EXCHANGE RATE PASS-THROUGH TO IMPORT AND DOMESTIC PRICES IN NIGERIA, 1980-2006

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ABSTRACT

There is a strong relationship between exchange rate movement and domestic prices in an import-dependent economy. The adoption of the Structural Adjustment Programme in Nigeria in 1986 caused a significant upward movement in the exchange rate. The official exchange rate depreciated by 56.2% annually between 1986 and 1993, and it was 31.6% during 1994-2003 period. Over the same periods, the general price level rose by 30.5% and 23.7% respectively. Specific studies on exchange rate pass-through to prices in Nigeria are scarce. This study therefore examined the extent of exchange rate pass-through to import and domestic prices in Nigeria during the period 1980-2006.

A price model that recognised the developments in the tradable and non-tradable sectors of the economy was used. The tradable component drew largely on Sharma's price transmission analysis that was predicated on the purchasing power parity doctrine. Both the Engle-Granger and the Johansen cointegration techniques were used to estimate the price model. The techniques made it possible to separate the effects of short-run exchange rate dynamics from those of the long-run. The time series properties of the variables in the model using various criteria, including the Augmented Dickey-Fuller and Phillip-Perron tests, were ascertained. A 'general-to-specific' methodology, which involved over-parameterised error correction specifications, was adopted. Tests statistics indicated that the models exhibited high degrees of goodness of fit. Annual data were used for the estimation. In order to capture the effect of exchange rate pass-through to import prices across product groups, import and tariff data were disaggregated according to the harmonized system of trade classification.

At the aggregate level, exchange rate pass-through to import prices was found to be incomplete, while the disaggregated results showed varying degrees ranging from low to more than complete pass-through. Both the short-run and long-run effects of exchange rate pass-through were evident, but occurred with lags. All the results obtained were significant at the 5.0% level. In the short run, a 10.0% depreciation of the exchange rate led to 9.0% increase in import prices. The same percentage depreciation raised import prices by 2.5% in the long-run. The pass-through in the vegetable, and boiler and machinery products groups recorded 11.5% and 19.2% increase, respectively. By interpretation, Nigeria absorbed the full impact of any exchange rate shocks and also part of the cost of production of the exporters of these products. Comparatively, the effect of a 10.0% depreciation was correspondingly 2.8% and 8.0% in the

optical and paper making material products. This meant that part of the exchange rate shocks was absorbed by the exporters. The sectoral differences in exchange rate pass-through were significantly related to the product group's share in total imports. In addition, a 10.0% depreciation raised domestic prices by 7.5%.

There was a significant exchange rate pass-through to import and domestic prices in Nigeria. Commitment to supply-side policies is desirable in order to boost domestic production of goods and lessen dependence on imports. This would moderate the effect of exchange rate shocks on import and domestic prices.

Key Words: Domestic prices, Exchange rate pass-through, Exchange rate shocks, Import prices, Supply-side policies

Word Count: 494

DEDICATION

This thesis is dedicated to the Almighty ALLAH (SWT) the Lord of the Universe. I also dedicate this work to my parents, **Ganiyu Moyosore** and **Hosseinat Bolaji OYINLOLA**, for their support, understanding, prayers, and endless love. I thank them with immense appreciation of the privileges I was endowed with them. They represent the opportunity cost of what I am today.

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Mutiu Abimbola OYINLOLA

CERTIFICATION

We certify that this work was carried out by Mr. **MUTIU ABIMBOLA OYINLOLA** under our supervision in the Department of Economics, University of Ibadan, Ibadan, Nigeria.

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TABLE OF CONTENTS

Page

CHAPTER ONE

INTRODUCTION **1**

CHAPTER TWO

CHAPTER THREE

CHAPTER FOUR

THEORETICAL FRAMEWORK AND METHODOLOGY … … 80

CHAPTER FIVE

EMPIRICAL ANALYSIS   …   ……   ……   ……   ……   ……   …   88

CHAPTER SIX

SUMMARY, CONCLUSION AND SOME POLICY RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMYS AND ABBREVIATIONS

AFEM	Autonomous Foreign Exchange Market
AIC	Akaike Information Criteria
CBN	Central Bank of Nigeria
CES	Constant Elasticity of Substitution
CET	Common External Tariff
CISS	Comprehensive Import Supervision Scheme
CPI	Consumer Price Index
DAS	Dutch Auction System
ECOWAS	Economic Community of West African States
EPZ	Export Processing Zone
ERPT	Exchange Rate Pass-Through
FEM	Foreign Exchange Market
GDP	Gross Domestic Product
HS	Harmonized System
IFEM	Inter-Bank Foreign Exchange Market
IFS	International Financial Statistics
IMF	International Monetary Fund
LAIMP	Log of Aggregate Import Price
LATRF	Log of Aggregate Tariff
LCP	Local Currency Pricing
LCPI	Log of Consumer Price Index

L/Cs	Letters of Credit
LEXR	Log of Official Exchange Rate
LGDP	Log of Real Gross Domestic Product
LMSS	Log of Money Supply
LOOP	Law of One Price
LPANM	Log of Import Price of Live Animal &Animal Products
LPARS	Log of Import Price of Articles of Stones Plaster, Cement, Mica…
LPBAM	Log of Import Price of Base Metal & Articles of Base Metal
LPCHM	Log of Import Price of Product of Chemical and Allied Industries
LPFOD	Log of Import Price of Prepared Foodstuffs
LPLST	Log of Import Price of Plastic, Rubber and Articles Thereof
LPMCH	Log of Import Price of Boilers, Machinery and Appliances;
LPMIN	Log of Import Price of Mineral Products
LPOPT	Log of Import Price of Optical, Photographic, Cinematographic
LPPMM	Log of Import Price of Paper Making Material; Paper & Paperboard
LPTXT	Log of Import Price of Textiles and Textile Articles
LPVEG	Log of Import Price of Vegetable Products
LTANM	Log of Tariff Rate of Live Animal and Animal Products
LTARS	Log of Tariff Rate of Articles of Stones Plaster, Cement, Mica…
LTBAM	Log of Tariff Rate of Base Metal & Articles of Base Metal
LTCHM	Log of Tariff Rate of Product of Chemical and Allied Industries
LTFOD	Log of Tariff Rate of Prepared Foodstuffs

LTMCH	Log of Tariff Rate of Boilers, Machinery and Appliances;
LTMIN	Log of Tariff Rate of Mineral Products
LTOPT	Log of Tariff Rate of Optical, Photographic, Cinematographic
LTPLST	Log of Tariff Rate of Plastic, Rubber and Articles Thereof
LTPMM	Log of Tariff Rate of Paper Making Material; Paper & Paperboard
LTTXT	Log of Tariff Rate of Textiles and Textile Articles
LTVEG	Log of Tariff Rate of Vegetable Products
MFN	Most Favoured Nation
NBS	National Bureau of Statistics
NEEDS	National Economic Empowerment and Development Strategy
NEPC	Nigerian Export Promotion Council
NEXIM	Nigerian Export-Import Bank
NOEM	New Open Economy Macroeconomics
OLS	Ordinary Least Square
OMO	Open Monetary Operations
PCP	Producer Currency Pricing
PPP	Purchasing Power Parity
QRs	Quantitative Restrictions
SAP	Structural Adjustment Programme
SC	Schwarz Criteria
SFEM	Second-tier Foreign Exchange Market
SITC	Standard International Trade Classification

SSA   Sub-Saharan Africa

TOT   Terms of Trade

TRAINS   Trade Analysis and Information System

UNCTAD   United Nations Conference on Trade and Development

USA   United States of America

USD   United States Dollar

VAR   Vector Autoregressive

VEC   Vector error correction

WDAS   Wholesale Dutch Auction System

WDI   World Development Indicator

WITS   World Integrated Trade Solution

WTO   World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1 The Problem.

The sustenance of price and exchange rate stability has remained the main objective of monetary policy in Nigeria (CBN, 2007). However, in spite of the continued policy focus on this objective, inflation experience in Nigeria has gone through episodes of creeping to moderate and from high to galloping. Nevertheless, domestic price increases have decreased significantly in recent times. After peaking at 72.8% in 1995, inflation dropped to 9.4% in 2006, the lowest rate of price increases since 1999 (CBN, 2006). The sustainability of the policies employed in achieving this feat requires conscious and concerted efforts aimed at achieving a steady economic growth. Such steady economic growth is also enhanced by stability of domestic prices. As Nigeria's economy is open to international trade and is heavily dependent on imports of raw materials, capital goods and consumer goods, any instability of exchange rate feeds into domestic prices. This assertion is based on a strand of contentions about price determination[1], which argues that any appreciation or depreciation of the exchange rate in a freely floating exchange rate system will not only result in significant changes in the prices of imported finished goods but also imported intermediate goods that affect the cost of the finished goods and services and hence, the domestic price level[2].

However, literature suggests that a country like Nigeria, which is open to international capital flows, may find it impossible to achieve both stable exchange rate and monetary policy aims directed at domestic goals like price stability-the so called "impossible trinity"[3] (see

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[1] Nnanna (2002) also strengthened this assertion when he noted that the sustained instability in the exchange rate may make the price stability objective of the Central Bank of Nigeria difficult to achieve. In addition, Greene (1989) identified the various contentions on the explanation of inflation. One of the other contentions relies on the traditional approach which believes that monetary growth, arising particularly from the domestic bank financing of large budget deficits, is the major source of inflationary pressures. There is also the monetary phenomenon (see Friedman, 1963) contention, which posits that domestic price is driven by excess money supply. This argument holds true for Nigeria, an oil exporting nation, which during the oil boom period monetized the oil receipts, thereby creating undue pressure on inflation.

[2] The phenomenon that describes how the movements in exchange rate affect the import prices is referred to as the exchange rate pass-through (ERPT) and is broadly defined as the percentage change in imports prices in the importing nation's currency caused by one percent change in exchange rate.

[3] According to the theorem of the impossible trinity, a country cannot have simultaneously a fixed exchange rate, free capital mobility, and an independent monetary policy dedicated to domestic goals. Only two of these three objectives can be achieved at a time. Which one should be given up depends on the country circumstances. For

Fischer, 2001). Discords between the two goals will eventually arise and endanger the attainment of one or even both objectives. One main feature of the argument is that keeping the exchange rate stable in an open economy that is subjected to short-term capital flows can be risky. Any exogenous shock arising from movement in exchange rate under the managed-float system adopted by Nigeria may undermine the domestic goal of price stability. This raises concerns on the ability of CBN to conduct an independent monetary policy to achieve domestic price stability especially at a period when monetary authorities in many countries are adopting or shifting towards an inflation targeting regime.

For a small open economy trading in a much larger international market, one would expect a change in exchange rate to result into an equal amount of change in import prices (i.e. complete pass-through). This is because in a flexible exchange rate system, exchange rate changes generated in an efficient foreign exchange market in response to internal and external economic conditions are expected to ensure efficient allocation and balance of payments equilibrium at all times (Friedman, 1953). The assumptions of perfect market and free entry for open macroeconomic models ensure that movement in exchange rate is fully transmitted to the prices of traded goods. Such models have relied on the assumption of the purchasing power parity (PPP) which induces the complete pass-through and therefore appropriate impetus for the expected balance of payments adjustment.[4] It was assumed that the delay in adjustment was due to transient price rigidities in a perfectly competitive market. Further investigation to the reason for less-than-complete pass-through in the long-run has led to the development of models based on imperfectly competitive market structures, the results of which have demonstrated that incomplete pass-through appears to be a widespread phenomenon.

The break down of the Bretton Woods system in 1973 and the subsequent adoption of the flexible exchange rate system has reinforced the argument of the impact of exchange rate changes on inflation in the international scene. In Nigeria, the role of exchange rate in insulating the domestic economy from external shocks has come under investigation in the course of formulating an efficient monetary policy aimed at curbing inflationary pressures. Nigeria is recognized for controls in the foreign exchange market, high import tariff, and a thriving parallel

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example, countries satisfying optimum currency area criterion would give up monetary discretion, while countries strongly integrated in the global capital markets would likely give up fixed exchange rate.
[4] However, researchers have expressed fear that external account imbalance of major trading nations, notably, the United States of America (USA), were not responding as expected to significant exchange rate movement.

exchange market. Therefore, the extent of the effect of exchange rate movements on domestic price changes in Nigeria needs to be clarified in the light of these market distortions.

Against this background, the role of exchange rate changes in the movement of key macroeconomic variables especially inflation needs to be examined in Nigeria. This is particularly important under the framework of the Structural Adjustment Programme (SAP) in 1986 and the adoption of the managed floating with no pre-determined path for the exchange rate. This marked the beginning of the period of rapid movement in exchange rate, which had been mostly on the upward path largely due to the fact that the monetary authority attempted to influence the exchange rate without having a specific exchange rate path or target. Indicators for managing the rate were broadly judgmental (e.g., balance of payments position, international reserves, parallel market developments), and adjustments may not be automatic. From 1986, there has been a significant shift in exchange rate and trade policy direction towards greater liberalization. As a result, nominal effective exchange rate between 1985 and 1989 fell at an average of 41% annually and the official exchange rate depreciated at an average of 71% annually. The parallel market exchange rate was even worse; it depreciated by an average of 114% annually between 1986 and 1993 (CBN, 2006). In recent years, measures like the Dutch Auction System (DAS)[5] mechanism of determining exchange rate that later metamorphosed into the Wholesale Dutch Auction System (WDAS) in February 20, 2006[6], were directed towards moving the economy further into liberalization. The resulting impact is evident in the relative appreciation and stability of the exchange rate since its commencement. In addition, other efforts are directed towards moving the domestic price closer to international prices. Such efforts include attempts at removing restrictions on market access through round-table negotiations in the World Trade Organization (WTO) Doha Development Round. The drive behind these changes is that free trade would enhance countries' competitiveness in the world market.

The depreciations described above occurred between 1985 and 1989 when the average annual increase in the consumer price index (CPI) was about 78%. This statistic however does

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[5] The DAS is a method of exchange rate determination through auction where bidders pay according to their bid rates and where the ruling rate is arrived at with the last bid rate that clears the market.
[6] The exchange rate has been stable since the commencement of DAS particularly in the year 2004. Year 2004 opened with a rate of N137.00/$1 and closed with an exchange rate of N132.85/$1, indicating an appreciation of N4.15 (or 3.03%). There was further improvement in 2005 as the naira appreciated by 2% from N132.00/$1 to N129/$1 as at end December, 2005. The exchange rate under the new WDAS has also stabilized and continued to improve the operations of the foreign exchange market. As at March 20, 2006 the exchange rate was N128/$1. The naira further appreciated in 2007 closing at N116/$1 in December, 2007.

not reveal the volatility of changes in CPI as the period entails years of rapid fall and increase in inflation. It was found that annual change in inflation actually rose well above 300% in 1988 relative to the previous year (CBN, 2006). This volatility has significant implications for the appropriate conduct of monetary policy in an open economy and hence the management of consumer price inflation and balance of payments which are affected by exchange rate movement, through its effect on prices of imports. It is therefore imperative for the extent of pass-through of exchange rate to the disaggregated import prices to be investigated to provide an understanding of the process of price determination in Nigeria for a robust formulation of monetary policy aimed at curbing inflation.

In this regard, some pertinent questions would require answers: What are the driving forces behind the movement of domestic price in Nigeria? What product categories are more susceptible to movements in exchange rate? To what extent has the liberalization of the trade policy affected the impact of exchange rate on prices? Is exchange rate pass-through in Nigeria within a dynamic adjustment framework? These questions will constitute the main research focus of this study.

1.2 Objectives of the Study

The broad objective of the study is to estimate the extent of exchange rate pass-through to prices in Nigeria. More specifically, this study intends to

(i)   empirically determine the impact of exchange rate shocks on the disaggregated import prices, and

(ii)   empirically determine the impact of exchange rate shocks on the domestic price level in Nigeria.

1.3 Justification for the Research

First, the knowledge of the extent of pass-through to domestic prices could influence monetary authorities' forecasts of the future path of inflation, a key element in the conduct of monetary policy. Indeed, the successful implementation of monetary policy presupposes that monetary authorities have not only a good understanding of price determination, but that they are also relatively successful at predicting the future path of inflation. The critical role played by other key factors in price determination cannot be underestimated. If inflation forecasts are based

on estimates of exchange rate pass-through that do not take other factors such as tariff into account, these forecasts could be overestimating the effects of changes in the exchange rate on domestic prices. Moreover, the conduct of monetary policy aimed at price stability depends on the source and the duration of price shock. This can only be deciphered with the conduct of an investigation into the extent of pass-through.

Second, there is a submission that the extent of exchange rate pass-through (ERPT) is influenced by industry-based factors especially in the developed countries. Such industry-based factors are identified in Nigeria by the nature of policies in place to protect such industry. Nigeria is recognized for her protective policies especially in the non-oil sectors. This is necessary to bring about favourable terms-of-trade and thereby increase her competitiveness in the international market. This has an economy-wide effect which depends largely on factors that are specific to individual commodity market. An indication of the possible size and the extent of the influence of these factors can only be gauged from empirical estimation of the ERPT at the disaggregated import price level.

Despite the above, there is still a paucity of research on the empirical estimates of pass-through for small open and developing economy. Moreover, most of the available studies focus on the developed countries such as the USA, Germany, Canada, Belgium, Italy, Austria, Switzerland, Ireland (Baldwin, 1988; Hooper and Mann, 1989; Feenstra, 1989; Kim, 1990; Kenny and MacGettigan, 1996; Hänninen, 1998), Asia (Athukorala and Menon, 1994; Mallick and Marques; 2007) and Latin America (Garcia and Restrepo; 2001) leaving a glaring gap for developing countries. Although, there are few empirical studies on some Sub-Sahara African (SSA) countries (Bhundia, 2002 for South Africa; Kiptui, *et al.* 2005 for Kenya; and Oladipo 2007 for Nigeria), these cannot be generalized for all SSA countries because of their peculiar problems and economic conditions which are country-specific and therefore responsible for the heterogeneous nature of pass-through estimates as obtained in the study by Barhoumi (2005) on a few developing countries. Moreover, most of these studies employed open macroeconomic models based on perfectly competitive market structure which are not applicable to the developing economies. In addition to the scarce literature that exists, a large proportion of the studies were carried out at the aggregate level. Finally, many of the previous studies have ignored the need for testing the time-series properties of the variables entering the import function.

This study attempts to fill these gaps by informing the formulation of monetary policy in Nigeria using a disaggregated analysis of exchange rate pass-through in Nigeria. This is carried out through the provision of a pass-through model in an imperfectly competitive market structure that incorporates the role of trade policy.

1.4 Scope of the Study

The study covers a period of twenty-seven years from 1980 to 2006. The choice of the period is guided by data availability considerations. The research is a study on a small, open, developing country, Nigeria[7]. The major focus of the study is on the relationship between exchange rate movement and the domestic price level. The extent of ERPT to prices of major disaggregated imports grouped into major product categories based on the Harmonized System of Customs Goods Classification Code (HS) is also investigated. The selected items under the HS classification are: Live Animals and Animal Products; Vegetable Products; Prepared food Industry Products; Mineral Products; Chemical and Allied Products; Plastic, Ethers, Esters of Cellulose, Rubber; Paper-making Material and Articles thereof; Textiles & Textile Articles; Stone, Plaster, Cement, Asbestos, Mica Products; Metals, Base Metals & Articles of Base Metal; Machinery and Appliances (Other than Electrical); Instruments and Apparatus (Photo, Clocks etc). The choice of these product groups is based on data availability, relevance and size of sector.

1.5 Plan of Study

Following the introduction in chapter one, the background to the study is discussed in chapter two where an elaborate analysis of inflation and exchange rate is undertaken. In addition, the relevant monetary and trade policies in the study period are also reviewed. Chapter three deals with the theoretical and empirical literature review while the theoretical foundation on which the models are built is developed in chapter four. The methodology and specification of the various equations are also presented in this chapter. The empirical results and their interpretation are presented in chapter five. The study is rounded up with summary of findings, policy recommendations, and conclusion in chapter six.

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[7] The small country assumption is based on the market share of Nigeria in total world exports. Nigeria market share in world export has remained insignificant since 1980 when it was 1.27% and worsened over the decades to less than 0.4% in 2006 (UNCTAD, 2007).

