labour productivity on the probability of exporting, but a positive and significant effect of labour productivity on the share of exports in total sales of exporters. Therefore, higher productivity in firms already participating in international trade increases exports of manufactured goods in Nigeria.

The study established that trade liberalization leads to a more competitive domestic market through its effect in curtailing prices and excess profits of domestic firms but, such may not cut across all sub-sectors of the manufacturing industry. This is because more import penetration only decreased the price-cost margins of firms in the Foods, Beverages and Tobacco sub-sector. In the Non-Metallic Mineral Products and Woods, Wood Products and Furniture sub-sectors the effect of import penetration on the price-cost margins of firms was not significant. Thus, trade liberalization only increases competitiveness of the firms in some sub-sectors of the manufacturing industry.

5.4 Policy Implications

Drawing from the major findings of the study a number of policy implications have been identified. Firstly, the government should implement sub-sector specific tariff policies in order to improve productivity towards achieving greater GDP share of

manufacturing, since higher tariff rates increased total factor productivity of firms in the Foods, Beverages and Tobacco and Non-Metallic Mineral Product sub-sectors, but decreased total factor productivity of firms in the Woods, Wood Products and Furniture sub-sector. Thus, to increase productivity it is necessary for the government through the Federal Ministry of Finance to increase the tariff rates in the Foods, Beverages and Tobacco; and Non-Metallic Mineral Product sub-sectors while reducing the tariff rate in the Woods, Wood Products and Furniture sub-sector. More so, the government needs to implement restrictive policies to limit the amounts of imports of finished goods into the economy towards improving productivity and thus, increasing the GDP share of manufacturing. This is based on the results that higher import penetration negatively impinged on total factor productivity in all sub-sectors.

In view of the country's membership in ECOWAS and its obligations to the Common External Tariff (CET), Nigeria cannot unilaterally change the tariff rates being applied. Therefore, the government should consider tabling a proposal before ECOWAS that would result in the needed tariff rates adjustments. Alternatively, government's existing policy of trade liberalization, which emphasizes lower tariffs and ensures easier access to the economy, should be implemented alongside complementary policies so as to mitigate the negative effects on firms. In this light, measures such as investment in science and technology to ensure a strong technological base; investment in the requisite education needed in the sector; and investment in infrastructure to support activities in the sector will provide alternative channels for improving productivity. However, the assessment of these complementary instruments and their optimal employment lies outside the scope of this study.

Secondly, government should enhance policies aimed at encouraging exports. This is because higher export penetration improves total factor productivity of firms. Consequently, the study recommends that the government should engage in more bilateral and multilateral trade negotiations to expand exports, and the Nigeria Export Processing Zones Authority should continue the expansion of free trade zones in the country to encourage exports of local products. In addition, the Nigerian Export Promotion Council should establish certification centres across the country to be saddled with the responsibility of providing necessary information on product development and value creation of manufactured goods to comply with international quality standards. These will increase export penetration leading to improved productivity of firms and hence, ensure the attainment of larger GDP share of manufacturing.

Thirdly, exporting firms in Nigeria should invest in improving productivity of their employees in order to boost their export sales. This is based on the study results that higher labour productivity increases exporters' share of exports in total sales. Exporting firms can achieve this through the training and education of their employees, and the creation as well as maintenance of a culture that fosters both innovation and shared employee knowledge through the organization of workshops and sponsorship of in-service education. Furthermore, exporting firms can provide work incentives to gain employees' loyalty. Through these measures, labour productivity will be enhanced important for increasing the share of exports in total sales of firms participating in foreign markets and invariably, the goal of achieving larger share of manufactured exports in total merchandise exports will be realised.

Lastly, the government should sustain measures intended at increasing access of foreign goods into the economy to enhance competitiveness of firms in the Foods, Beverages and Tobacco sub-sector. This is because higher import penetration resulting from trade liberalization imposed a market discipline effect on firms in the Foods, Beverages and Tobacco sub-sector. In the Non-Metallic Mineral Products and Woods, Wood Products and Furniture sub-sectors import penetration did not have significant effect on firms' price-cost margins. Nonetheless, to improve competitiveness of firms across all the sub-sectors, firms can be encouraged to adopt more capital intensive procedures in their production since the results of the study indicated that higher capital to employee ratio curbs excess profits of domestic firms thus, inducing more competitiveness.