CHAPTER TWO

BACKGROUND TO THE STUDY

2.1   Introduction

In many developing countries, the determination of the exchange rate has generated so much excitement both in academic and policy discussions. This is partly because of the vague standpoint of theoretical literature on what exactly constitutes optimal exchange rate policy and partly because of prevailing sentiments in these economies on the nature of the relationship between exchange rate arrangements and domestic monetary and real sector activities (Williamson, 1995). Thus, for the first two decades after Nigeria's independence and with the collapse of Bretton Woods System, the conduct and maintenance of exchange rate policies were primarily within the purview of politics; economic considerations remained minimal. Most exchange rate policies are based on realistic fundamentals driving the exchange rate. In Nigeria, the search for effective exchange rate system continues three decades after the collapse of the Bretton Woods system[8]. The experiences are as varied as the attempts. This chapter presents the contextual background to the study. The efforts of monetary authorities in Nigeria to curtail inflation and stabilize exchange rate are reviewed in details. The performance of imports vis-à-vis the trade policy is also outlined.

2.2   Exchange Rate and Inflation Movement in Nigeria

Exchange rate system in Nigeria witnessed a radical change from the long operated fixed system between the 1960s and the early 1980s. Foreign exchange regime shifted dramatically from 1986, when SAP began. Since the move to a liberalized system, the economy witnessed series of changes that have substantially affected the trend and stability of the rate. The official exchange rate was ₦0.65/$1 on the average in the 1970s, with an annual average appreciation of -2.47% over the period. Contrary to the 1970s, the 1980s showed an annual average depreciation of 35.67% at an average of ₦2.25/$1. This indicates a depreciation of 247.3% between 1970s and 1980s. The trend in the 1990s is in two folds as a result of the operation of dual-exchange rate markets[9]. With an average annual depreciation of 46.22%, the average official exchange rate

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[8] The Bretton Woods system collapsed in 1973.
[9] Note that the official exchange rates terminated in December, 1998.

during the period was ₦26.24/$1, while that of autonomous foreign exchange market (AFEM) was ₦50.26/$1 with an average annual depreciation of 42.27%. The official exchange rate represents the average exchange rate mainly used for official and government businesses in the period as against the AFEM rate which was the exchange rate used by most private businesses in Nigeria (see Table 2.1 below). This represents a depreciation of over 1000% and 2000% in the official exchange rate and AFEM rate between 1980s and 1990s respectively. The depreciation of the exchange rate continued until the year 2004 when the Wholesale DAS system was introduced. An average appreciation of about 1.85% in the exchange rate (average annual change) was experienced between 2004 and 2006. The introduction of the wholesale DAS with free sale to the inter-bank market is an important step towards unification of the two major foreign exchange markets-the retail market for non-financial traders and investors and the inter-bank market. The naira also continues to be traded in two markets for small-scale cash transactions-the *bureau de change* market and the parallel market. The movement of the exchange rate is a manifestation of policies enacted by the Nigerian government and the structure of the foreign exchange market. A detailed perusal of the structure of the market will assist our understanding of the nature of the movements.

2.2.1   The Foreign Exchange Market in Nigeria

The evolution of the foreign exchange market in Nigeria was influenced by a number of factors such as the changing pattern of international trade, institutional changes in the economy and structural shifts in production. Before the establishment of the Central Bank of Nigeria (CBN) in 1958 and the enactment of the Exchange Control Act of 1962, foreign exchange was earned by the private sector and held in balances abroad by commercial banks which acted as agents for local exporters. During this period, agricultural exports contributed the bulk of foreign exchange receipts. The fact that the Nigerian pound was tied to the British pound sterling at par, with easy convertibility, delayed the development of an active foreign exchange market. However, with the establishment of the CBN and the subsequent centralization of foreign exchange authority in the Bank, the need to develop a local foreign exchange market became important.

Table 2.1: Official and Parallel Exchange Rate Trend

YEAR	OFFICIAL EXCHANGE RATE (AVERAGE)		Δ OFFICIAL EXCHANGE RATE (PERIODIC%Δ)		PARALLEL EXCHANGE RATE(AVERAGE)	Δ PARALLEL EXCHANGE RATE (PERIODIC%Δ)
1970-1979	0.65		-		0.85	-
1980-1989	2.25		247.29		3.86	357.26
1990-1999	26.24	50.255¤	1067.60	2136.54¤	57.76	1395.57
2000-2003	118.77		352.69		132.94	130.17
2004	132.89		11.89		140.9	5.99
2005	131.87		-0.77		142.17	0.90
2006	128		-2.93		130	-8.56

Note: ¤- Referred to AFEM rate only.

Sources: Author's computation, compiled from:
   (i) International Monetary Fund's International Financial Statistics (IFS) CD-ROM 2007.
   (ii) Central Bank of Nigeria Statistical Bulletin, 2006.

The increased export of crude oil in the early 1970s, following the sharp rise in its prices enhanced official foreign exchange receipts. The foreign exchange market experienced a boom during this period and the management of foreign exchange became necessary to ensure that shortages did not arise. However, it was not until 1982 that comprehensive exchange controls were applied as a result of the foreign exchange crisis that set in that year. The increasing demand for foreign exchange at a time when the supply was shrinking encouraged the development of a flourishing parallel market for foreign exchange.

The exchange control system was unable to evolve an appropriate mechanism for foreign exchange allocation in consonance with the goal of internal balance. This led to the introduction of the Second-tier Foreign Exchange Market (SFEM) in September, 1986. Under SFEM, the determination of the Naira exchange rate and allocation of foreign exchange were based on market forces. To enlarge the scope of the Foreign Exchange Market, *Bureaux de Change* were introduced in 1989 for dealing in privately sourced foreign exchange.

As a result of volatility in rates, further reforms were introduced in the Foreign Exchange Market in 1994. These included the formal pegging of the naira exchange rate, the centralization of foreign exchange in the CBN, the restriction of *Bureaux de Change* to buy foreign exchange as agents of the CBN, the reaffirmation of the illegality of the parallel market and the discontinuation of open accounts and bills for collection as means of payments.

The Foreign Exchange Market was liberalized in 1995 with the introduction of an Autonomous Foreign Exchange Market (AFEM) for the sale of foreign exchange to end-users by the CBN through selected authorized dealers at market determined exchange rate. In addition, *Bureaux de Change* were again accorded the status of authorized buyers and sellers of foreign exchange. The Foreign Exchange Market was further liberalized in October, 1999 with the introduction of the Inter-bank Foreign Exchange Market (IFEM). The Nigerian foreign exchange market has witnessed tremendous changes: The Second-tier Foreign Exchange Market (SFEM) was introduced in September, 1986; the unified official market in 1987; the autonomous Foreign Exchange Market (AFEM) in 1995; and the Inter-bank Foreign Exchange Market (IFEM) in 1999. *Bureaux de Change* were licensed in 1989 to grant access to small users of foreign exchange and enlarge the officially recognized foreign exchange market. Exchange rates in the *Bureaux de Change* are market determined. A parallel market for foreign exchange has been in

existence since the exchange control era. It has been established that scarcity in the official sector and bureaucratic procedures engendered the growth and development of the parallel market.

2.2.2 Foreign Exchange Management Before 1986

Prior to 1986, importers and exporters of non-oil commodities were required to get appropriate licences from the Federal Ministry of Commerce before they could participate in the foreign exchange market. Generally, import procedures followed the international standard of opening of letters of credit (L/Cs) and subsequent confirmation by correspondent banks abroad. The use of Form 'M' was introduced in 1979 when the Comprehensive Import Supervision Scheme (CISS) was put in place to guard against sharp import practices. The authorization of foreign exchange disbursement was a shared responsibility between the Federal Ministry of Finance and the CBN. The Federal Ministry of Finance had responsibility for public sector applications, while CBN allocated foreign exchange in respect of private sector applications.

Increased emphasis was placed on export promotion as a means of reducing pressure on the external sector during the period. The government introduced a number of incentives to boost non-oil exports. These included arrangements for setting up export processing zones (EPZ), concessions to exporters to retain 25 per cent of their export proceeds, the liberalization of export and import licensing procedures and the provision for the establishment of an export credit guarantee and insurance scheme. Exchange control was discarded on September 26, 1986 in order to evolve an exchange rate mechanism that would better reflect the underlining macroeconomic realities.

2.2.3 Foreign Exchange Management Since 1986

The Second-tier Foreign Exchange Market (SFEM) was introduced on September 26, 1986 when the determination of the Naira exchange rate was made to reflect market forces. The modalities for the management of the Foreign Exchange Market have changed substantially since the introduction of SFEM, in line with the principles of the Structural Adjustment Programme (SAP) which emphasised the market-oriented approach to price determination.

Within the basic framework of market determination of the Naira exchange rate, various methods were applied and some adjustments carried out to fine-tune the system. A transitory dual exchange rate system (first and second-tier) was adopted in September, 1986. On 2nd July

1987, the first and second-tier markets were merged into an enlarged Foreign Exchange Market (FEM). Various pricing methods, such as marginal, weighted average and Dutch auction system, were adopted. With the introduction of the SFEM, the Federal Ministry of Finance had its allocative powers transferred to the CBN, but it retained approving powers on public sector transactions.

The constant fine-tuning of the market culminated in the complete floating of the Naira on March 5, 1992 when the system of pre-determined quotas was discontinued. The unabating pressure on the foreign exchange market resulted in a policy reversal in 1994 to that of "guided deregulation" which necessitated the institution of the Autonomous Foreign Exchange Market (AFEM) in 1995. Apart from the institution of an appropriate mechanism for exchange rate determination, other measures increasingly applied in managing Nigeria's foreign exchange resources included demand management and supply side policies. The CBN and the government have actively fostered the development of institutions such as the Nigerian Export Promotion Council (NEPC) and the Nigerian Export-Import Bank (NEXIM) in the drive to earn more foreign exchange.

The AFEM metamorphosed into a daily, two-way quote Inter-Bank Foreign Exchange Market (IFEM) on October 25, 1999. The IFEM was expected to broaden and deepen the foreign exchange market on daily basis and discourage speculative activities.

2.2.4 Foreign Exchange Management and Inflation in Nigeria

We have witnessed a remarkable improvement in the exchange rate of Naira over other exchangeable foreign currencies of the world. Since 1986, following the introduction of Structural Adjustment Programme (SAP) to date, the exchange rate has moved from regulated, guided deregulation and deregulation. This is because the world has globalized where best practices are being adhered to. The achievements recorded since the adoption of Dutch Auction System (DAS) are attributed to improvement in the external reserves position of about US$20.0 billion as at December, 2004 to US$30.0 billion at the end of January, 2006. In addition, greater autonomy of the CBN and its increased discretion in deployment of instruments of monetary control to support DAS; emergence of an inter-bank market for foreign exchange which stabilized supply gaps between auctions; reduction in inflationary pressures and disciplined fiscal operation particularly in year 2004 are also influential to the achievements. The achievements

were further consolidated with the introduction of Wholesale Dutch Auction System (WDAS) on February 20, 2006 replacing the retail DAS. The WDAS allows the end-users to bid through their banks thereby stabilizing the operations of the foreign exchange market. A brief summary of the objectives and achievements of DAS are presented in Appendix 1.

It may be interesting to have an overview of the trend of inflation vis-à-vis the exchange rate during the aforementioned periods. Inflation rate was 15.8% on the average in the 1970s. It increased in the 1980s to reach a peak of 54.5% in 1988. The situation was further worsened in the 1990s. Inflation rose to an average of 30% in the 1990s with an all-time peak of 72.8% in 1995. It has remained below 20% between 2000 and 2006 but the two-digit inflation is still a cause for concern to policy makers. The trend shows that Nigeria has experienced high volatility in inflation rates. Since the early 1970's, three episodes of high inflation in excess of 30% are recorded. The growth of money supply is correlated with the high inflation episodes because money growth was often in excess of real economic growth. However, preceding the growth in money supply, some factors reflecting the structural characteristics of the economy are observable. Some of these are supply shocks, arising from factors such as famine, exchange rate devaluation (depreciation) and changes in terms of trade brought about by imposition of tariffs.

In Figure 2.1, the year 1975 marked the first inflation rate in the 30% range. The drought in Northern Nigeria was suspected to be responsible for the high cost of agricultural food products, a significant proportion of the average consumer's budget. In addition, the excessive monetization of the oil revenue might have also given the inflation a monetary nature. As a result of an increasing debt profile, worsening external balance and generally low economic activities, the government of Nigeria was under pressure from debtor clubs to reach an agreement with the International Monetary Fund (IMF) in 1985 to devalue the domestic currency among others. The expectation that devaluation was in the offing incited inflation as prices adjusted to the parallel rate of exchange. In other words, the cause of the inflation may also be attributed to the worsening terms of external trade experienced by the country at that time.

Figure 2.1: Movement in Domestic price (CPI %), 1970-2006

Domestic Price(annual CPI%)

1995(72.8%) third episode

1988(54%) second episode

1975(34%) first episode

☐ Domestic price
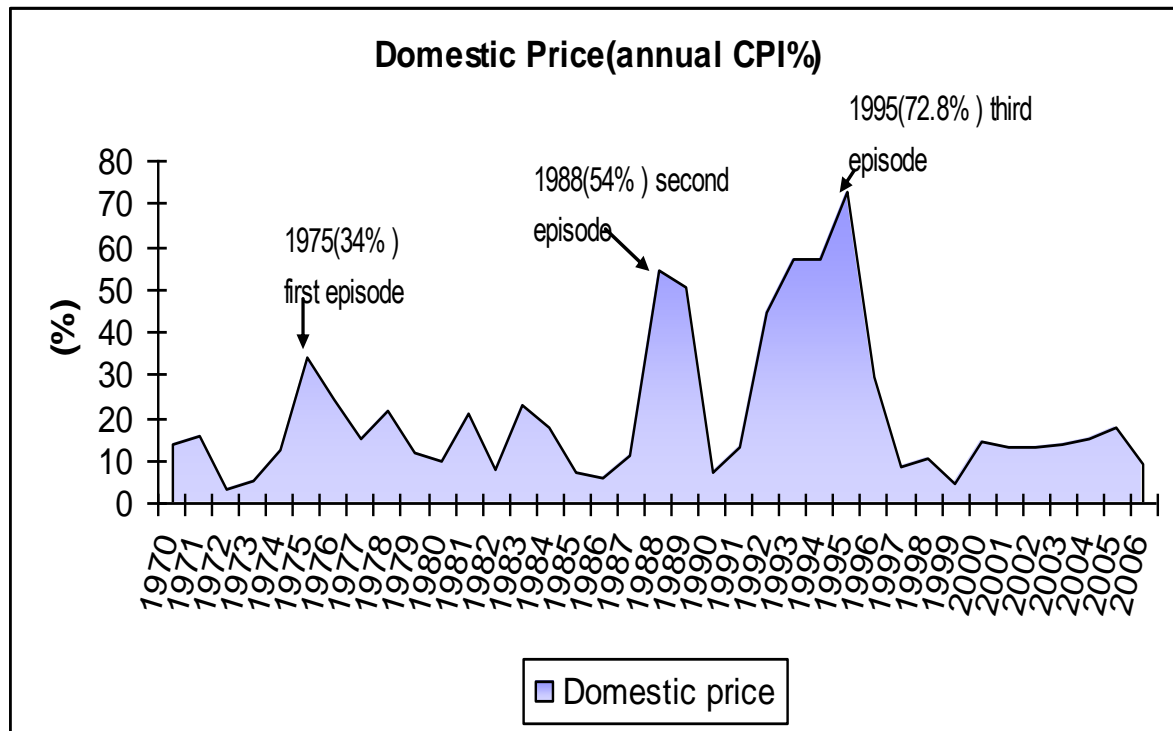
Source: Constructed by the author from Central bank of Nigeria Statistical bulletin, 2006

The second high inflation episode started in the last quarter of 1987 and accelerated through 1988 and 1989. This episode is related to the fiscal expansion that accompanied the 1988 budget. Though initially the expansion was financed by credit from the CBN, it was later sustained by increasing oil revenue (occasioned by oil price increase following the Persian Gulf War) that was not sterilized. However, with the drastic monetary contraction initiated by the authorities in the middle of 1989, inflation fell, reaching one of its lowest points in 1990.

The third inflationary episode occurred in 1993, and prolonged through the end of 1995 before a continuous and drastic plunge that persisted till 1997. Though inflation gathered impetus towards the tail end of 1992, it reached 57% by the end of 1993, the highest rates since the 1980s, and by the end of 1995, it was 72%. As with the second inflation episode, it coincided with a period of expansionary fiscal deficit and money supply growth. The authorities found it too difficult to contain the growth of private sector domestic credit and bank liquidity; and by the end of 1992, money supply growth was 73%

The episodes reviewed so far suggest that inflation in Nigeria was driven from both the demand and the supply side. The demand side pressures arose from changes in monetary aggregates while the supply side pressures arose from salient structural characteristics of the economy. Some of these were the climatic conditions; the structure of production which is favourably disposed to the reliance on imported inputs that was affected by changes in exchange rate and tariffs.

The influence of exchange rate changes brought about by the changing regimes or policies of exchange rate determination on the dynamics of inflation is further emphasized as shown by Table 2.2 below. A significant period in the analysis of the Table is stage five when exchange rate was determined through managed float. The average depreciation in the period 1986-1993 and 1994-2003 was 56.2% and 31.6% respectively with an accompanying inflation rate of 30.5% and 23.7%. It is also interesting to note that there seems to be some correlation between changes in domestic price and exchange rate in the form of depreciation (appreciation) as revealed in Figure 2.2 below. This also confirms the observation made by Agu (2005) who pointed out that exchange rate depreciation or floatation is inflationary for Nigeria and that exchange rate changes are weakly correlated with domestic price changes for a number of years.

It is important to understand the driving forces behind the movement of exchange rate and inflation. While changes in exchange rate were restricted under the fixed exchange rate

regime and relatively flexible under the SAP period, the dynamics of inflation in Nigeria is the manifestation of different factors which include the rate of movement of exchange rate, monetary policy and trade policy among others. It is therefore necessary to analyze the movement of exchange rate and inflation vis-à-vis the impact of the interaction of the aforementioned factors on real activities of the economy.

2.3. Monetary Policy in Nigeria

Monetary policy refers to the combination of measures designed to regulate the value, supply and cost of money in an economy, in consonance with the level of economic activities. It can be described as the art of controlling the direction and movement of monetary and credit facilities in pursuance of stable price and economic growth (CBN, 1992). Over the years, the objectives of monetary policy have remained the attainment of internal and external balance. However, emphasis on techniques/instruments to achieve those objectives has changed over the years. There have been two major phases in the pursuit of monetary policy, namely, before 1986 and since 1986. The first phase placed emphasis on direct monetary controls, while the second relies on market mechanisms.

2.3.1 Monetary Policy Before 1986

The oil sector, expanding role of the public sector in the economy and over-dependence on the external sector played very vital roles in the economic environment that guided the conduct of monetary policy before 1986. In order to maintain price stability and a healthy balance of payments position, monetary management depended on the use of direct monetary instruments such as credit ceilings, selective credit controls, administered interest and exchange rates, as well as the prescription of cash reserve requirements and special deposits. The most popular instrument of monetary policy was the issuance of credit rationing guidelines, which primarily set the rates of change for the components and aggregate commercial bank loans and advances to the private sector. The sectoral allocation of bank credit in CBN guidelines was to stimulate the productive sectors and thereby stem inflationary pressures. The fixing of interest rates at relatively low levels was done mainly to promote investment and growth.

Table 2.2: **Devaluation and Inflation under Successive Exchange Rate Regimes**
(In percent a year)

Exchange Rate Regime Exchange Rate*	Change in Nominal	Inflation*
Peg to pound Sterling 1960-1967	0	3.15
Peg to US dollar 1967-1974	-1.66	8.71
Peg to either pound or US dollar 1974-1976	0.81	29.13
Peg naira to an import-weighted basket of currencies 1976-1985	3.87	15
Managed-float exchange rate** 1986-1993	56.2	30.5
1994-2003	31.6	23.7

Sources: Central Bank of Nigeria Statistical Bulletin and Annual reports (various issues).
National Bureau of Statistics of Nigerian Statistical fact sheets on Economic and social development, 2006
*Data are annual averages; positive and negative values for the change in exchange rate indicate depreciation and appreciation respectively.
** The sub-division is done to show the trends during SAP and National Economic Empowerment and Development Strategy (NEEDS).

Figure 2.2: Changes in Exchange rate and Domestic price in Nigeria, 1970-2006
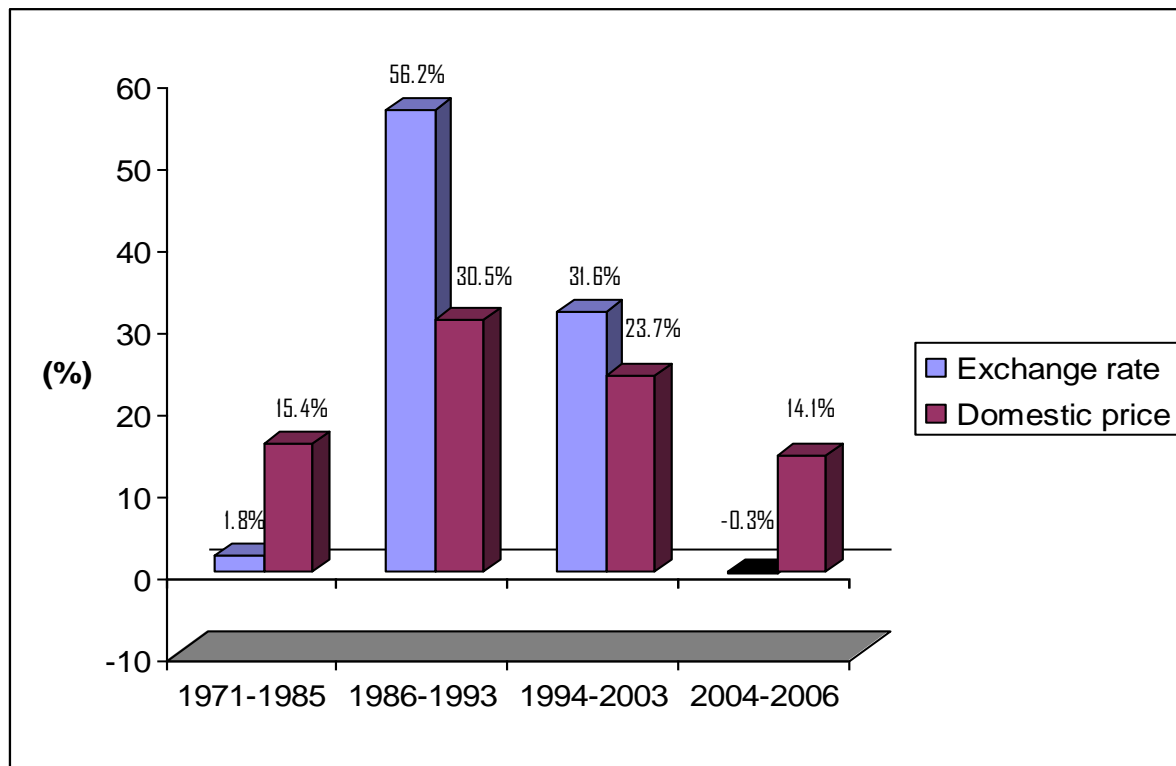
Source: Calculated by the author from Central bank of Nigeria Statistical bulletin, 2006
Note: Values are averages over selected periods.

Efforts by monetary authorities to reduce the amount of free reserve and credit-creating capacity of banks were less effective in restraining their credit operations. It therefore became increasingly difficult for the aims of monetary policy to be achieved. Consequently, monetary aggregates, government fiscal deficit, gross domestic product (GDP) growth rate, inflation rate and the balance of payments position moved in undesirable directions. The major sources of problem in monetary management were the nature of the monetary control framework, the interest rate regime and the conflicting fiscal and monetary policies. The monetary control framework, which relied heavily on credit ceilings and selective credit controls, increasingly failed to achieve the set monetary targets as their implementation became less effective with time. The rigidly controlled interest rate regime, especially the low levels of the various rates, encouraged monetary expansion without promoting the rapid growth of the money and capital markets.

The low interest rates on government debt instruments did not sufficiently attract private sector savers and since the Central Bank of Nigeria (CBN) was required by law to absorb the unsubscribed portion of government debt instruments, large amounts of high-powered money were usually injected into the economy. In the oil boom era, the rapid monetization of foreign exchange earnings resulted in large increases in government expenditure which substantially contributed to monetary instability. In the early 1980s, oil receipts were not adequate to meet increasing levels of demands and since expenditures were not rationalized, government resorted to borrowing from the Central Bank to finance huge deficits. This had adverse implications for monetary management.

2.3.2 Monetary Policy after 1986

The crash in the international oil market and the resultant deteriorating economic conditions in the country led to the adoption of Structural Adjustment Programme (SAP) in 1986. It was designed to achieve fiscal balance and balance of payments viability by altering and restructuring the production and consumption patterns of the economy, eliminating price distortions, reducing the heavy dependence on crude oil exports and consumer goods imports, enhancing the non-oil export base and achieving sustainable growth. The main strategies of the programme were the deregulation of external trade and payments arrangements, the adoption of a market-determined exchange rate for the Naira, substantial reduction in complex price and

administrative controls and more reliance on market forces as a major determinant of economic activity.

The objectives of monetary policy since 1986 have remained the same as in the earlier period-the stimulation of output and employment, and the promotion of domestic and external stability. In line with the general philosophy of economic management under SAP, monetary policy was aimed at inducing the emergence of a market-oriented financial system for effective mobilization of financial savings and efficient resource allocation. The main instrument of the market-based framework is the open market operations. This is complemented by reserve requirements and discount window operations. The adoption of a market-based framework such as Open Market Operations (OMO) in an economy that had been under direct control for long required substantial improvement in the macroeconomic, legal and regulatory environment.

In order to improve macroeconomic stability, efforts were directed at the management of excess liquidity; thus a number of measures were introduced to reduce liquidity in the system. These included the reduction in the maximum ceiling on credit growth allowed for banks; the recall of the special deposits requirements against outstanding external payment arrears to CBN from banks, abolition of the use of foreign guarantees/currency deposits as collaterals for Naira loans and the withdrawal of public sector deposits from banks to the CBN. Also effective from August, 1990, the use of stabilization securities for purposes of reducing the bulging size of excess liquidity in banks was re-introduced. Commercial banks cash reserve requirements were increased in 1989, 1990, 1992, 1996, 1999 and 2004. The rising level of fiscal deficits was identified as a major source of macroeconomic instability. Consequently, government agreed not only to reduce the size of its deficits but also to synchronize fiscal and monetary policies. By way of inducing efficiency and encouraging a good measure of flexibility in banks credit operations, the regulatory environment was improved. By 1996, all mandatory credit allocation mechanisms had been abolished.

2.4 Trade Policy in Nigeria

Trade policy measures are, typically, targeted at the tradable goods and services sectors where they influence the structure of incentives and thus affect the relative prices of importables and exportables. In this process, trade policy measures exert their impact by altering the composition and levels of imports and exports (Helleiner, 1992, 1995; Oyejide, 1999). The direct

impact of trade liberalisation should be to increase the exposure of economies to international trade (a common definition of openness), which would be reflected in an increase in the volume of trade. The expectation is that increased trade encourages a more efficient use of resources, increases competitiveness and contributes to economic growth. However, trade reform is likely to have a more direct and immediate effect on imports than on exports. Factors external to an individual country, such as world prices, are typically more important determinants of the volume and value of exports than a country's own trade policies. In much of the literature on trade policy in the developing countries, analysis of trade liberalization is often limited to import liberalization or the elimination or reduction of tariff and non-tariff barriers to imports. In reality, however, trade liberalization should consist of both import liberalization and export promotion. The export promotion component of trade liberalization is important to the extent that a widespread and deep import liberalization programme is unlikely to be either successful or sustainable in the absence of successful export.

The defining moment in Nigeria with respect to trade policy was in 1986 when the Structural Adjustment Programme (SAP) was adopted. For the two decades prior to economic reform, Nigeria's trade policy regime was viewed as complex, restrictive, and opaque (WTO, 2005). Emphasis of trade policy prior to 1986 was directed towards the protection of infant industries, self-sufficiency in food and raw materials, and the encouragement of import-substitution industrialization, the local sourcing of raw materials and the development of an indigenous technological base in industrial production. This is otherwise known as the Inward-oriented trade policies. However, with the adoption of SAP in 1986, there was a radical shift to outward-oriented trade policies. These are policies and measures that emphasize production and trade along the lines dictated by a country's comparative advantage such as export promotion and export diversification, reduction or elimination of import tariffs, and the adoption of market-determined exchange rates.

2.4.1 Trade Policy Dynamics

The trend of Nigeria's trade policy since the 1960s is characterized by uncertain and unpredictable trade regimes. Trade policy since the 1960s has witnessed extreme policy swings from high protectionism in the first few decades after independence to its current more liberal stance (Adenikinju 2005). The Nigerian Government considers trade as the main engine of its

development strategy because of its ability to create jobs, raise incomes, expand market, facilitate competition, and disseminate knowledge. Its trade policy is geared towards enhancing the competitiveness of domestic industries with a view to, *inter alia*, encouraging local value-added, and promoting and diversifying exports. Trade policies also seek (through the gradual liberalization of the trade regime) to create an environment conducive to increased foreign capital inflows, and to transfers and adoption of appropriate technologies. Nigeria intends to liberalize its trade regime in a manner that ensures that the resultant domestic cost of adjustment does not outweigh the benefits. The reforms are designed to allow a certain level of protection of domestic industries and enterprises.

In addition, tariffs have at various times been used to raise fiscal revenue; it provides the Nigerian government with its second largest source of revenue after oil exports. It is also used to limit imports to safeguard foreign exchange or even protect the domestic industries from competition. Moreover, various forms of non-tariff barriers such as quotas, prohibitions and licensing schemes have on various occasions been extensively used to limit imports of particular items. The overall pattern portrays the long-held belief that trade policy can be used to influence the trade regime in directions that can promote economic growth. Attempts were made to use trade policy to promote manufactured exports and enhance the linkages in the domestic economy, to increase and stabilize export revenue, and scale down the country's reliance on the oil sector (Olaniyi, 2005). Trade policies were accordingly directed at discouraging dumping; supporting import substitution; stemming adverse movements in the balance of payments; conserving foreign exchange; and generating government revenue (Bankole and Bankole, 2004).

The use of trade policy for governmental objectives dates back to the period after independence when Nigeria was pursuing the import substitution industrialization strategy. This involved the use of trade policy to provide effective protection to local manufacturing industries, through such measures as quantitative restrictions and high import duties. Indeed, prior to the recent economic reforms, Nigeria maintained a complex tariff structure which comprised of about 19 bands and 5,113 lines (at the HS-6 digit level), with tariffs ranging between 2.5% and 150%. Machinery and spare parts imports were restricted and exchange controls on the repatriation of dividends and profits were enforced. Restrictions were also applied on capital goods, spare parts and non-essential imports. The post-war reconstruction exercise after the Nigerian civil war in 1970 informed the less restrictive policy stance. As a result, only items

considered as non-essential were restricted, while tariff on essentials were reduced. However this surge of liberalization ended in 1977, when a wide range of imported finished goods requiring licenses came to be placed on very high duties or were banned outright. This renewed restrictive trade policy culminated in the banning of 82 items in 1979; while a further 25 items were placed on import license.

The level of external reserves influenced significantly the direction of trade policy. A policy of massive trade and exchange rate liberalization was adopted in 1980 owing to the comfortable stock of foreign reserves in the preceding year. However, the collapse of the world oil market in 1981 led to a dramatic policy shift towards exports promotion and a move to intensify the use of local raw materials in industrial production (Adenikinju, 2005). However, the increase in the value of imports led to a worsening of the balance of payments (with, in addition, the backdrop of the collapse in world oil prices), which forced the government to promulgate the Economic Stabilization (Temporary Provisions) Act in April 1982. This led to the increase in tariff rate on some items, use of specific license for importation, and stringent exchange rate regulation. The fundamental objective of trade policy was to provide protection for domestic industries and reduce the apparent dependence on imports. Accordingly, tariffs on raw materials and intermediate capital goods were scaled down. In 1984, the range of import duties was reduced from between 0 and 500 per cent to between 5 and 200 per cent. Notwithstanding this, the balance of payments arrears continued to accumulate; an indication of the failure of the various control measures to achieve their aims.

From 1986, there was a significant shift in trade policy direction towards greater liberalization. This shift in policy was directly attributable to the adoption of Structural Adjustment Programme (SAP). A new decree called the Customs, Excise; Tariff etc (Consolidation) Decree was enacted in 1988 and was based on new Customs goods classification, the Harmonized System of Customs Goods Classification Code (HS). It provided for a seven-year (1988 -1994) tariff regime, with the objective of achieving transparency and predictability of tariff rates and this resulted into a significant reduction of tariff averages. Imports under the regime thus attracted *ad valorem* rates applied on the Most Favoured Nation (MFN) basis. A new seven-year (1995 - 2001) tariff regime, established by Decree No. 4 of 1995 succeeded the previous (1988–1994) regime. The tariff structure over the period 1988-2001 increased import duties on raw materials, and on intermediate and capital goods, while tariffs on

consumer goods were slightly reduced. This was aimed at reducing distortions in resource allocation and combating smuggling. Both the 1988 and 1995 tariff schedules had provisions for reviews and amendments. However, they maintained the familiar mixed trends in tariff regimes. Three types of changes were subsequently common, namely, reduction in rates; increase in rates and/or removal from or addition to the import prohibition list.

Nigeria's external sector policies were torn between protectionism and liberalization, although they showed a systematic movement towards liberalization. The (1995–2001) customs and excise schedule was replaced by a new tariff regime in 2002 with a simplified structure and lower tariffs (see Table 2.3 below). Customs duties were regularly revised in the annual budgets. The 2000 budget reduced the average import tariff from 24% to 12%. And the 2001 budget introduced many cuts in import duties as well as some increases, especially for final goods. These changes were expected to further reduce the average tariff. In addition, some non-tariff barriers were removed. The customs and excise schedule originally included import prohibitions on 16 items and absolute prohibitions on 19 items (mostly on health, safety, and moral grounds). These import prohibitions were progressively reduced by the annual budgets.

From 2003, trade policy regime in Nigeria as presently contained in the National Economic Empowerment and Development Strategy (NEEDS) and trade policy documents, has been geared towards enhancing competitiveness of domestic industries, with a view to, *inter alia,* encouraging local value-added and promoting as well as diversifying exports. The emphasis is placed on gradual liberalization and it is managed in a manner which ensures that the resultant economic costs do not outweigh the inherent benefits. In the course of protecting the domestic industries, the tariff rates were increased with high effective rates in several sectors and lower import duties on inputs (raw materials and intermediate goods) unavailable locally. The policy also led to an increase in import duties levied on finished goods that compete with local production. For example, the 50 percent tariff is currently levied on goods in selected sectors in which the country has a comparative advantage and aims to support domestic production, such as vegetable oils (HS sections 15.11, 15.12, 15.13) and starch (HS sections 11.08)[10].

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[10] See appendix 2 for detailed information on various policies developed to boost domestic production in agricultural and manufacturing sectors.

Table 2.3: Simple Average Tariff Rate at Product Group levels, 1980-2006

PRODUCT GROUP	1980-1985	1986-1994	1995-2001	2002-2004	2005-2006
Live Animal and animal products	73.56	38.91	22.06	25.72	17.19
Vegetable products	56.32	29.85	32.43	48.46	12.22
Animal/veg fats and oils and their cleavage products;	45.97	24.17	24.64	43.05	20.33
Prepared foodstuff	86.10	45.77	42.42	62.79	19.16
Mineral products	27.39	14.52	16.60	16.48	5.66
Product of chemical	46.55	24.98	19.41	20.38	9.70
Plastic, rubber aandarticles	48.12	25.71	23.28	23.54	11.15
Raw Hides	52.12	27.56	25.70	26.16	11.55
Wood	42.01	22.24	24.60	27.36	15.77
Paper making materials	46.57	24.86	14.24	16.08	9.50
Textiles and textile articles	87.28	58.28	37.67	43.27	16.22
Footwears	87.66	47.22	33.62	38.04	16.85
Articles of stones	69.98	36.92	32.01	32.26	17.26
Pearls, precious stones	225.00	133.33	65.46	62.60	11.04
Base metals	48.54	25.66	20.65	22.18	12.76
Boiler,machinery	38.66	20.63	15.30	16.38	6.92
Vehicle	43.94	23.29	13.84	16.90	7.28
Optical	49.74	26.31	19.70	17.81	12.20
Arms	52.83	27.94	29.20	28.53	17.81
Miscellenous	78.49	41.68	33.30	37.91	18.61
Works of art, collectors' pieces and antiques.	125.00	60.00	52.86	50.00	20.00
AVERAGE AGGREGATE TARIFF	68.18	37.14	28.52	32.19	13.77

Source: Author's computations from tariff data in UNCTAD's TRAINS, wits.worldbank.org (all in 2-digit HS product group)

Looking at the tariff structure, Nigeria is known to have a total bound tariff line of only 19.2%, as indicated in the WTO's Nigeria Trade Policy Review. From our data, since the last trade policy review undertaken in 1998, average applied MFN tariff has increased from about 28% to 33% in 2003, with applied MFN tariff rates on Agriculture and non-agricultural sectors averaging 48% and 29%, respectively in 2003. A general assessment of the tariff structure reveals that tariff rates are widely dispersed, ranging from 2.5% to a maximum of 150%, with a total of only 19 bands applied. Thus the overall picture reveals mixed escalation, due to the high tariffs in agriculture. This seems to indicate a policy bias in favour of agricultural protection. A number of industries are also protected through positive escalations, while several industries benefit from tariff exemptions and concessions on import of inputs of raw materials. Tariff averages for raw materials are lower than those for semi-or fully manufactured products. In 1988, the tariff average for first production stage was 16%; this increased to 36% at the second stage and increased further to 59% at the third stage. The corresponding values for 2001 were 18%, 31% and 44%, respectively (Adenikinju, 2005).

The sectoral distribution of tariff shows a wide difference with significantly higher levels of protection for agricultural products as already indicated. In 2003, the average MFN rate for agriculture (Chapters 1-24; 2-HS digits) was 48.2%, compared to 31% in 1998 (see Table 2.4 below). The sharp rise in tariff was said to have mainly occurred in 2002, with the imposition of high tariffs on several agricultural products. Indeed, tariff amendment introduced in 2002 led to tariff rates of 100% on several products in HS chapters 1-24, which fall under Agriculture classification. The lowest recorded average agricultural rates are on Fish and crustacean, mollusc and other aquatic invert (12.44%); Oil seeds, fats and oils and their products (14.89%); and Vegetable plaiting materials; vegetable products (15%). The highest rates are recorded on fruits and vegetables (100%); tobacco (89.4%), with rates of 150% on cigars and other manufactured tobacco products; and beverages and spirits (91.4%), with rates of 150% on water.

Given the relatively high level of protection for agricultural products and decline in non-agricultural products, especially raw materials, machineries and plants spare parts for local manufacturing industries, the overall tariff structure had displayed a mixed escalation as shown in Figures 2.3, 2.4 and 2.5. This implies high effective rate of protection to agricultural industry, thus increasing the profitability of production in the sector and hence influencing the pattern of resource allocation in their favour. The most protected areas (subject to a tariff of 100%) include

butter, cheese and curd; edible vegetables and certain roots and tubers; edible fruits and nuts; vegetable oil, margarine; prepared or preserved meat products; sugar confectioneries; food preparations containing chocolate, pasta, party and rice. Figures for 2003 indicate that non-agricultural products attracted an average applied MFN rate of 29%, up from 27.9% in 1998. Average MFN applied duties by product group range from 2.5% to 100%, with the lowest average rates on mineral products (16%); chemical products (16.7%); and optical and photographic imports (15.8%). The highest rates are precious stones (62.6%) followed by textiles (42.6%), and footwear (32.9%) respectively. Interestingly, in industrial products too, there is a wide dispersion of tariffs within each product group. Some chemicals attract tariffs of 2.5%, while others attract rates as much as 100%.