5.5 Contribution to Knowledge

This study contributes to the literature on studies relating to the role of trade liberalization on performance in the manufacturing industry in a number of ways. Firstly, the study having been carried out for a period when trade policy in Nigeria is adjudged liberalized, and employing a robust technique to estimate total factor productivity has adequately gauged how productivity evolves over time in response to changes in trade liberalization measures. Hence, the current study was able to obtain an important finding suggesting that implementing a particular tariff regime would have varying effects across different sub-sectors. A previous attempt in examining this relationship was done for the immediate period following the implementation of SAP in Nigeria when trade policy only began to be liberalized. More so, in the previous attempt total factor productivity of the manufacturing firms in Nigeria was computed using the

fixed effects method which did not allow for variability of the productivity variable over time.

Secondly, the study provides greater insight on self-selection of firms to export markets for Nigeria. The study achieved this by interrogating not just the influence of productivity on the probability to export but, also probed whether or not productivity increases the share of exports sales in total sales of the firms who export. Earlier studies that have examined self-selection in the manufacturing sector in Nigeria only considered the influence of productivity on firms' decision to export.

Lastly, the study makes available empirical evidence on the competitive effect of trade liberalization to manufacturing firms in Nigeria which was previously lacking. While various studies have provided empirical evidence for other countries in this area, no previous study for Nigeria was done in order to answer the question as to whether or not trade liberalization increases competition among firms in the manufacturing sector.

5.6 Areas for Further Research

The study has presented an assessment of an important national development policy thrust, and was conducted based on quarterly firm-level data from the Survey of the Manufacturing Industry in Nigeria carried out for 2008 to 2010. Given that Nigeria has long committed itself to the rules of trade liberalization, in particular the CET of the ECOWAS trade liberalization scheme, the country cannot unilaterally implement protectionist strategies to improve productivity of firms. Hence, a study assessing the contribution of other complementary policy instruments to productivity of firms in the manufacturing sector will provide required alternative channels to improving

productivity in the industry, should attempts to get other ECOWAS member states to increase tariffs fail. In addition, a study examining how firms can dampen the negative effects of trade liberalization on productivity will provide information on ways firms can thrive in the midst of increased foreign competition.

A research probing why productivity does not influence the decision to export can be carried out. This can be done in order to examine the nature of goods produced by domestic firms in comparison to the demand in foreign markets. Also, a study could be undertaken to investigate effective instruments in improving labour productivity. This will provide further details on optimal means of enhancing labour productivity towards increasing firms' exports.

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Appendix I: Summary Statistics

Table A1: Summary Statistics for the Foods, Beverages and Tobacco Sub-Sector

Variable	Mean	SD	Min	Max	No. of Obs.
Gross Output	60.5610	58.5014	13.6766	164.5079	428
Share of Total Sales Exported	0.0187	0.0909	0	0.9287	428
Price-Cost Margin	0.7350	0.1679	0.1598	0.9778	428
Number of Employees	49	27	20	252	428
Production Wage	2.1404	1.6860	0.5246	4.9645	428
Value-Added per Employee	0.9497	0.6681	0.2524	2.3272	428
Material Input	8.5808	7.5425	1.4565	19.6507	428
Capital Input	0.7548	0.7440	0.0637	0.8617	428
Capital per Employee	0.0159	0.0148	0.0024	0.0405	428
Capital-Output Ratio	0.0202	0.0179	0.0034	0.0487	428
Concentration Index	0.7251	0.1594	0.5360	0.9070	428
Simple Average Tariff Rate	15.76	0.22	15.58	16.03	428
Import Penetration	50.48	15.24	30.62	70.90	428
Export Penetration	6.52	5.25	0.29	19.69	428

Variables are in ₦ '000 000 were relevant.
Min = Minimum; Max = Maximum; SD = Standard deviation;
No. of Obs. = Number of Observations.
Source: Computations using Study Data (2016).

Table A2: Summary Statistics for the Non-Metallic Mineral Products Sub-Sector

Variable	Mean	SD	Min	Max	No. of Obs.
Gross Output	32.1115	22.4958	8.8044	67.1711	239
Share of Total Sales Exported	0.0008	0.0059	0	0.0524	239
Price-Cost Margin	0.6398	0.1822	0.1152	0.9665	239
Number of Employees	34	22	10	66	239
Production Wage	1.8235	1.3559	0.4496	3.9126	239
Value-Added per Employee	0.8857	0.6751	0.1991	2.2018	239
Material Input	6.6738	4.3262	1.8899	12.1492	239
Capital Input	0.3871	0.3537	0.0637	0.8617	239
Capital per Employee	0.0159	0.0152	0.0018	0.0395	239
Capital-Output Ratio	0.0234	0.0220	0.0026	0.0577	239
Concentration Index	0.54	0.19	0.34	0.91	239
Simple Average Tariff Rate	15.62	0.29	14.60	15.66	239
Import Penetration	91.03	7.81	72.76	98.68	239
Export Penetration	0.35	0.30	0	1.20	239

Variables are in ₦ '000 000 were relevant.
Min = Minimum; Max = Maximum; SD = Standard deviation;
No. of Obs. = Number of Observations.

Table A3: Summary Statistics Woods, Wood Products and Furniture Sub-Sector

Variable	Mean	SD	Min	Max	No. of Obs.
Gross Output	53.7409	45.0180	11.3700	127.2900	228
Share of Total Sales Exported	0.0115	0.0799	0	0.7818	228
Price-Cost Margin	0.6181	0.2123	0.0636	0.9584	228
Number of Employees	46	35	12	101	228
Production Wage	3.3170	2.4154	0.6383	6.8853	228
Value-Added per Employee	1.0518	0.8250	0.2263	2.7272	228
Material Input	10.2307	8.1442	1.7842	21.4360	228
Capital Input	1.3847	0.9677	0.3848	2.6025	228
Capital per Employee	0.0337	0.0252	0.0056	0.0684	228
Capital-Output Ratio	0.0510	0.0443	0.0074	0.1208	228
Concentration Index	0.4739	0.2335	0.1082	0.6853	228
Simple Average Tariff Rate	28.63	0.26	28.09	30.60	228
Import Penetration	51.70	14.18	30.90	75.13	228
Export Penetration	3.89	5.11	0	10.85	228

Variables are in ₦ '000 000 were relevant.
Min = Minimum; Max = Maximum; SD = Standard deviation;
No. of Obs. = Number of Observations.

Appendix II: Pre-estimation Tests Results

Table A4: Fisher-Type Panel Unit Root Test Results

Variable	Test Statistic					
	FBT		NMMP		WWPF	
	ADF	PP	ADF	PP	ADF	PP
Gross Output	4.2561***	3.3894***	2.8670***	4.1627***	4.4178***	47.2309***
Labour Input	4.8101***	4.1610***	1.7857**	6.8077***	3.1260***	29.7669***
Capital Input	11.1108***	10.9667***	1.4665*	4.3614***	3.3323***	1.9771*
Material Input	6.2471***	1.4443*	2.6475***	12.8446***	3.5709***	1.3156*
Total Factor Productivity	5.1290 ***	5.2982***	3.6936***	3.3287***	5.0706***	3.1197***
Share of Exports in Total Sales	5.8259***	24.1285***	3.5055***	31.6499***	6.1781***	-2.5767
Price-Cost Margins	4.9855***	45.7588***	3.6324***	15.4967***	3.7860***	46.7288***
Simple Average Tariff Rate	1.9851**	1.5136*	1.2919**	1.0383	1.4262**	-4.2020
Herfindahl Concentration Ratio	3.9249***	1.9099**	4.4433***	44.7683***	4.1169***	8.6382***
Import Penetration	5.5417***	9.3965***	7.2692***	5.2638***	7.3074***	1.7928**
Export Penetration	9.3573***	48.2354***	6.1400***	13.4783***	4.5894***	10.1961***
Number of Employees	4.8854***	2.9650***	2.7734***	1.0885	3.3736***	-3.9228
Production Wage	4.8101***	4.1610***	1.7857**	6.8077***	3.1260***	29.7669***
Capital per Employee	7.1250***	11.1546***	4.4563***	9.9162***	3.9481***	-2.9384
Labour Productivity	4.1313***	12.0842***	6.9425***	37.7804***	4.8862***	18.7557***
Capital-Output Ratio	4.3500***	33.7183***	2.7123***	15.0040***	2.4663***	11.4036***
Growth Rate of Value-added	8.9651***	47.4438***		9.7412***		8.4746***
Interaction between concentration ratio and import penetration	2.6721 ***	1.4610*	18.4914***	-5.4651	2.6523***	41.1953***