Table 2.4: Simple Average Tariff rate (%), 1988-2006

	Simple Tariffs, 1988-2006	
	Agricultural Tariff Rate (%)	Non-agricultural Tariff Rate (%)
1988	33.89	34.61
1990	34.93	42.04
1992	34.76	35.99
1994	34.77	35.92
1996	30.68	27.93
1998	30.66	27.95
2000	31.34	28.37
2002	48.62	29.76
2003	48.19	28.98
2004	38.20	28.77
2005	17.24	12.96
2006	17.21	12.96

Source: Author's computations from tariff data in UNCTAD TRAINS, wits.worldbank.org

Figure 2.3: Agricultural Tariffs, 1988-2006
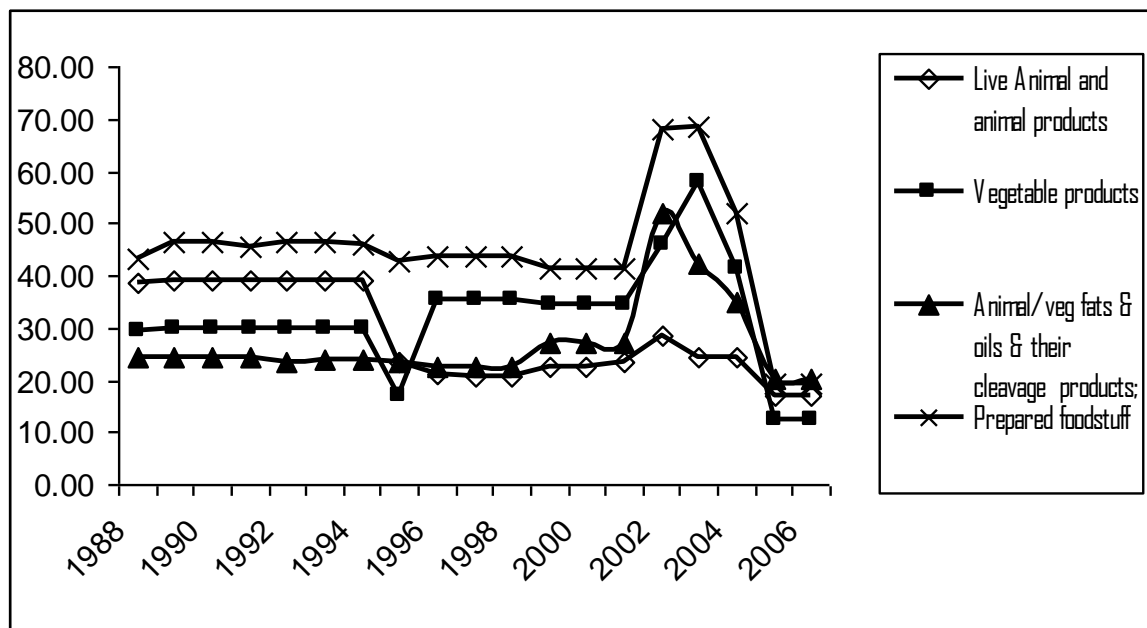
Source: Author's computations from tariff data in UNCTAD's TRAINS, wits.worldbank.org

Figure 2.4: Selected non- agricultural Tariffs (i), 1988-2006
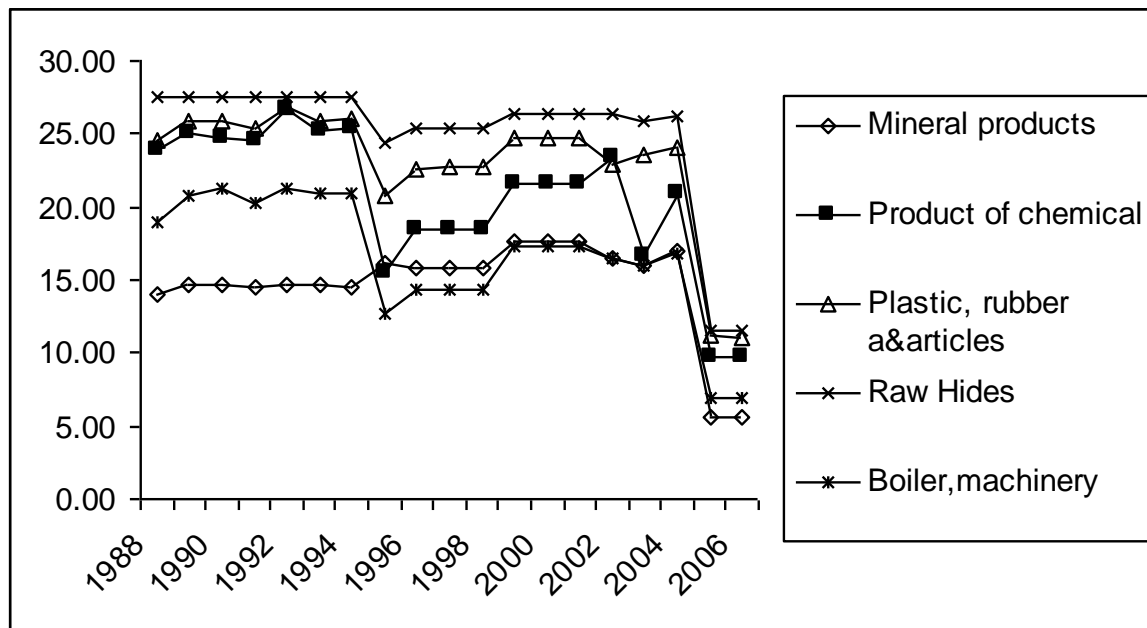
Source: Author's computations from tariff data in UNCTAD's TRAINS, wits.worldbank.org

Figure 2.5: Selected non- agricultural Products Tariff Trend (ii), 1988-2006
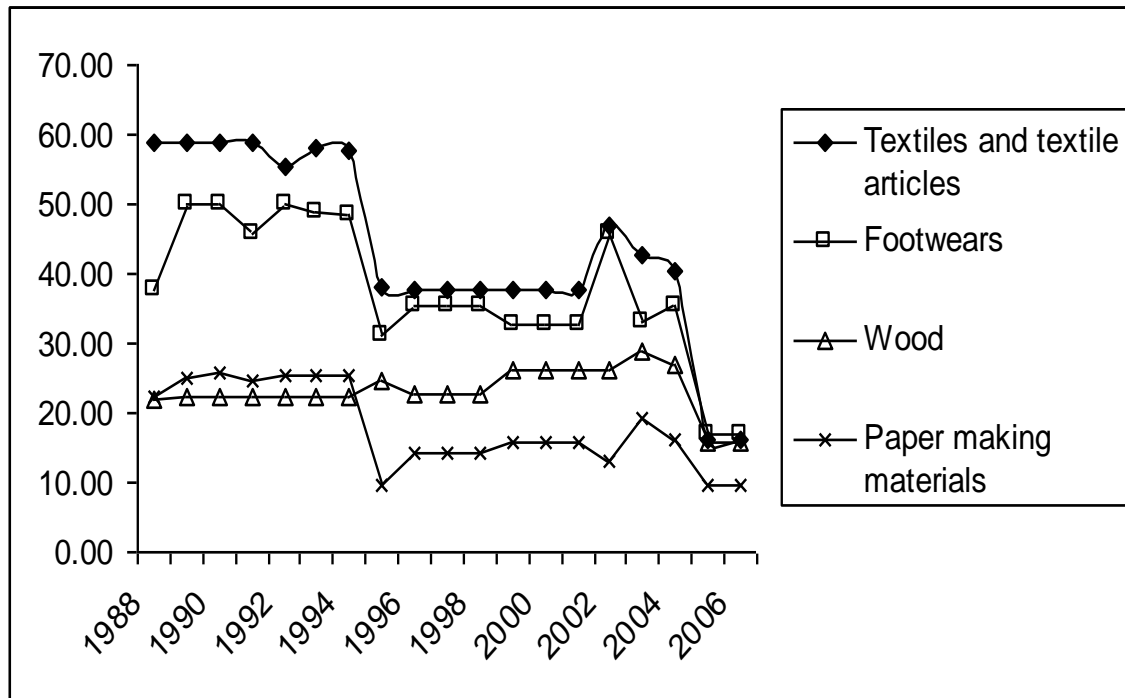
Source: Author's computations from tariff data in UNCTAD's TRAINS, wits.worldbank.org

In its last major tariff revision, in October 2005, the government implemented the Economic Community of West African States (ECOWAS) Common External Tariff (CET), reducing the number of tariff bands in Nigeria from 20 to 5. The five tariff bands are: zero duty on capital goods, machinery, and essential drugs not produced locally; 5% duty on imported raw materials; 10% duty on intermediate goods; 20% duty on finished goods; and 50% duty on goods in the industries that the government seeks to protect. The 50% tariff would cover many items currently subject to import bans. Nigeria however requested for type-A exemption for some items that should be put in a fifth category of 50%. The Community is yet to agree on the fifth band. Nigeria has reduced her duty rates from 0%-150% to 0%-50% within the transitional period of 2006-2007. Exemptions granted by ECOWAS on some other tariff lines are supposed to be phased out during the transitional window to the ECOWAS CET. The CET has simplified and improved the transparency of Nigeria's tariff structure. Nigeria plans to be fully compliant with the ECOWAS CET from January 1, 2008.

The effect of these policies undertaken by the government is manifested in the decline of average simple tariff rate from 40.69% in 1990 to 33.35% in 2003. The decline does not only have implication for total imports, but also for the composition of the total imports and the movement of the domestic prices of goods and services. Figure 2.6 reveals that the share of consumer goods in total imports fell from 39.6% to 26.7% between 1980 and 1990, but, not for long. The contribution of consumer goods rose again in 1992 and the increase continued until the 40% mark was reached in 2003. From 2003, import of Machinery and Equipment contributed more than Consumer goods but by 2004, raw materials surpassed Consumer goods imports. An indication of a protective trade policy: tariff rates on final (consumer) goods are generally higher than that of Machinery and Equipment which experienced a decline in tariff. By 2005, Machinery and Equipment imports (capital goods) constituted 43%, raw materials (30%) and Consumer goods (27%). One interesting finding from the data is that there seems to be some correlation in the movement of CPI inflation and the consumer goods component of the total imports over the selected years.

Figure 2.6: Share of Components of Total Import for selected years.
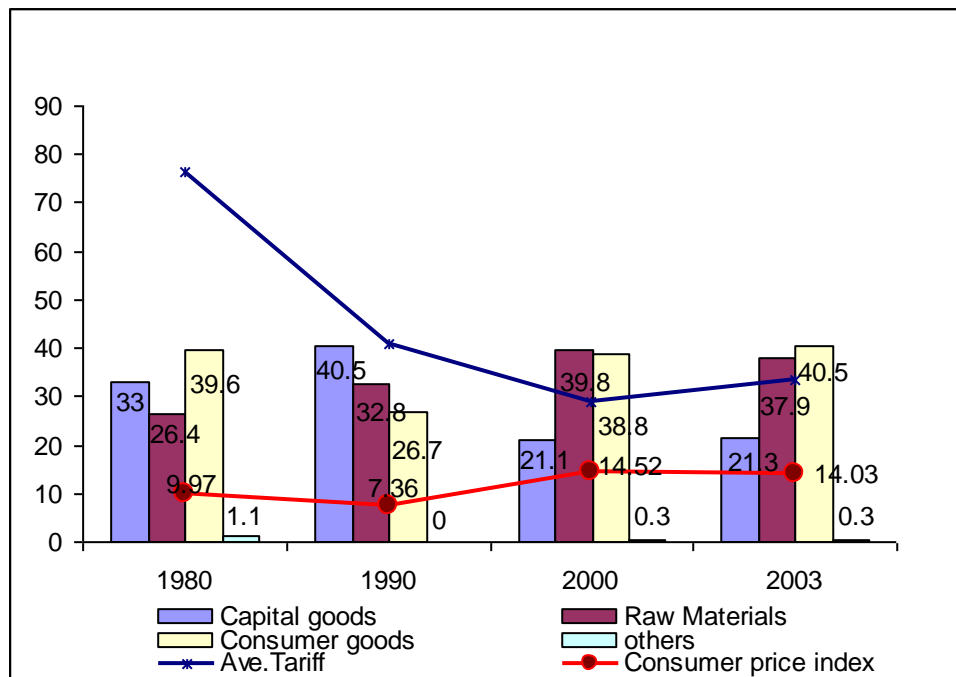
Source: Computed from statistics obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, (various issues)

In addition, an examination of the contribution of external trade to gross domestic output (GDP) reveals that the share of export in GDP has increased continuously over time, while that of import has dwindled. The share of exports in GDP was 17.7% on the average in the 1970s; it increased to 21.4% in the 1980s, and further increased in the 1990s to 41.7%. This impressive export performance is due to the favourable development in the oil export market over time (Ogunkola *et al*, 2006). With respect to the contribution of imports to GDP, it has varied over time but has been lower than that of export for most part of the period under consideration. The share of imports in GDP increased from an average of 17.8% in the 1970s to 20.3% in the 1980s. It further increased in the 1990s to an average of 37.6%. The trend of the ratio was generally on the decline between 2000 and 2006, except for 2002 and 2004. A similar downward trend was also noted in the share of exports in GDP from 2004 as shown in Table 2.5 below. The contribution of imports to GDP had been driven by non-oil imports which accounted for a significant proportion of the share of imports in GDP (Ogunkola *et al*, 2006).

Overall, the share of total trade (export and import) in GDP has followed the trend of export share in GDP, which has consistently risen over time from an average of over 35.0% in the 1970s to over 41% in the 1980s, and about 80% in the 1990s. This implies that the degree of openness (the share of total trade in GDP) of the Nigerian economy has increased substantially over the period under consideration (see Table 2.5 below). It should be noted however, that the real benefits associated with increased openness of an economy are yet to be fully reflected in the growth of the Nigerian economy. This has been attributed to the operation of the oil driven economy. The present reforms embarked upon by the government as contained in the NEEDS documents, are expected to improve this condition by diversifying from oil to non-oil activities such that manufacturing and agriculture become the growth driving force. This is based on the fact that very few people in Nigeria participate in oil sector activities which accounted for overwhelming proportion of total export and a reasonable share of GDP. This seems to suggest that the reduction of tariff rate, and the import-substitution oriented policies and measures of the government, are aimed at ensuring that the objective of economy's diversification is achieved.

Table 2.5: Exchange rate and other Macroeconomic Indicators for the Nigerian Economy

	CPI INFLATION (%)	NOMINAL EXCHANGE RATE (N/US$, AVERAGE)	IMPORTS OF GOODS AND SERVICES (% OF GDP)	EXPORTS OF GOODS AND SERVICES (% OF GDP)	TRADE(% OF GDP)	GDP GROWTH (%)
1970-1979	15.80	0.65	17.87	17.71	35.57	7.0
1980-1989	20.89	2.189	20.34	21.43	41.76	1.74
1990-1999	30.45	50.255	37.62	41.78	79.77	2.8
2000	14.52	101.7	32.20	54.26	86.46	1.5
2001	12.96	111.9	32.50	43.27	75.78	4.72
2002	12.88	120.58	41.63	40.87	82.50	4.63
2003	14.03	129.4	41.51	49.73	91.24	9.57
2004	15	132.89	37.42	54.60	92.02	6.58
2005	17.86	131.66	35.22	53.13	88.35	6.51
2006	9.4	128	20.11	37.81	57.92	5.3

Sources: (i) World Development Indicators, 2007

(ii) CBN Annual Report for the Year Ended 31st December, 2006

(iii) Statistical appendix of African Regional Economic Outlook (sub-Saharan Africa), IMF publication September, 2006 and IMF Country Report No.06/180 May 2006.

2.5   Import Price Trend in Nigeria

The commencement of exchange rate and trade liberalization in 1986, and the continued pursuance of other measures and policies geared towards gradual movement of the economy further into liberalization since 2003, had had multifaceted impact on changing import prices over time. Figure 2.7 below provides the trend of import prices of agricultural products from 1970 to 2006. Our analysis is on the fluctuations in prices of imported products with the aim of evaluating the changes and tracing the source of price changes. The level of analysis covers changes in import prices, relationship between these changes and changes in the domestic price, and the various policies and measures influencing import prices.

The analysis of changes in price over time revealed a relatively low fluctuation in prices of the agricultural products between 1970 and 1993. Although, liberalization of exchange rate began in 1986, there was no visible impact on the prices of imported products until 1993 when the prices fluctuated rapidly. It may be too hasty to attribute the fluctuations as a fall out of the complete floating of the naira in 1992, when the system of predetermined quotas was discontinued. Other sources of the fluctuation like the changes in international market prices and trade policy measures are also potential suspects in the period. This fact is demonstrated with the coincidence of the periods of rapid fluctuation of the import prices and the shift from 1995-2001 tariff regime to the NEEDS trade policy regime, which has a penchant for domestic production to revamp the productive capacity of the economy in agricultural and some manufacturing industries.

The impact of the components of price change on the aggregate import price shows some mixed relationships. Table 2.6 shows the trend of the components whilst Table 2.7 shows their fluctuations. Domestic price and import price show a similar trend from 1971 to 1987, and a twist occurred between 1988 and 1991 when the import price moved in the same direction as the exchange rate and tariff. It is also observed that rapid fluctuations of aggregate import price, domestic price, and exchange rate occurred in the early 1980s before stabilizing in 2001. To reiterate this point, the average growth rates of the three variables are found to be higher in the period between 1985 and 2001 than any other period in Table 2.7. The mixed revelations and relative impact of these variables therefore require an elaborate empirical investigation for the impacts to be evaluated.

Figure 2.7: Import Prices of Selected Products, 1970-2006
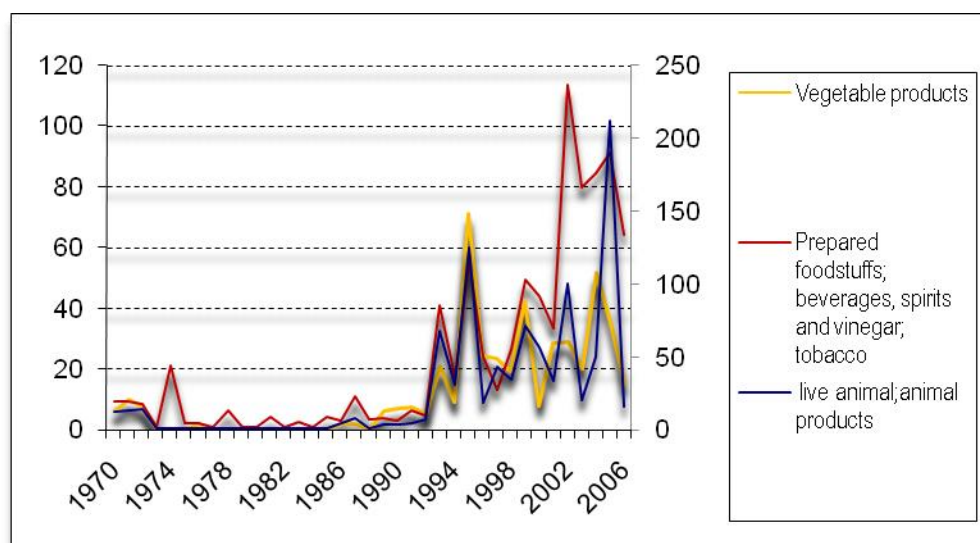
Source: Computed by the author from Foreign Trade Statistics (various issues), a publication of the National Bureau of Statistics (NBS), Abuja.

Table2.6: Aggregate Import Price and Components of Price Changes, 1980-2006

	Aggregate Import Price	Exchange rate	Domestic price	Average Tariff	World Export Price
1980	10.06	0.55	9.97	76.39	94.72
1981	17.29	0.63	20.81	75.48	95.15
1982	50.29	0.67	7.70	76.08	91.37
1983	27.82	0.74	23.21	60.34	86.71
1984	24.08	0.76	17.82	61.95	84.97
1985	126.81	0.89	7.44	58.84	83.24
1986	127.19	2.02	5.72	35.47	89.75
1987	191.77	4.02	11.29	35.68	98.81
1988	12.83	4.54	54.51	34.47	104.17
1989	13.79	7.65	50.47	40.57	106.00
1990	12.85	8.04	7.36	40.69	113.02
1991	18.03	9.91	13.01	40.16	110.90
1992	23.24	19.66	44.59	35.75	113.14
1993	35.76	22.63	57.17	35.72	107.43
1994	32.06	21.89	57.03	35.70	110.59
1995	22.47	81.02	72.81	27.43	121.20
1996	72.41	81.25	29.29	28.46	118.93
1997	60.26	81.65	8.21	28.46	111.56
1998	58.47	83.81	10.32	28.46	105.32
1999	46.67	92.69	4.76	28.94	103.22
2000	122.63	100.12	14.52	28.94	100.00
2001	151.39	111.23	12.96	28.97	96.25
2002	125.74	120.58	12.88	33.35	97.20
2003	130.18	129.22	14.03	32.64	106.70
2004	118.91	132.89	15.00	30.57	115.98
2005	148.36	131.87	17.90	13.77	121.58
2006	115.77	128.00	9.40	13.77	128.36

Sources: (i) World Development Indicators, (WDI) 2007

(ii) International Financial Statistics, (IFS) 2007

(iii) Foreign Trade Summary, (various issues), a publication of the National bureau of
     Statistics, (NBS) Abuja

(iv) UNCTAD's TRAINS, wits.worldbank.org

Table 2.7: Average Growth Rate of Selected Variables, 1971-2006

	1971-1984	*1985-2001*	*2002-2006*
Change in Import Price	15.68279	49.19657	-3.85412
Change in Exchange Rate	0.71553	45.07947	2.941846
Change in Domestic Price	31.22672	42.08935	-2.58553
Change in Average Tariff*	-4.60149	-3.50496	-9.67304
Change in World Price	9.420047	0.86996	5.97259

Sources: Same as Table 2.6

Note: * indicates that average tariff commences from 1980.