*Note: *** Significant at 1%; ** significant at 5%; * significant at 10%*
FBT = Foods, Beverages and Tobacco NMMP = Non-metallic Mineral Products
WWPF = Woods, Wood Products and Furniture

Table A5: Results of the Likelihood Ratio Test for Model Selection of Production Function

	Sub-Sector			Chi-square (χ^2) critical value: *df* = 3
	FBT	**NMMP**	**WWPF**	
Likelihood ratio statistic (λ)	-73.2972	-40.2534	-36.3156	9.3484

Table A6: Results of the Likelihood Ratio Test for Model Selection for the Effects of Productivity on the Share of Exported Sales

	Sub-Sector			Chi-square (χ^2) critical value: *df* = 6
	FBT	**NMMP**	**WWPF**	
Likelihood ratio statistic (λ)	30.5512			14.0671

Table A7: Chow Test Results

	Model		
	Effects of trade liberalization on productivity of firms.	**Effects of Productivity on Firms' Exports**	**Effects of Trade liberalization on Competitiveness of firms**
Chi-square statistics	153.21	36.94	67.95
P-value	0.0000	0.0000	0.0000

Appendix III: Diagnostic Tests Results

Table A8: Result of Multicollinearity Test on the Production Functions

	FBT		NMMP		WWPF	
Variable	**VIF**	**1/VIF**	**VIF**	**1/VIF**	**VIF**	**1/VIF**
Log of Labour Input	3.27	0.3062	2.29	0.4365	2.05	0.4873
Log of Material Input	2.77	0.3606	2.22	0.4494	2.17	0.4615
Log of Capital Input	2.35	0.4251	1.49	0.6701	1.88	0.5323
Mean VIF	2.80		2.00		2.03	

Note: VIF = Variance inflation factor.

Table A9: Results of Multicollinearity Test for the Models on the Effects of Trade Liberalization on Productivity of Firms

	FBT		NMMP		WWPF	
Variable	**VIF**	**1/VIF**	**VIF**	**1/VIF**	**VIF**	**1/VIF**
Log of Simple Average Tariff Rate	20.32	0.0492	2.03	0.4920	1.03	0.9694
Log of Herfindahl Concentration Ratio	8.43	0.1186	2.35	0.4261	1.32	0.7595
Log of Import Penetration	7.80	0.1282	3.16	0.3168	1.08	0.9252
Log of Export Penetration	1.16	0.8656	1.29	0.7764	1.42	0.7030
Mean VIF	9.43		2.21		1.21	

Note: VIF = Variance inflation factor.

Table A10: Result of Multicollinearity Test for the Models on the Effects of Productivity on Firms' Exports

Variable	FBT		NMMP		WWPF	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Log of Number of Employees	6.77	0.1478	4.33	0.2310	3.40	0.2940
Log of Production Wage	6.39	0.1564	4.22	0.2367	3.27	0.3057
Log of Capital per Employee	2.09	0.4795	2.23	0.4484	2.50	0.4000
Log Labour Productivity	2.06	0.4855	1.87	0.5336	2.43	0.4114
Capital-Output Ratio	1.76	0.5669	2.47	0.4051	2.34	0.4265
Growth Rate of Value-added	1.41	0.7073	1.28	0.7793	1.26	0.7910
Mean VIF	3.41		2.74		2.54	

Note: VIF = Variance inflation factor.

Table A11: Result of Multicollinearity Test for the Models on Effects of Trade liberalization on Competitiveness of firms

Variable	FBT		NMMP		WWPF	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Log of Concentration Ratio	3.40	0.2938	1.75	0.5720	1.78	0.5627
Log of Import Penetration	3.02	0.3307	2.02	0.4956	1.49	0.6691
Log of Output per Employee	1.85	0.5415	1.44	0.6922	1.58	0.6330
Growth Rate of Value-added	1.47	0.6807	1.52	0.6586	1.74	0.5757
Log of Export Penetration	1.43	0.6993	1.11	0.8980	1.88	0.5309
Log of Capital per Employee	1.36	0.7360	1.27	0.7896	1.28	0.7840
Log of Number of Employees	1.35	0.7430	1.12	0.8897	1.16	0.8065
Log of interaction between concentration ratio and import penetration	1.13	0.8820	1.14	0.8786	1.24	0.8600
Mean VIF	1.88		1.42		1.52	

Note: VIF = Variance inflation factor

Table A12: Results of the Regression Specification Error Test

Model	Sub-Sector	F-statistic	P-value
Effects of trade liberalization on productivity of firms.	FBT	1.710	0.1642
	NMMP	2.597	0.0531
	WWPF	0.712	0.3997
Effects of Productivity on Firms' Exports	FBT	1.137	0.3220
	NMMP	0.102	0.9586
	WWPF	2.104	0.1019
Effects of Trade liberalization on Competitiveness of firms	FBT	1.524	0.2194
	NMMP	2.075	0.0594
	WWPF	0.600	0.5499

Table A13: Hausman Test for the Effects of Trade Liberalization on Productivity of Firms (Foods, Beverages and Tobacco)

Variable	FE Coefficient	RE Coefficient	Var(Diff.)	SE
Log of Simple Average Tariff Rate	37.2339	36.0594	1.1745	1.3982
Log of Import Penetration	-0.4461	-0.4465	0.0004	
Log of Export Penetration	0.0397	0.0399	-0.0002	0.0002
Log of Concentration Ratio	0.7272	0.6588	0.0684	0.0781
Number of Observations	428			
Hausman Statistic– Chi-square = 0.79				
Prob>Chi-square = 0.9402				

Table A14: Hausman Test for the Effects of Trade Liberalization on Productivity of Firms (Non-Metallic Mineral Products)

Variable	FE Coefficient	RE Coefficient	Var(Diff.)	SE
Log of Simple Average Tariff Rate	82.8979	77.8661	5.0318	6.1873
Log of Import Penetration	-0.7023	-0.6424	-0.0599	
Log of Export Penetration	0.2181	0.2294	-0.0113	
Log of Concentration Ratio	0.0078	-0.0298	0.0376	0.0523
Number of Observations	239			
Hausman Statistic– Chi-square = 3.45				
Prob>Chi-square = 0.4858				

Table A15: Hausman Test for the Effects of Trade Liberalization on Productivity of Firms (Woods, Wood Products and Furniture)

Variable	FE Coefficient	RE Coefficient	Var(Diff.)	SE
Log of Simple Average Tariff Rate	-6.5351	-6.5353	0.0002	
Log of Import Penetration	-0.4939	-0.4940	0.0001	0.0064
Log of Export Penetration	0.2666	0.2619	0.0047	0.0099
Log of Concentration Ratio	-0.1523	-0.1518	-0.0005	0.0162
Number of Observations	228			
Hausman Statistic– Chi-square = 1.26				
Prob>Chi-square = 0.7375				

Table A16: Results of the Breusch-Pagan Lagrange Multiplier Test for Random Effects