CHAPTER THREE
LITERATURE REVIEW

3.1   Introduction

Studies of the effects of exchange rate changes on prices of traded goods originally developed as one component of the investigation of a specific macroeconomic problem. Open-economy models have traditionally assumed that international trade takes place in perfectly competitive markets, so that the pass-through of exchange rate changes to destination-currency prices is complete. In a flexible exchange rate regime, any imbalance in external trade should then result in an equilibrating movement in exchange rates and a corresponding corrective adjustment in the relative prices of imports.

If, however, exchange rate changes are not fully reflected in the selling prices of traded goods, the anticipated correction in trade volume will not occur. The failure of the trade balance of major economies such as the USA and Japan to adjust as expected following the advent of flexible exchange rate systems focused attention on the mechanisms underlying these prices and quantity adjustments in international markets. Consequently, the earliest theoretical analyses of exchange rate pass-through were couched in macroeconomic terms, with models concentrating on sluggish price changes and variation in supply and demand elasticities in international trade.

Broad explanations such as these, however, were unable to account for the observed prolonged deviations from complete pass-through. Researchers accordingly turned to microeconomic models of price-setting behaviour, finding explanations in imperfectly competitive market structures in which incomplete pass-through in the long-run can occur through variations in profit margins. Dynamic models added an intertemporal dimension, allowing for hysteretic effects as exporters seek to maximize strategic advantage by varying pass-through over time. The "pricing-to-market" literature developed and extended these models by highlighting the existence of market segmentation in international trade. If there are differences in demand curves or in the cost effects faced by exporters in trade to individual countries, pass-through can vary between destinations, violating the Law of One Price.

A further class of models has gone outside the traditional microeconomic theories of market structure, to seek explanations in industry or firm specific institutional factors. Here, incomplete pass-through in the longer-term may result from market impediments such as the existence of externally-imposed barriers to trade, or the use of internal exchange rate transactions

by multi-national corporations. Similarly, some researchers have questioned the partial-equilibrium nature of industry-based pass-through models, turning, in a sense, full circle, by emphasizing broader influences on pass-through via economy-wide macroeconomic conditions.

This chapter presents a review of both the theoretical and empirical literature on exchange rate pass-through as well as related methodological issues.

3.2   Exchange Rate Pass-through and Purchasing Power Parity: Concepts and the Link[11]

Exchange rate pass-through (ERPT) is usually defined as the percentage change in destination-currency import prices resulting from a one percent change in the exchange rate between the exporting and importing countries (Goldberg and Knetter, 1997). Literature on exchange rate pass-through has been synonymous with the literature of the purchasing power parity (PPP). PPP states that price levels between two countries are equal when expressed in the same currency at any period of time. Therefore, if PPP holds, exchange rate fluctuations translate into proportional movements in the domestic price level; i.e. pass-through is equal to one. PPP requires two restrictive assumptions: (i) that there is instantaneous costless and frictionless arbitrage. (ii) That the same goods enter the basket of goods with the same weight in every country. Surely neither of the above can hold all the time leading to the weak or relative version of PPP. It has also come to be known as the *inflation theory of exchange* rates suggesting that changes in the exchange rate between two countries are determined by the difference of their inflation levels. (i.e. $\hat{e} = \hat{P} - \hat{P}^*$). The relative version eliminates the requirement that arbitrage is costless but it does require that it does occur at a constant cost. This will clearly not be the case if there are quantitative restrictions in place or if there are modifications in trade policy. More importantly, the determination of domestic inflation may use different shares of goods in their respective baskets and certainly non-traded groups are not the same and cannot be arbitraged.

The literature has identified different types of "structural" and "transitory" deviations from PPP although pinpointing the source of the deviations has proved to be difficult. The most important structural deviation from the strong and weak versions of PPP arises from differences in productivities or differences in productivity changes, respectively. The phenomenon was first

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[11]This section relies immensely on Anaya (2000) which also benefited from Dornbusch, R. (1988), *Exchange Rates and Prices* Introduction to Part III.

noted by Ricardo who noted that real prices of home goods are high "in countries where manufactures flourish." The mechanism, now called the Balassa-Samuelson effect, assumes the Law of One Price (LOOP) as it applies to tradables[12]. An increase in productivity in the traded sector puts upward pressure on the nominal wage. Without commensurate increase of productivity in the home goods sector, non-tradable prices increase. Thus, a country that is "catching" because it has greater increases in productivity will have observed an appreciation of its domestic price level when measured in a common currency. That is, its real exchange rate will appreciate. The phenomenon has been documented in country cross-sections and long-term time series. Other structural deviations from PPP can arise because of supply shocks, permanent Terms of Trade (TOT) shocks, changes in tastes between traded and non traded goods, or changes in commercial policy.

Transitory deviations from PPP beyond those caused by transportation and information costs which make arbitrage difficult on a continuous basis arise because of sticky prices and wages compared to exchange rates. The literature has theoretically justified slow adjusting domestic prices and wages for many reasons. The implications have been explored extensively. Indeed slow adjusting prices are implicit in the standard Mundell-Fleming model of international macroeconomics. The question that the empirical section addresses is the size and duration of these temporary deviations. There is one notable type of shock which does create a deviation from PPP even if the domestic price indexes have different shares and goods in their baskets: namely, a monetary shock when the conditions for homogeneity postulate of monetary theory exist. In this case, a change in the money supply will lead to a proportionate change in all prices including the exchange rate.

In the traditional open-economy macroeconomic models, if the PPP assumption holds, ERPT to domestic prices would be immediate and complete. One can therefore infer that the failure of PPP might be responsible for incomplete pass-through (for a survey, see Goldberg and Knetter (1997)). To demonstrate this, an expression for pass-through is derived from simple accounting relationship between the price paid by the importer and price received by the exporter, each expressed in their known currency.

$$P_m = EP_x \tag{3.1}$$

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[12] While the Purchasing Power Parity PPP is in macro or aggregate form, the Law of One Price (LOOP) captures the micro or disaggregated form.

where P_m is the price of import expressed in importing country's currency, P_x is the price of export in the exporting country's currency or in international market, and E is the nominal exchange rate in destination currency per unit of foreign currency. Any exchange rate change must be fully reflected in either an increase (decrease) in import prices, or the opposite decrease (increase) in the foreign currency. When import prices bear full extent of the change, pass-through is said to be complete.

The effects of differing degrees of pass-through can be demonstrated by expressing equation 3.1 in logarithmic form:

$$\ln P_m = \ln E + \ln P_x \tag{3.2}$$

and differentiating:

$$dP_m/P_m = dE/E + dP_x/P_x \tag{3.3}$$

Dividing equation 3.3 by (dE/E) gives an expression relating pass-through to prices expressed in domestic-currency and in foreign currency, where pass-through is defined as the elasticity of price with respect to the exchange rate:

$$(dP_m/P_m)/(dE/E) = 1 + (dP_x/P_x)/(dE/E) \tag{3.4}$$

or alternatively:

$$(dP_m/P_m)/(dE/E) + [-(dP_x/P_x)/(dE/E)] = 1 \tag{3.5}$$

Equation 3.5 demonstrates that the *absolute* values of pass-through to domestic currency prices, P_m and to foreign-currency prices, P_x must sum to one, although the price movement will be in opposite directions, and, therefore, of opposite sign. Thus, if pass-through to import prices is complete, that is, equal to one, exchange rate shocks are fully transmitted to the importing country and has no effect on the exporters, and vice versa.

The relationship derived above can also be used to examine the link between exchange rate pass-through and the Law of one Price, a fundamental concept underlying many traditional theories of international economics and trade, for example, those reviewed in Isard (1977) and Goldstein and Khan (1985). The Law of One Price is based on the concept of perfect goods arbitrage. It states that, in the presence of a competitive market structure, and in the absence of transport and related costs, the price of identical goods sold in different markets must be the same, when expressed in a common currency (Deardorff, 2000).

For example, the price of traded goods at the international market must be equal to the price paid by consumers for imports to the Nigerian market. At any given exchange rate, the Law of One Price can then be expressed in absolute terms as:

$$P_{m,D} = P_{m,N} = EP_{x,F} \qquad\qquad (3.6)$$

Where $P_{m,D}$ is the price of the goods paid by domestic consumer in naira (Nigerian currency), and $P_{m,N}$ is the price paid by Nigerian importers expressed in naira, $P_{x,F}$ is the price received by the exporters in foreign currency, and E is the nominal exchange rate in naira per unit of foreign currency.

The literature identifies two channels of ERPT. These are the direct and the indirect channels. The direct channel of pass-through runs via the external sector of a country, i.e. through the price of imports. The channel is derived on the conjecture of PPP and it forms the benchmark of the theory of ERPT, which states that pass-through of exchange rate to domestic prices ought to be complete and no arbitrage opportunities may exist in the long run as demonstrated above.

The indirect channel of ERPT refers to the competitiveness of goods on international markets. A depreciation of the exchange rate makes domestic products relatively cheaper for foreign buyers, and as a consequence, exports and aggregate demand will rise and induce an increase in the domestic price level. Since nominal wage contracts are fixed in the short run, real wages will decrease and output will increase. However, when real wages are bidded up to their original level over time, production costs increase, the overall price level increases and output falls. Thus, in the end the exchange rate depreciation leaves a permanent increase in the price level with only a temporary increase in output (Kahn, 1987).

3.3   Exchange Rate Pass-Through in The Short-Run

Empirical studies of trade policy in the 1950s and 1960s usually assumed that exchange rate variations were fully reflected in the foreign-currency prices of traded goods, that is, in the long-run, pass-through was complete for both imports and exports (Kindleberger 1963; Branson, 1972). The apparent unresponsiveness of national trade balances to exchange rate adjustments in the early days of the floating exchange rate period was therefore largely seen as a short-run phenomenon, the result of small, non-persistent deviations from complete pass-through in the long-run.

The explanation of the short-run nature of incomplete exchange rate pass-through has been anchored on the influence of the contractual nature of most international transactions. Magee (1974) identified a "currency-contract" period where prices are fixed under the terms of pre-existing contracts in the first phase of pass-through. Short-run pass-through would then be zero if the contact price is dominated in the importer's or destination currency and the importer would bear any loss or gain. On the other hand, if the contract is priced in the supplier's currency, short-run pass-through would be complete and the buyer would carry the risk. This reasoning according to Phillips (1991), influenced the degree of pass-through in Australia and the USA as he suggested that the rapid increase in Australian import prices was largely due to the fact that approximately 90% of Australian imports were dominated in foreign currencies in contrast with that of the USA where the bulk of imports were invoiced in domestic currency. In addition, the "currency contract" also influences the choice of currency of payment of the exporter. If the importer's currency appreciates, the exporter could retain the benefit of the appreciation if the contract is written in that currency. But if the supplier's own currency is likely to appreciate, then pricing in the supplier's currency will shift the risk of loss onto the importer. The reverse is true of importers, who will prefer to price in depreciating currencies. Magee (1974) concluded that the contract currency chosen, and hence, the degree of pass-through in the fixed-price period will be decided by the relative market power of the parties.

Mann (1986) extended this analysis by pointing out that the invoicing decision is in reality more complex, as the exporter's total revenue is at risk in either case, but the source of the risk varies. Although writing a contract in the exporter's own currency removes the risk of a price change, the exporter still faces a quantity risk, as quantity demanded will be uncertain when the buyer's price changes. The reverse is true of a decision to price in the buyer's currency, as now the quantity sold is unaffected, but the price risk remains. The invoicing decision here, and hence the degree of pass-through in the short-run, will depend on the risk aversion characteristics of both buyer and seller.

The more recent availability of exchange rate hedging using forward currency markets can alter risk exposure, and accordingly the invoicing decision. Friberg (1998) argued that, when forward currency markets are introduced, pricing in the buyer's currency and fully hedging the concomitant price risk is optimal behaviour for an exporter in most circumstances. Short-run pass-through will then always be zero, until contracts are renegotiated.

In all cases involving contract currencies, the frequency with which contract prices can be adjusted is clearly an important element. If contracts are flexible, and can be readily altered, the invoice currency chosen is of little consequence for pass-through. The optimal invoice currency will be that which requires the least price adjustment to achieve the desired long-run level of pass-through, and the choice of contract currency will depend on the same factors that determine pass-through in the long-run (Knetter 1992a).

In practice, however, many contracts in international trade are traditionally written in a third currency, particularly the United States dollar (USD) (Alston *et al* 1992). While this ensures that pass-through to USD prices will be zero, pass-through to destination prices in the short-run will depend not on exporter/importer currency changes, but on USD/importer-currency exchange rates. Pass-through to destination currencies in the short-run may even be greater, rather than less, than complete.

Other factors have been suggested as possible sources of short-run deviations from complete pass-through apart from contractual consideration. The potential reluctance of the exporters to bear the adjustment or "menu" costs of changing prices in importer's currencies has been highlighted as one of the sources. According to Ghosh and Holger (1994), menu costs might arise in two ways: the inconvenience imposed on customers as foreign-currency prices are changed may lead to "informational" costs to the exporter if it subsequently results in loss of sales. Exporters may also incur "administrative" menu costs in determining new prices and informing distributors, particularly if servicing multiple markets with diverse currency movements.

Similarly, exporters may be reluctant to modify output levels in response to a price change, particularly if the change is perceived to be transitory. For example, products to particular destinations may have specific requirements that entail commitment to a fixed production run, so that producers prefer to allow adjustment in the short-run to fall entirely on their own prices (Alston *et al* 1992; Menon 1993b). Transient lags in pass-through can also be due simply to incomplete information about exchange rate changes, or to normal delays between placement of the order and payment, when the exchange rates used are those of the date of order rather than the export or delivery date (Bushe *et al* 1986).

In all these cases, the impact of exchange rate changes in the short-run may differ in important ways from the long-run effects. These differences can be attributed to short-run

inflexibility of either supply or prices. Ultimately, however, as with currencies of contract, normal market conditions would be restored over time, and pass-through of exchange rate changes would become complete, as theoretically expected in a perfectly competitive market.

3.4   Perfectly Competitive Models: The Elasticity Approach

In the long-run, perfectly competitive model, exporters of traded goods must operate at the level of production for which marginal cost is equal to price expressed in domestic currency. Any attempt by suppliers to maintain incomplete pass-through by absorbing exchange rate effects in domestic-currency prices must be short lived, as the resulting losses or gains in profits will lead to the exit or entry of competitors in the industry. Pass-through for both imports and exports can be incomplete only in the short-term, that is, only until the alteration in quantity supplied that result from new entry or exit brings about an adjustment to the foreign currency price. In traditional macroeconomic models that assumed perfect competition, such as those pioneered by Marshall (1923) and Lerner (1944), the degree of pass-through was linked to the timing, rather than the magnitude, of trade effects.

In keeping with these early elasticity-based models of balance of payments adjustment, initial attempts to estimate pass-through focused on measures of relative elasticities. Branson (1972), for example, derived a simple model of demand for, and supply of, exports between two countries in an integrated market. He argued that exchange rate-induced excess profits or losses in perfectly competitive markets, with no barriers to entry, would ensure the theoretical result of complete pass-through in the long-run. Incomplete pass-through would then be only a "medium-run" phenomenon, possibly enduring for longer than the contractual and short-run price stickiness discussed above, but ultimately it would still be a transitory occurrence.

The timing and extent of pass-through in the interim will depend on the relationship between price elasticities as derived in Branson (1972). For example, as supply becomes more inelastic, and demand more elastic, the degree of pass-through becomes smaller, that is, approaches zero, resulting in constant foreign or world prices. When coupled with the customary determinants of elasticities, this relationship can be used to classify economies on the basis of expected rates of pass-through.

A country that lacks specialization in its exports, holding only a small share of world markets, would be expected to face high elasticity of demand. Conversely, a country with a high

proportion of primary commodities, such as agricultural products, among goods exported, with exports constituting a larger share of domestically produced tradable goods, is conducive to relatively inelastic supply. The combination of these circumstances gives rise to the "small country" assumption, whereby the domestic currency traded prices in small economies are expected to be more sensitive to exchange rate changes than those of the larger economies. (Spitaller 1980).

There are some underlying assumptions of incomplete pass-through which the "small country" case may encounter in the elasticity approach. The incomplete pass-through is assumed to depend on the supply responses of producers in individual countries, and the exact degree of pass-through on the interaction between demand and supply conditions. However, the model offers only very general explanations for what may lie behind those responses, and no information at all about the timing of exchange rate effects (Venables 1990; Menon 1995). Both demand and supply conditions will depend on the details of the industrial organization of the industry under study, and may differ between countries.

An implication of the "small country" assumption is that the size of the economy is related directly to the proportion of world markets held by that economy, and inversely to its proportion of traded goods. The assumption also implies that the export of primary commodities will necessarily indicate a lack of market control by exporters. These assumptions may not be correct, especially for primary-exporting nations that dominate the production of a particular commodity.

The validity of the assumption of perfect competition is a precursor to the use of elasticity approach to calculate the extent of pass-through in the "small country" case. The application of these assumptions to modern trade models has been criticized in the light of several factors that may lead to imperfect market structures. Some of them highlighted by Mann (1986) include imperfect substitutability of products so that each supplier has some market power; production technology that exhibits non constant returns to scale so that the supply curve is sloped; a relatively small number of firms in the industry; and wage and sales contracts that may limit the speed of adjustment of prices to changes in costs or demand.

If trade occurs under conditions that are less than perfectly competitive, therefore, more detailed models that address the nature of competition in the industries concerned are needed to analyze the effects of an exchange rate change.

3.5 Imperfectly Competitive Models

3.5.1 Static Equilibrium Models

Investigations carried out on the nature of exchange rate pass-through in small and large open economies have led to the establishment of a number of theoretical models (Krugman, 1987). The early literature on exchange rate pass-through was spurred in part by the non-response of the USA import prices to the strong appreciation of the dollar in the early 1980s and the subsequent depreciation[13]. This was noted by Branson (1972), when he concluded that trade effects were taking "substantially longer than econometric evidence on normal price lags would suggest", because "Japanese and German exporters are, to a large extent, not passing through the exchange rate changes". In addition to seeking explanations for pass-through that went beyond broad determinants of elasticities, research also focused on the development of more complete models of export demand and supply, to overcome the perceived limitations of the perfectly competitive approach. In imperfectly competitive industries, firms are assumed to have some power to set prices, so that pricing is no longer at marginal cost. Exporters will maximize profit by setting export prices in domestic currency as a mark-up, or profit margin, over costs. If the mark-up remains constant following an exchange rate movement, pass-through to foreign currency prices will be complete. Alternatively, firms may choose to absorb some or all of the change by varying their mark-up, so that pass-through will be incomplete

There are arguments that there is no single coherent theory of devaluation (or revaluation) but rather a fusion of reasons behind non-responsive prices in the face of exchange rate shock (Magee, 1974). The mechanism behind the early theoretical models is the strategic interaction between firms in an imperfect competition framework. The literature draws from the industrial organisation literature and focuses on the relationship between the exchange rate pass-through and industry characteristics such as market structure and the nature of competition. The models are partial equilibrium in nature, that is, they focus on the response of prices to an exogenous movement in the nominal exchange rate.

Recent theoretical literature builds on the concept of market segmentation (although incomplete pass-through is not necessarily evidence of a lack of market integration). Even in situations where we have perfect competition and product homogeneity, the pass-through may be different from one due to non-price elasticity of demand and the supply side effects of exchange

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[13] Detailed survey exists in Menon (1995a) and Goldberg and Knetter (1997).

rate changes. Of course, reasons abound why national or regional markets might be segmented, namely; transportation costs, custom duties, non-tariff barriers, physical differences in product characteristics, and brand loyalty of consumers.

Given segmented markets, Krugman (1987), and Dornbusch (1987) initiated a number of models examining variations in mark-ups in response to exchange rate changes in oligopolistic settings. In Dornbusch (1987) model, domestic and foreign firms engage in a Cournot type competition which yields, as equilibrium import prices, a weighted average of the marginal costs of domestic and foreign firms (times the exchange rate). Dornbusch identified four factors that are likely to affect the degree of pass-through to destination currency import prices: (i) the degree of market integration or segmentation, (ii) the degree of product differentiation, (iii) the functional form of the demand curve, and (iv) the market structure and the degree of strategic interaction among suppliers.

As regards the importance of the degree of market integration; if markets are perfectly integrated, the law of one price (LOOP) must hold. In its absolute version the LOOP says that, when prices are measured in a common currency, identical products should sell for the same price everywhere (see e.g., Goldberg and Knetter, 1997). The relative version of the LOOP allows for a constant wedge between the common currency prices of identical products. By contrast, if markets are segmented (e.g., due to formal or informal trade barriers), a wide ranges of pricing responses are possible. In this situation if exporters seek to maximise profit, pass-through is likely to be high, but if exporters seek to maximise market share rather than profit, pass-through may be incomplete (Hooper and Mann, 1989). Thus, firms may set different prices to different destination markets and the LOOP may not hold.

To investigate the implications of product differentiation for the degree of exchange rate pass-through, Dornbusch considered the Dixit and Stiglitz (1977) model of monopolistic competition. In this model, the optimal price is a constant mark-up over marginal cost, and the mark-up is inversely related to the elasticity of demand. Hence, price discrimination is optimal if the demand elasticities differ across destination markets. However, the bare prediction from the Dixit and Stiglitz model is that, for given marginal costs, destination currency import prices respond proportionally to movements in the nominal exchange rate, that is, the exchange rate pass-through is complete. This follows from the assumption that the elasticity of demand is constant. In order to get incomplete pass-through in the monopolistic competition framework one

must assume that the elasticity of demand is increasing in the firm's price. Specifically, demand must be less convex than in the constant elasticity case. In this case it will be optimal for the monopolist to adjust the mark-up in response to an exchange rate change. This has the effect of lowering the degree of exchange rate pass-through to import prices. Krugman (1987) referred to such exchange rate induced mark-up adjustment as 'pricing-to-market'.

To demonstrate the importance of market structure and strategic interaction among suppliers, Dornbusch used the example of a Cournot industry of domestic and foreign firms that supply a homogenous good in the domestic market. In the baseline case with a linear demand curve, the elasticity of the equilibrium price with respect to the exchange rate is found to be less than one, that is, the exchange rate pass-through is incomplete. The pass-through elasticity is increasing in the relative number of foreign firms to total firms in the domestic market and in the overall level of market concentration. In general, the pass-through elasticity also depends on the form of the demand curve. If demand becomes more elastic as price goes up, it is to the firms' benefit to refrain from fully passing the exchange rate shock through to purchasers' prices (Yang, 1997).

In addition, the extent of exchange rate pass-through may also be influenced if the imports are mainly intermediate goods that have locally produced substitutes priced in domestic currency, where the local producer may replace the imported input by the domestic one in response to exchange rate changes. Obsfeld (2001) terms this "expenditure-switching effect", which depends on the degree of substitutability between local and imported goods. Dornbusch (1987), and Hooper and Mann (1989) also wrapped up with this conclusion as they observed that the adjustment of mark-up to exchange rate movements is dependent on the extent of product homogeneity and substitutability, the relative market shares of domestic and foreign firms, the market concentration and the extent of price discrimination possible. A general result in the literature is that the more differentiated (or the less substitutable) the products in an industry; the larger the share of foreign exporters relative to domestic producers, the higher the degree of price discrimination (or the higher the concentrated market), and hence, the higher the pass-through rates as a result of greater ability of foreign firms or exporters to maintain markup.

In summary, the wide diversity of the static models of imperfectly competitive industries makes it difficult to generate unambiguous conclusions. Competitive interaction can occur in many different ways, and a model appropriate to one industry may be of little relevance to

another. Nevertheless, these models do demonstrate very clearly that imperfect competition is likely to result in incomplete pass-through in the longer term, under a range of plausible market structures and product types.

Furthermore, they have the advantage of providing a more concrete basis for empirical testing, by emphasizing the strategic interaction between firms in the marketplace, and the general correlation of different rates of pass-through with specific characteristics of individual industries, for example, the number of firms and level of market concentration. This leads to the important prediction that firms in the same industry, sharing a common market with similar technology, should also have similar rates of pass-through, whatever their country of origin (Ohno 1989). The static equilibrium of the oligopoly models, however, by its nature can provide information only about a particular situation at one point in time, with no allowance for intertemporal or intersectoral feedback effects. As the question of the pass-through of exchange rate changes arises only because of the continuous variability of flexible exchange rates over time, the dynamic nature of the strategic interaction between firms must also be considered.

3.5.2. Dynamic Model of Imperfect Competition

The hypothesis of Krugman (1987) that a full explanation of pricing-to-market would require a dynamic model of imperfect competition motivated Froot and Klemperer (1989) to consider a two-period duopoly competing in the domestic market and assumed that the firms' second period demands depend on their market share in the first period. Possible sources of such dependence are brand-switching costs or network externalities. In this model, the expected value of the exchange rate affects the value of the market share in the second period, and hence, the optimal price in the first period. The authors showed that the magnitude and sign of the exchange rate pass-through will depend on whether exchange rate changes are perceived to be temporary or permanent.

Baldwin (1988) and Baldwin and Krugman (1989) "hysteresis models" are examples of models emphasising dynamic supply-side effects. A basic assumption in these models is that firms incur significant sunk costs when entering foreign markets. The entry costs could represent investment in marketing and advertising, or investments in distribution networks. The hysteresis models predict that the exchange rate pass-through will depend both on the expected duration and the size of the exchange rate change. In particular, the exchange rate pass-through will

depend on whether the exchange rate change is large enough to induce new firms to enter and old firms to exit the market. A testable implication of the hysteresis models is that large exchange rate changes permanently alter the market structure and lead to structural breaks in estimated trade equations.

Another model focusing on dynamic supply-side effects is the model in Kasa (1992). Kasa considered a monopolistic exporter that faces quadratic costs of adjusting supply. Similarly, in Froot and Klemperer (1989), a critical factor affecting the degree of exchange rate pass-through is the relative importance of the transitory component of exchange rate fluctuations. Exchange rate changes that are perceived to be transitory are absorbed in the monopolist's profit margin, resulting in a low degree of pass-through to import prices. A common feature of all the models considered so far is that they are flexible price models; that is, prices are allowed to adjust instantaneously to shifts in costs or demand.

Engel (2004) emphasises that there is no role for monetary policy or nominal prices in these models. Giovannini (1988) derives the optimal pricing policy of a price discriminating monopolist when prices have to be set in advance, that is, before the realisation of the variables determining cost and demand. A main result is that, when prices are predetermined, the co-movement between the exchange rate and traded goods prices depends critically on the currency denomination of export prices. If prices are set in the currency of the exporter, deviations from the LOOP and incomplete pass-through indicate ex ante price discrimination and pricing-to-market. If, on the other hand, prices are set in the currency of the importing country, the observed deviations from the LOOP and incomplete pass-through are the sum of a price discrimination effect and an expectations effect. The model implies that, when prices are predetermined in the currency of the importing country, the exchange rate pass-through depends on the stochastic properties of the nominal exchange rate. Giovannini's emphasis on nominal rigidities and the choice of price-setting currency makes his study an important precursor to the New Open Economy Macroeconomics (NOEM) literature.

3.6   New Open Economy Macroeconomics

Obstfeld and Rogoff (1995) in their model argue that the LOOP holds for all goods, and prices are set in the currency of the producer (so-called producer currency pricing, PCP). This implies that local currency import prices respond proportionally to unexpected exchange rate

movements, that is, the exchange rate pass-through is complete and immediate. This is in conformity with traditional open-economy macro models such as the Mundell-Fleming-Dornbusch model and with the recent New Keynesian small open economy model considered by Gal´ı and Monacelli (2005). Betts and Devereux (1996, 2000) modified Obsfeld and Rogoff's study with the introduction of pricing-to-market into their model. This generated incomplete pass-through and short-run deviations from the LOOP by allowing for international market segmentation and by assuming that import prices are temporarily rigid in the currency of the importing country. The key concepts in this literature are those of local currency pricing and producer currency pricing (LCP and PCP, respectively), which refer to the case where exporters preset their prices in the currency of the importing country or in their own currency, respectively. In their model, prices are set one period in advance and hence are predetermined every period. Local currency price stickiness (or LCP) then implies that the short-run exchange rate pass-through is zero. Due to the assumption that foreign and domestic households have identical constant elasticity of substitution (CES) preferences over differentiated goods, the LOOP holds and the exchange rate pass-through is complete in the flexible price equilibrium.[14]

Subsequent studies have combined the LCP framework with more general models of time-dependent pricing such as Calvo's (1983) model of random price adjustment (e.g., Smets and Wouters, 2002; Monacelli, 2005), the linear quadratic adjustment cost model of Rotemberg (1982) (e.g., Adolfson, 2001; Laxton and Pesenti, 2003; Bergin, 2006), or a staggered contracts model (e.g., Bergin and Feenstra, 2001; Chari *et al*., 2002). A key feature of these models is that the optimal price-setting rules are forward-looking; import prices depend on the expected future path of the driving variables. The models predict that the exchange rate pass-through to import prices will be gradual, and moreover, that the size and speed of pass-through will depend on the expected persistence of the exchange rate change. One implication of the forward-looking nature of the price-setting rules is that the degree of exchange rate pass-through will be endogenous to the monetary policy regime[15]. According to Taylor (2000), a low inflationary environment creates an avenue where the effect of a change in marginal cost of production on the pass-through is likely to be dampened. He therefore relates the decline in pass-through to a tightening and enhanced credibility of monetary policy. In the light of this, an increase in marginal cost in

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[14] If the preferences of foreign and domestic consumers exhibited different elasticities of substitution, LOOP in its absolute form would not hold, however, the exchange rate pass-through would still be complete.
[15] See Taylor (2000) and Gagnon and Ihrig (2004) for details.

an environment with a great deal of price stability, will lead to a less degree of pass-through than in an environment with little aggregate price stability. Therefore, a low inflation environment may entail a lower pass-through of (exchange rate) shocks to prices.

The relationship between pass-through and inflation environment has been further explored by other studies[16]. Others like Gagnon and Ihrig (2004) and Bailliu and Fujii (2004) also tested Taylor's hypothesis in their studies. Gagnon and Ihrig developed a theoretical model relating the fall in the degree of pass-through to increased emphasis on inflation stabilization by the Central Banks whilst Bailliu and Fujii showed evidence that exchange rate pass-through to domestic prices (import, producer and consumer prices) had declined over time and that this decline resulted from a transition to a low-inflation environment, itself induced by a shift in monetary policy. More precisely, they found that this decline was brought about by inflation stabilization episodes that took place in the early 1990s and not in the 1980s. The upshot of these theories is that exchange rate pass-through may be complete or partial depending on the prevailing economic environment.

A recent strand of the literature analyses the choice of price-setting currency (i.e. the choice between LCP and PCP) in the context of the NOEM framework. The optimal choice of price-setting currency is found to depend on several factors, including the exporting firm's market share in the foreign market (Bacchetta and van Wincoop, 2005), and the degree of substitutability between foreign and domestic goods (Goldberg and Tille, 2005).[17] The model in Devereux *et al.* (2004) predicted that the exchange rate pass-through will be lower in countries with relatively stable monetary conditions because foreign exporters have an incentive to stabilise local currency import prices in these countries. Another contribution emphasising the joint endogeneity of the exchange rate pass-through and the monetary policy regime is Corsetti and Pesenti (2005). In the model in that paper, foreign exporters decide how much of an exchange rate change should be passed-through to local currency import prices prior to the realisation of the exchange rate. LCP and PCP arise as special cases. The expected profits from exports and hence, the optimal degree of pass-through, depend on the monetary policy rule and the nature of the shocks hitting the economy.

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[16] They include Choudhri and Hakura (2001), Devereux and Yetman (2002), and Devereux, Engel and Storgaard (2004)

[17] Goldberg & Tille (2005) also discuss the circumstances under which it might be optimal to invoice in a third-country vehicle currency.

The first-generation NOEM models do not distinguish between the consumer "retail" prices of imports and import prices "at the docks". By contrast, Smets and Wouters (2002) assumed that importing firms buy a homogenous good at a given price from the world market and transform it into differentiated goods for sale in the domestic market. Similarly, Monacelli (2005) assumed that domestic retailers import differentiated goods for which the LOOP holds. In these models, the exchange rate pass-through to import prices at the docks is immediate and complete. However, because of local currency price stickiness, the exchange rate pass-through to import prices at the consumer stage is incomplete in the short run.

Corsetti and Dedola (2005) extended the basic NOEM framework by assuming that the distribution of traded goods to final consumers requires the input of local, non-traded goods and services. This assumption is consistent with the notion that traded goods prices at the consumer level contain a significant non-traded component. Distribution costs create a wedge between the import prices at the docks and the consumer price of imports. This has the direct effect of lowering the degree of exchange rate pass-through to import prices at the consumer level. In addition, the existence of a wedge between producer and consumer prices implies that the price elasticity of demand perceived by the exporter, and hence the exporter's optimal mark-up, will be a function of the price of non-traded goods in the importing country. This creates scope for price discrimination between the domestic and foreign markets and implies that the exchange rate pass-through to import prices will be incomplete, even in the absence of local currency price stickiness

Bergin and Feenstra (2001) and Gust and Sheets (2006) introduced "pricing-to-market" by replacing the standard assumption that households have CES preferences over differentiated goods with preference specifications that have the property that the elasticity of demand facing a firm depends on the firm's price relative to the prices set by its competitors. In these models, an exporter contemplating raising her price will take into account that, if the prices of import-competing goods remain constant, an increase in the firm's price will cause demand to become more elastic, leading to a reduction in the desired mark-up. Hence, it is optimal for an exporter to absorb part of an exchange rate movement in the mark-up and so the exchange rate pass-through to local currency import prices will be incomplete.

A direct channel, through which the exchange rate affects domestic firms' prices, is via the prices of imported intermediate goods. When imported goods enter the production function

for domestic goods, marginal costs will depend on the prices of imported intermediate goods. This is potentially an important transmission channel for exchange rate changes in a small open economy (see e.g., McCallum and Nelson, 2000). The direct effect of import prices on the aggregate consumer price index depends on the degree of openness and on the degree of home bias in consumption. Obviously, in a general equilibrium framework, the reduced form co-movement between exchange rates and prices depends not only on the optimal response of price setters to movements in the exchange rate, but on the entire structure of the model and the source of the shocks hitting the economy (Ambler *et al.*, 2003).

There is a sprouting literature estimating NOEM models with incomplete pass-through. One of such is Choudhri *et al.* (2005), who focused explicitly on the ability of different versions of a small open economy NOEM model to explain the degree of exchange rate pass-through to a set of prices in non-US G8 countries. The NOEM models are estimated by minimising a measure of the distance between the impulse responses of prices to an exchange rate shock obtained from an identified VAR and the corresponding responses in the theoretical models. The best-performing model incorporates many of the mechanisms for generating incomplete or slow pass-through proposed in the literature, including nominal price- and wage rigidities, a combination of LCP and PCP, and distribution costs.

3.7   Pricing-to-Market

The emergence of a phenomenon known as "pricing-to-market" brought the limitations of the existing static models into spotlight in the early 1980s. It was claimed that Japanese and German exporters were price discriminating between the United States and other markets, by not passing through the increases in United States dollar (USD) import prices expected after a significant depreciation of the USD (Krugman 1986). The term "pricing-to-market" is now generally used to refer to the tendency of exporters to maintain constant destination-currency prices in the face of exchange rate changes. That is, to demonstrate rates of pass-through that is not only incomplete, but varies between different markets. This exchange rate-induced divergence in prices between markets is an example of third-degree price discrimination, where different groups of consumers pay different prices for identical goods (Pigou, 1920).

3.7.1 Market Segmentation and the Law of One Price

The existence of pricing-to-market implies that the global market for a product is segmented, that is, not integrated. A goods market is said to be geographically segmented if the physical location of buyers and sellers influences the price charged, by more than the cost of transporting the product between sites. Local differences in prices can occur for a variety of reasons that prevent arbitrage, such as warranties that are valid only in the country of purchase (Goldberg and Knetter 1997).

Clearly, market segmentation violates the Law of One Price. This can be demonstrated by extending equation 3.6, representing the absolute form of the Law of One Price, to multiple foreign markets:

$$P_{m,D} = P_{m,N} = E_1 P_{x,F1} \neq E_2 P_{x,F2} \tag{3.7}$$

where E_1 and E_2 are nominal exchange rates in naira per unit of foreign currency, and $P_{x,F1}$ and $P_{x,F2}$ are foreign currency prices in each of two different markets. But in a segmented market, where pricing-to-market exists, foreign currency prices expressed in a common currency are not equal:

$$E_1 P_{x,F1} \neq E_2 P_{x,F2} \tag{3.8}$$

Similarly, foreign currency price in either market, when expressed in domestic currency, may or may not be equal to price in the domestic market ($P_{x,D}$) (Marston 1990).

Where there are multiple foreign export markets, the relationship between the Law of One Price and exchange rate pass-through is much more definite than that found previously in Section 3.2. The Law of One Price in equation 3.6 can be restated in the relative form:

$$dP_{m,D}/P_{m,D} = dP_{m,N}/P_{m,N} = dE_1/E_1 + dP_{x,F1}/P_{x,F1} = dE_2/E_2 + dP_{x,F2}/P_{x,F2} \tag{3.9}$$

In this case, when an exchange rate, for example E_1, changes, the Law of One Price will only hold as long as the price received by exporters ($P_{x,F1}$) also changes by the full amount of the exchange rate variation (and moves in the opposite direction). That is, pass-through to destination-currency prices must be complete. Where an exporter sells to multiple markets, therefore, incomplete pass-through to any individual destination implies that the Law of One Price does not hold, and the global market must accordingly be segmented.

3.7.2 Modelling Pricing-to-Market

The existence of a segmented market also has implications for the nature of competition in the market. A producer in a perfectly competitive market cannot practice price discrimination because to do so would violate the assumption that price is always equal to marginal cost. A perfectly competitive market must therefore be integrated, and the simple elasticity approach to estimating pass-through cannot then be used to explain pricing-to-market. Models of pricing-to-market are accordingly based on imperfectly competitive structures where producers can exercise market power by charging prices above marginal cost, with a mark-up that may differ between customers. However, the reverse is not always true. The existence of imperfect competition does not necessarily imply that the market is segmented. If arbitrage is still possible, a producer may have market power, but not be able to practice price discrimination.

Most studies of pricing-to-market arising from variations in pass-through have adopted the approach of a profit-maximising firm with some degree of market power, selling across multiple markets. A widely cited model of pricing-to-market is derived from Hooper and Marquez (1993) and Knetter (1989, 1992a). They show that price in each destination market is the product of a destination-specific mark-up over a common marginal cost, with the mark-up determined by the price elasticity of demand in each market. Pass-through to destination currencies will be incomplete if a change in the exchange rate is not fully reflected in the import price. In this case; there must be a variation in either the mark-up, through a change in the price elasticity of demand, or in marginal cost, through a change in quantity or a change in input costs.

Knetter (1992a) and Hooper and Marquez (1993) demonstrate the effects of these changes in greater detail by deriving the coefficient for the pass-through of exchange rate changes to import prices. The term pricing-to-market therefore has generally been used in relation to the effects of changes in the price elasticity of demand.

For demand schedules less convex than the constant elasticity class, as in the case of linear demand curves, the price elasticity of demand increases in response to lower sales. A depreciation of the importer's currency, increases import prices and in turn reduces import demand. As price elasticity of demand increases in response, profit-maximising exporters will increase their prices less than otherwise, and pass-through will accordingly be lower. In this model, pass-through could even be greater than unity if the price elasticity of demand decreases in response to lower sales, as with demand curves that are more convex than the constant

elasticity case. Pricing-to-market, or different degrees of pass-through to different markets, is therefore seen as primarily a function of variations in the shape of demand curves in different markets.