Sub-Sector	Chi-square statistic	Probability value
FBT	353.80	0.0000
NMMP	141.63	0.0000
WWPF	132.63	0.0000

Table A17: Results of the Modified Wald test for group wise Heteroskedasticity

Model	Sub-Sector					
	FBT		NMMP		WWPF	
	Chi-square statistic	P-value	Chi-square statistic	P-value	Chi-square statistic	P-value
Effects of trade liberalization on productivity of firms.	8469.82	0.0000	32694.95	0.0000	685.36	0.0000
Effects of Productivity on Firms' Exports	24000.00	0.0000	45000.00	0.0000	1200.00	0.0000
Effects of Trade liberalization on Competitiveness of firms	19000.00	0.0000	130000.00	0.0000	52081.15	0.0000

Table A18: Results of the Wooldridge test for Autocorrelation

Model	Sub-Sector					
	FBT		NMMP		WWPF	
	F-statistic	P-value	F-statistic	P-value	F-statistic	P-value
Effects of trade liberalization on productivity of firms.	8.90	0.0044	4.59	0.0388	2.04	0.1637
Effects of Productivity on Firms' Exports	2.18	0.1461	2.30	0.1378	24.48	0.0000
Effects of Trade liberalization on Competitiveness of firms	0.09	0.7706	0.63	0.4326	1.61	0.2144

Table A19: Hausman Test for the Model on the Effects of Trade liberalization on Competitiveness of firms (Foods, Beverages and Tobacco)

Variable	FE Coefficient	RE Coefficient	Var(Diff.)	SE
Log of Import Penetration	-0.1187	-0.0327	-0.0859	0.0449
Log of Concentration Ratio	0.5085	0.3063	0.2022	0.0614
Log of Export Penetration	0.0585	0.0314	0.0271	0.0102
Growth Rate of Value-added	0.0005	0.0003	0.0002	0.0001
Log of Output per Employee	0.1029	0.0457	0.0572	0.0204
Log of Capital per Employee	-0.0628	-0.0353	-0.0275	0.0079
Log of Number of Employees	-0.0864	-0.0433	-0.0430	0.0317
Number of Observations	377			
Hausman Statistic– Chi-square = 78.39				
Prob>Chi-square = 0.0000				

Table A20: Hausman Test for the Model on the Effects of Trade liberalization on Competitiveness of firms (Non-Metallic Mineral Products)

Variable	FE Coefficient	RE Coefficient	Var(Diff.)	SE
Log of Import Penetration	-0.1004	0.2875	-0.3879	0.2259
Log of Concentration Ratio	0.0699	0.0239	0.0460	0.0575
Log of Export Penetration	0.1866	0.0961	0.0905	0.0585
Growth Rate of Value-added	0.0001	0.0004	-0.0003	0.0002
Log of Output per Employee	0.4179	0.1345	0.2834	0.0441
Log of Capital per Employee	-0.0821	-0.0313	-0.0508	0.0157
Log of Number of Employees	-0.0099	-0.0144	0.0046	0.0654
Number of Observations	199			
Hausman Statistic– Chi-square = 116.20				
Prob>Chi-square = 0.0000				

Table A21: Hausman Test for the Model on the Effects of Trade liberalization on Competitiveness of firms (Woods, Wood Products and Furniture)

Variable	FE Coefficient	RE Coefficient	Var(Diff.)	SE
Log of Import Penetration	0.0021	-0.0078	0.0099	0.0678
Log of Concentration Ratio	0.1139	0.0720	0.0419	0.0391
Log of Export Penetration	0.1667	0.0907	0.0760	0.0256
Growth Rate of Value-added	0.0005	0.0003	0.0002	0.0003
Log of Output per Employee	0.3553	0.1348	0.2206	0.0503
Log of Capital per Employee	-0.0851	-0.0392	-0.0460	0.0192
Log of Number of Employees	-0.0389	-0.0083	-0.0307	0.0630
Number of Observations	197			
Hausman Statistic– Chi-square = 85.05				
Prob>Chi-square = 0.0000				