3.7.3 Alternative Models of Pricing-to-Market

Several authors have confirmed and extended the conclusions of the basic monopoly model above by applications in other market structures and situations. Krugman (1986) and Knetter (1992a) re-examined the earlier Dornbusch (1987a) oligopoly models in a multi-market context. They found that the factors generating low degrees of pass-through in the models featuring strategic interaction could easily be generalised to indicate high degrees of pricing-to-market, that is, the tendency to maintain constant destination currency prices in divergent markets. In general, pricing-to-market is least likely, and pass-through greatest to all markets, when the industry as a whole is highly competitive, but dominated by foreign exporters. Furthermore, the conclusions of the pricing-to-market studies also confirm the Dornbusch (1987) result that the size of the price effect in the oligopoly models is very sensitive to the functional form of the demand curve.

However, as discussed above, the existence of an imperfectly competitive market does not necessarily imply that the market is segmented. Krugman (1986) argued that "pricing-to-market properly understood almost certainly involves both imperfect competition and dynamics". The presence of market-specific distribution costs, or demand-side reputation costs, could then provide the impetus for price discrimination by reducing the ability to transport the product easily across markets (Goldberg and Knetter 1997). The degree of pricing-to-market will therefore be dependent, as in the dynamic models, on the expected and actual duration of exchange rate changes.

Damania (1998) confirmed the conclusions of the earlier dynamic models in a study of the impact of exchange rate fluctuations in a duopoly where firms interact over an indefinite period of time, and therefore have an incentive to tacitly collude. In an infinitely repeated game, he showed that the *degree* and even the *sign* of pass-through depended on the expected duration of the exchange rate change, and the relative competitive strengths of the firms.

Other studies have further investigated the role of market share in pricing-to-market, under different market structures. Feenstra, Gagnon and Knetter (1993) modelled Bertrand

competition with differentiated products under monopolistic competition. Their result supported Dornbusch (1987) that pass-through should be high for exporters from a country with a very large share of total destination market sales. However, for small and intermediate market share, the relationship is potentially nonlinear, and sensitive, as before, to assumptions about consumer demand and firm interactions. Similarly, Yang (1997) showed that the effect of market share on pass-through in a Dixit-Stiglitz model could vary widely, and was very dependent on the specific interactions among firms in their pricing strategies. He found that the degree of product substitution could be significant, with pass-through generally high for highly differentiated products, but varying widely for highly substitutable goods at different market shares. Nevertheless, Yang (1997) also concluded that pass-through was incomplete because of non-constant price elasticities of demand.

In the past, most authors have concentrated on variations in mark-ups as the primary explanation of pricing-to-market. However, as the arguments of Knetter (1992a) and Hooper and Marquez (1993) above demonstrated, pricing-to-market can also arise from destination-specific variations in marginal cost. For example, a depreciation of the importer's currency, that is, a decline will increase import prices and in turn reduce import demand. If production takes place under decreasing returns to scale, exporter's unit costs may be reduced, so that import price can rise less than proportionally to the exchange rate, even though the mark-up has not varied. For variations in costs such as these to provide a basis for pricing-to-market, however, the major part of the cost change must be linked to sales to a particular market or markets.

Several recent studies have accordingly focussed on models that incorporate varying costs between destination markets. Faruqee (1995) used a varying cost model to study pricing-to-market across different patterns of trade. He concluded that under two-way intra-industry trade, prices exhibit lower pass-through and greater destination specific adjustment compared to intersectoral trade. More localised effects were modelled by Gron and Swenson (1996), who studied the effects of local production by firms who produce in multiple locations. They found that firms producing simultaneously in more than one country pass-through a smaller proportion of exchange rate-generated cost shocks. Gron and Swenson (1996) suggested that this might be due to the greater flexibility possessed by these firms, so that they could avoid cost increases by shifting production.

Overall, the pricing-to-market studies confirm and combine the conclusions of the earlier static and dynamic models. As with all the imperfectly complete models, pricing-to-market occurs because pass-through is generally incomplete in the longer-term. In addition, the size of the effects is dependent on industry-specific functional forms of demand and cost curves, as in the static models. However, the added importance of destination-specific variations in both demand and costs factors, more in keeping with the dynamic models, suggests that the duration and exact nature of the exchange rate change may be of more importance in pricing-to-market in a segmented market, than is expected in an integrated market.

3.8 Institutional Factors

Incomplete pass-through in an industry with an imperfectly competitive structure results from the ability of exporters to charge prices at a mark-up above marginal costs. Consequently, any market imperfection that allows pricing above marginal cost for prolonged periods is likely to give rise to long term deviations from complete pass- through. Recent theoretical literature has drawn attention to the institutional framework faced by importers, as an important consideration in the search for explanations for incomplete pass-through in the long-run. Market imperfections such as tariffs may be imposed on imports, as in the barriers to international trade set up by governments of importing countries.

The failure of United States Dollar (USD) import prices to respond to the significant depreciation of the mid-1980s, which sparked interest in pricing-to-market, also prompted another strain of research on the pass-through issue. Bhagwati (1988) and Branson (1989) suggested that government trade policies, through non-tariff barriers (NTBs) and quantitative restrictions (QRs), could play a major role in limiting the effects of exchange rate changes on destination currency prices.

In markets where import quantities are restricted, importers effectively face a supply curve that becomes vertical, or perfectly inelastic, at the quantity at which the import restraint is imposed. If exporters are already filling quotas and therefore have no capacity to sell larger volumes, they also have no incentive to lower prices when their exchange rate depreciates. Pass-through will accordingly be zero, and exporters will simply absorb the exchange rate change into increased profit margins. Marston (1990) and Knetter (1992a) claimed that even the threat of

provoking trade restrictions, such as anti-dumping legislation, may be enough to limit the degree of pass-through by exporters whose currency is depreciating.

Similarly, if the current price was the maximum the market would bear for the restricted quantity, as would be expected from a profit-maximising exporter, the effects of a small appreciation would be absorbed in the import premium, so that pass-through would again be zero. It is only when the exchange rate appreciation is sufficiently large to overtake the premium that pass-through and import prices, will rise, and be subject to the same market conditions as would normally apply. An asymmetry in pass-through would then result, as the price response to depreciations remains zero at all levels.

Exchange rate changes have no effects as long as they fluctuate within a set range, the width of which in the dynamic models is determined by the size of entry and exit costs. Here the width of the range depends on the level of the import premium, which in turn derives from the volume of restricted imports relative to the potential quantity of unrestricted imports. There are, however, some significant differences. Although the presence of NTBs indicates an incomplete, and asymmetric, pass-through response, the effects do not depend on a particular market structure, and can occur even in perfectly competitive markets. The imposition of trade barriers can accordingly provide a simpler, more broadly-based, explanation for a structural break in the pass-through relationship than that suggested by the dynamic hysteresis models.

Price discrimination between markets by exporters, as in pricing-to-market, can be also explained simply by limitations to pass-through due to the presence of NTBs in individual markets in varying degrees of severity (Knetter 1992a). Moreover, differential rates of pass-through between exporters in the same industry and market can occur where trade barriers are selectively imposed. For example, Branson (1989) pointed out that a break in the pass-through coefficient could reasonably be expected in the early 1980s for exports to the USA from the largest exporters, but not in those from developing countries.

Alston *et al* (1992) noted the particular importance of trade distorting policies for agricultural products, but presented a contrasting view of their impact on pass-through. Even for products for which pass-through effects are zero because of prohibitive trade barriers, they argued that "there may be some indirect exchange rate pass-through effects arising from trade in factors or trade in competing products". If the goods subject to trade restriction have relatively low price elasticities of demand, as was considered likely, movements in the prices of inputs or

competing products can even lead to higher degrees of pass-through than found for other goods. Alston *et al* (1992) concluded that trade barriers may therefore have ambiguous effects on the pass-through of exchange rate changes. Furthermore, they argued that any government policies that altered production and market conditions had the potential to influence pass-through, particularly those that altered price elasticities.

Over time, the theoretical literature on exchange rate pass-through has progressed from attempts to explain the lack of macroeconomic adjustment in terms of simple elasticities, to complex microeconomic models incorporating differences over time, and location. However, the more complex models still feature, as their primary explanatory variables, characteristics of market structure and strategic interaction first suggested in the earlier studies. The emphasis on variations in market structure and strategic interaction as the dominant theme in most theoretical models highlights the importance of empirical estimations of pass-through, both in disaggregated industries where such influences are more clearly observable, and in the aggregate, where the complexity of possible effects can lead only to very broadly based and possibly inaccurate predictions.

3.9   Review of the Empirical Literature

Having provided the theoretical background underlying pass-through, we now proceed to examine the empirical evidence on exchange rate pass-through that emerged concurrently with the theoretical literature. A popular approach in the empirical literature was, and still is, to estimate variants of what may be termed a "pass-through regression". The pass-through regression is a regression of a price index (most commonly, an import price or an export price index) on the nominal exchange rate and other hypothesised determinants of prices. Exchange rate pass-through is usually defined as the (partial) elasticity of prices with respect to the exchange rate (or, in dynamic models, as the accumulated responses of prices to an exchange rate change), keeping other determinants of prices fixed. The degree of pass-through has come into limelight not just for its implication on international trade but also because import price adjustment is germane for both small and large open economies in analyzing the impact of exchange rate changes on balance of payments, trade balance and the rates of inflation. When pass-through is complete, total fluctuations in the exchange rate are reflected in the domestic import prices. However, if the domestic import prices remain stable, it is the mark-up that has to

adjust to exchange rate movements. In other words, incomplete pass-through portends that only some of the depreciation is passed to higher domestic price of imports. The exporter has to absorb the remnant so as to retain its market share in the destination market.

Influenced by the micro-based theoretical literature, a number of studies tested for pricing-to-market using industry-level data (see e.g., Knetter, 1989; Marston, 1990; Knetter, 1993). The findings in these studies are twofold. First, there is substantial evidence that exporters adjust their mark-ups in response to exchange rate changes in order to stabilise destination-currency import prices. Second, the degree of pricing-to-market varies significantly across industries, suggesting that industry structure is a critical dimension for understanding the exchange rate pass-through process. In the studies surveyed by Goldberg and Knetter (1997), the median pass-through to import prices of manufactures over the one-year horizon is around 0.5. This implies the existence of incomplete pass-through in the sector. Another empirical regularity is that the exchange rate pass-through is gradual: pass-through is higher in the long-run than in the short-run. These findings are confirmed in a more recent study by Campa and Goldberg (2005) who estimated pass-through regressions for 23 OECD countries over the period 1975-2003. The (unweighted) average of pass-through elasticities to import prices of manufactures is 0.46 over three months and approximately 0.64 over the longer run. Findings from the empirical literature revealed that cases of incomplete pass-through are common phenomenon in most countries.

Evidence of incomplete pass-through abounds in studies by Lattimore (1988), Phillips (1988), Menon (1993a and b, 1995, 1996) for Australia; Moreno (1989) for Taiwan and Korea, Athukorala (1991) for Korea; Athukorala and Menon (1994) and Alexius (1997) for Sweden, Faruqee (2006) for Euro area while studies by Kenny and McGettigan (1996) for Ireland and Kikuchi and Sumner (2002) for Japan found complete pass-through. The bulk of the country specific empirical studies reviewed (Hyder and Shah (2004) for Pakistan, Rowland (2003) for Colombia, Acheampong (2005) study for Ghana, Mwase (2006) for Tanzania, Leigh and Rossi (2002) for Turkey, Bhundia (2002) for South Africa, Stulz (2006) for Switzerland, Kiptui *et al* (2005) for Kenya, Khundrakpam (2007) for India, and Oladipo (2007) for Nigeria) focused on the extent of exchange rate pass-through to domestic prices (import prices, producer prices and consumer prices). The results revealed incomplete pass-through in most of the studies, thus, confirming the wide spread of incomplete pass-through even for small open economies. Also, the

degree of pass-through seems to be quite different across countries and products but a close observation revealed that different results for a country, especially for the United States and others, stem primarily from the use of different methodologies, model specifications and variable selections rather than from different time periods studied and products.

To reinforce the above-mentioned contention, one strand of the literature tests for pricing-to-market within a cointegration framework. The literature has focused on testing a particular implication of many pricing-to-market models, namely that the price of import-competing goods enters the exporting firm's pricing equation. The long-run exchange rate pass-through is defined as the coefficient on the exchange rate in a long-run import price equation, and a significant coefficient on domestic prices in the long-run price equation is interpreted as evidence of long-run pricing-to-market. Using this approach, several studies found evidence of long-run pricing-to-market, even in small open economies (see e.g., Menon, 1995b; Naug and Nymoen, 1996; Herzberg *et al*., 2003; Kongsted, 2003).

Most of the pass-through literature has focused on traded goods prices such as import or export prices. Recently, a number of studies have estimated pass-through regressions with aggregate consumer prices as the dependent variable. The main finding in this literature is that the exchange rate pass-through to consumer prices is numerically small. An example of such studies is Gagnon and Ihrig (2004), which covers 20 industrial countries over the period 1971–2003. They found that countries with low and stable inflation rates tend to have low estimated rates of pass-through to consumer prices. In a similar vein, Choudhri and Hakura (2006) estimated the exchange rate pass-through to consumer price inflation for 71 countries over the period 1979–2000. The average pass-through elasticity for the set of countries classified as low inflation countries is 0.04 in the first quarter, 0.14 after four quarters and 0.16 after twenty quarters. The averages mark the fact that several countries have negative short-run pass-through elasticities. Making comparisons of regimes across countries and across time, the authors found evidence of a significant and positive relationship between pass-through and average inflation.

The issue of whether the exchange rate pass-through has declined since the 1980s has been much debated in the recent literature. Campa and Goldberg (2005) found evidence that a shift in the commodity composition of manufactured imports contributed to a fall in the pass-through to aggregate import prices in many countries in the 1990s. Marazzi *et al*. (2005) document a significant decline in the pass-through to U.S. import prices. As possible

explanations they point to changes in the composition of imports, the increasing market shares of Chinese imports and changes in the pricing behaviour of Asian firms in the wake of the Asian financial crisis in 1997-98.

3.9.1   Exchange Rate Pass-through Degree and Dynamics

A clear point from the reviewed studies is that incomplete pass-through is a convincing phenomenon across a broad range of countries and industries (Menon 1995). However, a number of studies have found full pass-through for certain countries and industries, such as Faruqee (2004), Kenny and McGettigan (1998), among others. The extent of adjustment lags in ERPT as found by most studies varies across the countries and industries; as well as different studies for the same country and industry. This consequently turns to varying degrees of incomplete ERPT across the countries and industries. In view of this, several studies , such as Hooper and Mann (1989) and Baldwin (1988) in their studies on USA import prices, concluded that the change in the exchange rate had less of an impact than had been expected based on past experience. Estimates of the import pass-through parameter vary from 50 to 100 percent. Several explanations have been offered for the smaller than expected import pass-through rate. One, suggested by Parsley (1993), is that there has been an aggregation bias in the construction of an aggregate pass-through value, and that if properly constructed, the estimate would be larger. The most frequent hypothesis, Baldwin (1988), attributed the mystery to the hysteresis effect that the pass-through relationship changed permanently as a result of the sharp appreciation earlier in the decade. Melick (1990), however, after performing a series of stability tests, disputed this notion, arguing that these aggregate models are subject to misspecification. Other studies on the speed and magnitude of ERPT include Woo (1984), Feinberg (1989), Goldberg and Knetter (1997), Kim (1998), Gagnon and Ihrig (2001), Campa and Goldberg (2002), and Campa *et al*. (2005), to mention a few. Menon (1995) conducted a comprehensive survey of some 43 empirical studies on exchange rate pass-through in both industrialised and developing countries. The majority of the surveyed studies focus on the USA. Other studies, such as those by Rabanal and Schwartz (2001), Leigh and Rossi (2002), Kiptui *et al*. (2005) and Oladipo (2007) investigated ERPT in emerging and developing countries.

3.9.2 Exchange Rate Pass-through across Products and Countries

At the micro level, there are significant differences in the rate of pass-through across industries. This is quite clear from the multi-industry study, such as Yang (1997), Campa and Goldberg (2005), etc. At the macro level, pass-through rates also vary a lot from country to country. For example, Choudhri, Faruqee and Hakura (2005) found that pass-through ranges from a low 0.47 for Czech Republic to full pass-through in Slovenia. In addition, results from some of the multi-country studies provide conflicting signals with regard to some theoretically widely-accepted relationships. For example, McCarthy (1999) found that pass-through tends to be inversely correlated with the size of the country, while Hung, Kim and Ohno (1993) and Campa and Goldberg (2005) hardly found any relationship between pass-through and the country size. In addition, ERPT estimates across countries are significantly different and at times conflicting. For example, Kreinin (1977)[18] reported that ERPT estimates range from 50 percent for the USA to complete pass-through for Italy, while Khosla and Teranishi (1989) found pass-through to be almost complete in the USA and other larger economies, and incomplete for smaller open economies.

The comparative analysis of estimates of exchange rate pass-through across countries reveals that the estimates are usually larger for emerging and developing countries relative to the developed countries. Reginaldo (2006) revealed evidence on the exchange rate pass-through for a set of emerging and developed economies before and after the adoption of inflation targeting using autoregressive distributed lag (ARDL) model. The results support the view of previous literature that the pass-through is higher for emerging than for developed economies, and that it has decreased after the adoption of Inflation Targeting. The importance of the use of dynamic models in the inflation-depreciation relationship is highlighted in the results. In addition, the important role of foreign producer costs for the import pricing behaviour in developed economies, and of inflation stability in emerging markets also came into limelight. In contrast, however, Ca'Zorzi, Hahn and Sánchez (2007) examine the degree of exchange rate pass-through in prices in 12 emerging markets in Asia, Latin America, and Central and Eastern Europe using 3 alternative VAR models. The results contradicted the conventional wisdom that exchange rate pass through is higher in emerging countries than in developed countries. The results however confirmed Taylor's (2000) hypothesis once the outlier countries are excluded from the analysis.

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[18] As reported in Menon (1995).

The estimates of exchange rate pass-through across products have also been documented in the literature. An example is Otani, Shiratsuka, and Shirota (2003) who estimated exchange rate pass-through in food, raw materials, fuels, chemicals, textiles, metals and machinery products in Japan and found declining pass-through estimates across the products, though, some long-run estimates were found to be larger than 1, e.g. for food and raw materials. They opined that the general decline in ERPT was not as a result of shifting composition of imports away from high ERPT sectors into lower ERPT sectors. Campa and Goldberg (2005) estimated ERPT to import prices in 23 OECD countries both at the aggregate and at a broadly disaggregated level. They examined food, six manufacturing, energy, raw materials and non-manufacturing imports and found evidence of partial ERPT in the short run, particularly in the food and manufacturing sectors. Their inference is the contrast of Otani *et al*. They concluded that the discussed decline in ERPT observed in OECD countries since the 1980-90s is more due to a shift in the composition of imports away from high ERPT sectors like energy into lower ERPT sectors like manufacturing and food.

In addition, Rincon, Caicedo and Rodríguez (2005) examined exchange rate pass-through to disaggregated manufacturing imports covering the period 1995:1 to 2002:11 using error correction models, fixed and time-varying parameters, and Kalman filter technique in a mark-up framework. Their findings is that the long-run pass-through elasticities for the industries in the sample are stable and go from 0.1 to 0.8 and the short-run ones are unstable and go from 0.1 to 0.7, supporting mark-up hypotheses, in contrast to the hypotheses of perfect market competition and complete pass-through in Colombia. The results also showed evidence of the variability and different degrees of pass-through among manufacturing sectors, which confirm the importance of using dynamic models and disaggregated data for an analysis of pass-through. The findings did not support the hypothesis that low pass-through is predominant in both floating regime and low inflationary environment thereby failing to support Taylor's (2000) hypothesis, which states that there will be a decline in pass-through or in the pricing power that firms have in low inflation environments.

In Nigeria, Oladipo (2007) examined exchange rate pass through for Nigeria imports using a Johansen cointegration technique to a sectoral data between 1970 and 2004. He used the mark-up approach which sets export prices as a mark up on production costs. He found incomplete pass through at varying degree across sectors implying that foreign exporters passed

on only a part of the increase in their cost of production to import prices. He found that in the long run, pass-through was much larger than in the short run. The degree of pass-through for food and beverage sector (sector 12) was 0.884 percent, while pass-through for chemical and rubber products (sector 65); paper and paper products (sector 64); textile, wearing apparel and leather (sector 65); iron and steel bars (sector 67); fabricated metals, machinery and equipment (sector 74); and wood and wood products (sector 82), were 0.711, 0.568, 0.790, 0.655, 0.594, and 0.719 respectively. He found that exchange rate shocks have a positive effect on import prices, implying that depreciation increases import prices. For food and beverage sector, in the short run, 1% depreciation led to 0.88% increase in import prices, so that one could say that most of the exchange rate shocks were passed on to import prices. He also noted that approximately 6 percent of previous disequilibrium was corrected each quarter in the case of textile sector import unit values, while in the case of sector 64 about 2 percent of past disequilibrium was eliminated each quarter. Notably, the speed of adjustment was higher in the case of sector 65 (textile, wearing apparel and leather) and 74 (fabricated metal products, machinery and equipment). This signified the role played by incomplete pass-through especially in the short run in each of these sectors. He further suggested that the incomplete exchange rate pass-through were likely to lead to smaller real effects on the economy through lower changes in both the terms of trade and import volumes and finally to inflation (or deflation) effect of exchange rate depreciation (or appreciation) operating through changes in the prices of imported goods.

3.9.3 Asymmetric Exchange Rate Pass-through

The standard assumption in the empirical literature on exchange rate pass-through is that the degree of pass-through is both linear and symmetric, implying that large and small exchange rate changes and appreciations and depreciations have proportionally an effect of the same magnitude. This assumption has been tested in some empirical studies and the results have been mixed. The more researched of the two asymmetric ERPTs is the direction of the change in the exchange rate, that is, appreciation versus depreciation. While some authors (Mann, 1986 and Feinberg, 1989 for the USA, and Athukorala, 1991 for Korea) failed to find significant asymmetry, others (Ohno, 1989, Marston, 1990 and Wickremasignghe and Silvapulle, 2004 for Japan) found evidence of significant asymmetry. Ohno's (1989) findings supported the binding quantity constraint model of ERPT asymmetry, whereas Marston (1990) findings supported the

market share model as well as the production switching model. Similarly, Goldberg (1995) and Kadiyali (1997), who investigated ERPT asymmetry in a single USA industry, found significant asymmetry. Both studies reported that ERPT was higher when the dollar depreciated, a finding consistent with the binding quantity constraint theory. Likewise, Webber (2000), using aggregate trade data, found significant support for asymmetric ERPT to import prices in five of seven Asian countries. The findings also suggested that ERPT was larger when the importing country's currency depreciated than when it appreciated, supporting the binding quantity constraint model of asymmetric pass-through. Studies on ERPT with respect to size of change are quite scanty. One such study is Pollard and Coughlin (2004) which, in addition to investigating the magnitude and direction of ERPT, also analysed the size effect of a change in exchange rate. The authors found significant size effects on ERPT, with the pass-through significantly greater when there were large changes in exchange rates. This led the authors to contend that menu costs behaviour matters in determining ERPT. Bussière (2007) also examined the linear and symmetric assumptions for export and import prices in the G7 economies[19], focusing on non-linearities in the reaction of profit margins to nominal exchange rate changes and found that non-linearities and asymmetries cannot be neglected, especially on the export side, even though their magnitude varied noticeably across countries. This reaffirms the mixed and inconclusive results from the literature.

The most noticeable methodological feature of the empirical literature is the development of the techniques used to estimate pass-through. The methodology to model the pass-through to domestic prices can be broadly divided into four categories: single equation econometric methods, Vector Autoregressive (VAR) models, structural macro econometric models, and Dynamic Stochastic General Equilibrium (DSGE) otherwise called the New Open Economy Macroeconomics (NOEM) models. Most studies using single equation econometric methods estimate the pass-through with aggregated data. Some utilized the Vector error correction (VEC) approach to capture the dynamic response of prices to exchange rate movements under the assumption of cointegration.

The evolution of these models emanated from the studies that were primarily interested in confirming the existence of less than complete pass-through, measured by simple comparisons of percentage changes in export or import prices and exchange rates. An example of such studies is

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[19] Group of seven leading industrial nations, now G8.

Kreinin (1977). Subsequent researchers like Helkie and Hooper (1986), and Mann (1989) turned to standard least squares regression techniques, using principally ordinary least squares (OLS). Studies that employed OLS technique were criticized by Menon (1995) for not properly taking into account the time series properties, e.g. the non-stationary nature of the data. A considerable body of literature suggested that a large number of macroeconomic series and asset prices such as exchange rates were non-stationary. He pointed out that there were some recent empirical studies on ERPT that tried to improve the deficiencies of earlier identified studies. One of those studies was Kim (1998), who estimated ERPT for the USA using cointegration analysis and a vector error correction model (VECM). His paper related producer price inflation in the US to the trade weighted effective exchange rate, money supply, aggregate income and interest rates. He found that the exchange rate contributed significantly to producer price, which was supported by subsequent studies. In the same vein, Kenny and McGettigan (1998) also used cointegration analysis and vector error correction models to study ERPT for Ireland. When their results were compared with previous studies they found that the degree of pass-through in their study was higher. Their main criticism of earlier studies was the neglect of the time-series properties of the data, particularly non-stationarity.

As an alternative to pass-through regressions, structural vector autoregressions (SVAR) have become increasingly popular as a method to estimate the exchange rate pass-through (e.g., McCarthy, 2000; Hahn, 2003; Choudhri *et al*., 2005; Faruqee, 2006). A comprehensive study by McCarthy (2000), investigated ERPT on the aggregate level for selected industrialized economies. He estimated a VAR model for the period 1976-1998 over the whole distribution chain (import, producer and consumer prices). This is a pioneer work that incorporates a recursive distribution chain of pricing into a VAR model. This gave him advantages when compared to previous single-equation methods. First, it solves endogeniety problem inherent in the single-equation-based methods. Second, it allows us to incorporate prices along the distribution chain in a unifying model, while the previous studies typically focus on ERPT to domestic prices of imports. Even when some papers study the pass-through to both import prices and consumer prices; they do so in separate models. By investigating ERPT to a set of prices along the pricing chain, the VAR analysis characterizes not only absolute but relative pass-through in up-streaming and down-streaming prices. Third, estimated impulse response functions trace the effects of a shock to one endogenous variable on other variables through the structure of

VAR. This allows us to assess not only pass-through within a specific time period, but also its dynamics through time. So the impulse response functions are convenient measures of the degree and speed of pass-through parameters.

In terms of methodology, structural VAR method is most common in the literature, of which McCarthy (2000) is a very notable study[20]. Pass-through there is measured by means of impulse responses of different price series to an identified structural exchange rate shock. The problem with this approach is that it is not entirely consistent with the simplest notion of pass-through: the co-movement between the exchange rate and prices can be caused by any type of shock. In principle this would imply that we could observe as many measures of pass-through as there are identified structural shocks. Campa and Goldberg (2002) for this reason estimated a simple single-equation model for OECD countries and measure the pass-through effect (to import prices in their case) with nominal exchange rate coefficient.

A different use of SVAR analysis is found in Choudhri, Faruqee, and Hakura (2002). They empirically observed impulse responses of various price indexes to an exchange rate shock. These are used not to measure pass-through effect directly but as a benchmark for simulated responses obtained from calibrated theoretical model under different assumptions about nominal rigidities in the economy. A motivation for using the structural VAR approach is that it takes explicit account of the endogeneity of the exchange rate and permits the estimation of pass-through to a set of prices, such as import prices, producer prices and consumer prices, simultaneously. Another motivation is that structural VARs can be a useful tool to evaluate and estimate Dynamic Stochastic General Equilibrium models as applied by Rotemberg and Woodford (1997) and Chistiano *et al.* (2005).

The VARs used to estimate the degree of exchange rate pass-through typically include a nominal exchange rate, one or several price indices (typically, import prices, producer prices and consumer prices) and sometimes additional variables such as oil prices, a measure of the output gap, wages and interest rates. Recognising that the co-movement between prices and the exchange rate depends on the source of the shock, most studies define the exchange rate pass-through as the impulse responses of prices to a particular shock, namely an exogenous exchange

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[20] Some of the studies that have used VAR approach to estimate pass-through are: Hyder and Shah (2004) for Pakistan, Rowland (2003) for Colombia, Acheampong (2005) study for Ghana, Mwase (2006) for Tanzania, Leigh and Rossi (2002) for Turkey, Bhundia (2002) for South Africa, Stulz (2006) for Switzerland, Kiptui *et al* (2005) for Kenya, Khundrakpam (2007) for India amongst others.

rate shock. The findings in the structural VAR literature can be summarised as follows. First, the exchange rate pass-through is incomplete, even in the long-run. Second, the size and speed of pass-through decline along the distribution chain: import prices respond stronger and faster to exchange rate shocks than producer-and consumer prices. Finally, consumer prices are largely unresponsive to exchange rate shocks.

A common drawback of all SVAR-based studies is that they do not account explicitly for the possibility of cointegration. Price series are commonly integrated at least of order one, which calls for an explicit test for cointegration. From an economic point of view, neglecting cointegration is very surprising since theoretically long-run co-movement of prices and exchange rate seems very plausible. Neglecting cointegration when it is genuinely present, leads to neglecting the intrinsic meaning of equilibrium long-run relationship between the nominal exchange rate and prices. Identifying long-run equilibrium relations and analyzing the adjustment to disequilibria allows us to evaluate some important theoretical aspects of New Keynesian models.

The analysis of Coricelli, Jazbec, and Masten (2003) addressed the flaws of the existing studies of pass-through in a number of ways. First, the analysis is conducted within the framework of cointegrated vector auto regression model (CVAR). The study is not the first in this respect, since it is found earlier in Kim (1998) and Billmeier and Bonato (2002). However, the estimates presented in these two studies do not comply with definition of exchange rate pass-through, which means that in their case the pass-through is not identified. Second, the pass-through effect is estimated without relying on the identification of structural shocks. These can be identified using non-testable restrictions, which are very often imposed arbitrarily and in high-dimensional systems even with weak theoretical justification. Moreover, the procedure used in the paper directly distinguishes between permanent and transitory shocks. For the analysis of pass-through this is a very important distinction, since only permanent exchange rate shocks can have a non-zero equilibrium pass-through effect and hence cause a different change in pricing behaviour of economic agents. In particular, it is unlikely that transitory exchange rate shocks induce significant short-run changes in pricing behaviour if firms face costs associated with frequent price changes. If the analysis is to be used for policy applications, especially disinflation policies, and the choice of exchange rate regime tracing the effects of permanent shocks only become even more crucial.

Despite the plethora literature on exchange rate pass-through, very few studies can be found in the case of Nigeria. These are: Batini (2004), Barhoumi (2005), and Oladipo (2007). In his study, Batini (2004) quantified the importance of pass-through and the impact of external shocks in a subgroup of emerging market economies committed to price stability under a flexible exchange rate regime and compared to the Nigerian case using a VAR approach and variance error decomposition on a quarterly data over the period 1990:1 to 2002:4. The result showed that around 90% of Nigerian inflation is explained by exchange rate between 8 and 12 months. The result suggested that inflation may be highly influenced by fluctuations in the international value of the naira as these translate directly onto consumer price changes. He pointed out that it may be harder to control inflation in Nigeria relative to other countries with low pass-through. Barhoumi (2005) investigated the exchange rate pass-through into import prices in a sample of 24 developing countries (including Nigeria) over the period from 1980 to 2003 using non-stationary panel estimation techniques and test for cointegration. The result for Nigeria showed transmission of between 0.45 and 0.64 to import price from a percent change in exchange rate. While the other two studies have examined pass-through at the aggregate level, Oladipo estimated a detailed exchange rate pass-through at disaggregated import price level. Detailed summary of the literature is provided below in Table 3.1.

Taking a brief overview of the studies, the literature has demonstrated the various attempts developed to explain the lack of macroeconomics adjustment from simple to more complex models. One important conclusion obtainable from the review is that virtually all the models have common variables as determinants of either domestic price or import price. Certainly, the market structure and prevailing macroeconomic environment go a long way in determining the suitability of these models to any economy. In general, the literature suggests that pass-through to destination currency prices will be higher in more competitive markets, with more homogenous products, or where foreign exporters dominate a particular market. Conversely, pass-through will be lower in imperfectly competitive markets, where strategic interactions due to product differentiation or oligopoly will provide the most important influence on pricing. Furthermore, the pass-through relationship may not be continuous over time if markets have significant entry costs, or institutional barriers to trade exist, and may even differ between markets when destination-specific demand or cost factors arise. Finally, any assessment of pass-through using partial-equilibrium models must be placed in the context of the prevailing

macroeconomic environment, and allowance made for any potential endogeneity or feedback effects between real and financial variables.

The consideration of the underlying assumptions of the reviewed models is imperative in the choice of our model as it relates to Nigeria. Nigeria is considered a small open economy with high dependence on imports and high level of market distortions. Thus, the model, which relaxes the strict adherence to the basic assumption of Law of One Price, is considered. In addition, the model recognizes and accommodates the existence of market distortions and other features of imperfect competition. The model that fits into this description is the Pricing to Market model, which is in the spirit of deviation from the Law of One Price. This study also considers the influence of tariff rate on price changes in our import price equation. The specification of the theoretical model has led to the development of different empirical models to capture the influence of the main ingredients of price changes. The widely used "mark-up" model may not be well suited for the Nigerian case. The model is developed from the exporters' point of view and related to the importers via the exchange rate. Modeling pass-through equation for the importer should not involve the marginal cost or the foreign price level of the exporters but rather, the given international market price. The importers are not concerned on how the export price is derived. The NOEM model requires strict adherence to its underlying assumption of Law of One price to hold, which in the Nigerian context, is not attainable.

In contributing to the current policy debate, this study covered a 2-digit HS disaggregation which provides a more detailed analysis over Oladipo's SITC based disaggregation thereby providing an avenue for international comparison of the products. This study also incorporated the influence of tariff policy in the analysis. It is done through the use of tariff as a control variable in the estimation of the extent of exchange rate pass-through to prices in Nigeria. Most of the earlier studies reviewed have focused mainly on the effect exchange rate movements on prices without considering other sources of price changes.

Table 3.1: Summary of Literature Review

Study	Coverage	Model	Method	Main Findings
Kreinin (1977)	USA, Germany, Japan, Canada, Belgium, Italy, Austria, Switzerland: import and export (1970-1972) annual and aggregate.	Elasticity analysis	"Control country" approach: actual price change relative to hypothetical change from control countries.	Pass-through varies by country and direction of trade, larger for export from and smaller for imports to large countries.
Baldwin (1988)	USA: imports (1975:1-1987:1) quarterly aggregate (non-oil)	Supply-side hysterisis	2SLS with 5-quarterly lag	Shows structural breaks during period of USD appreciation predicted by beachhead model rather than at turning point.
Hooper and Mann (1989)	USA: imports (1973:1-1988:2) quarterly manufacturing	Mark-up	OLS in log form	Short and long run pass through-20% and 50-60% respectively. Significant break found in 1982, thus choice of data is important.
Feenstra (1989)	USA.: Import price of Japanese cars, trucks and heavy motorcycles(1974:1-1987:1)	Mark-up: Profit maximization under Imperfect competition model.	OLS in log form	Import pass-through can be complete when mark-up and marginal cost of a firm are constant
Kim (1990)	USA: imports (1968:1-1986:4) quarterly aggregate (non-oil)	Mark-up	OLS estimation of ECM in log form and Kalman filter technique	No strong evidence that direct effect of exchange rate changes on import prices declined in 1980s, but correlation between exchange rate and foreign costs rose, explaining why US import prices became less sensitive to changes in exchange rate.
Gagnon and Knetter (1992)	USA, Germany, Japan: Export (1973/75-1987) annual several engine size categories of automobile	Mark-up/PTM	Gauss-Newton (Maximum likelihood) procedure	Pass-through is virtually complete for US exporters, with no price discrimination.
Hung, Kim and Ohno (1993)	Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Korea, Netherlands, Norway, Sweden, Switzerland, Taiwan, UK, USA: Export (1970:1-1989:4) quarterly aggregate.	Mark-up	Engle-Granger and Johansen Cointegration	Pass-through varies between countries with USA being nearly complete while Japan and Germany are lower. Competitors prices influence is prominent .There is no correlation size of country and extent of export price adjustment
Ahmad and Muzafar (1993)	Malaysia : exports (1985:1-1992:2) monthly rubber, palm oil, cocoa, Timber	Derivation from Law of One Price Relationship	OLS on log variables	Pass-through is incomplete but differed across commodities, though stable over the period.
Athukorala and Menon (1994)	Japan : exports (1980:1-1992:1) quarterly total manufactures and 7 disaggregated industries	Mark-up, with cost of intermediate inputs modeled in separate equation	Cointegration: Johansen and Engle-Granger methods	Incomplete pass-through varied across industries. No evidence of asymmetry found during the period.
Menon (1995)	Australia :Aggregate manufactures(1981:1992)	Mark-up	Johansen cointegration	66% incomplete pass-through
Kenny and MacGettigan (1996)	Irish: imports price(1963-1995)	Mark-up pricing	Johansen cointegration technique	There is existence of incomplete pass-through
Lee (1997)	Korea : Imports (1980:1-1990:4) quarterly 24 manufacturing industries	Mark-up, including domestic	Fixed effect estimation	Incomplete pass-through in all industries , market concentration reduce the pass-through in all

		market concentration		industries.
Yang (1997)	USA: 87 manufacturing industries (1980:4-1991:4) quarterly	Mark-up	Weighted Least Square (WLS)	Pass-through varies across industries, showing mostly incomplete pass-through. Product differentiation being highly influencial.
Hänninen (1998)	Finland: Exports in UK (1978-1994) sawnwood quarter	Mark-up pricing, including export demand and price equations.	Johansen cointegration	Large pass-through estimate. Sawnwood price in pounds has lowered as a result of depreciation of Finnish markka
Goldfajn and Werlang (2000)	71 countries: Inflation (1980-1998)	Mark-up pricing	Panel estimation	Europe, Africa and Oceania have lower pass-through than Asia and America. Pass-through is substantially lower in OECD countries relative to emerging economies. Prices in emerging economies are more sensitive to depreciations.
Garcia and Restrepo (2001)	Chile: Price inflation (1986:1-2001:1) quarterly	Price equation based on imperfect competition.	Linear quadratic adjustment cost(LQAC)	Exchange rate depends on positively on economic activity (output gap) explaining the low pass-through. Thus, negative output has compensated the inflationary impact of exchange rate depreciation; productivity reduces unit labour costs and inflation; wages and foreign prices are positively related to inflation; expected inflation acceleration is significant.
Bhundia (2002)	South Africa: consumer prices (1976:2-2000:3)	Agnostic approach on a distributive chain of prices	Recursive VAR approach	Inflationary impact of exchange rate changes is absorbed at intermediate stages and is important in explaining relative price fluctuations.
Leigh and Rossi (2002)	Turkey :Domestic prices (1994:Jan-2002:Apr) monthly aggregate	System of equations	Recursive VAR with impulse-response functions	Pass-through to prices fade out after a year but mostly felt in the first four months; more pronounced in wholesale price compared with consumer prices; pass-through estimate is shorter and larger than that of emerging markets.
Kiptui, Ndolo andKaminchia (2005)	Kenya: Importsand Inflation (1972-2003) annual	Mark-up	VAR approach involving cointegration andECM model	71%-incomplete pass-through to import price; exchange rate and import prices have positive effect on consumer prices with exchange rate explaining 46% of the variation in consumer prices.
Barhoumi (2005)	24 developing countries: imports (1980-2003) annual	Mark-up	Non-stationary panel estimation and cointegration	Differences in pass-through in the developing countries are due to exchange rate regimes, trade distortions and inflation regime. Countries with fixed exchange rate andlower tariff barriers exhibit a higher pass-through than those with higher tariff barriers, floating exchange rate and lower inflation regime

Oladipo (2007)	Nigeria: Imports (1970:1-2001:4) quarterly aggregateand sectoral level.	Mark-up pricing	Johansen cointegration technique	Incomplete pass-through found at aggregate and all sectors. Some sectors have faster speed of adjustment than others, indicating their importances to the economy. The result confirms the outcome of other studies on small open economies.
Slavov (2007)	101 countries: inflation (1976-2006) annual aggregate	Mark-up pricing	Panel estimation	Pass-through decline in countries sharing common currency
Marazzi and Sheets (2007)	USA: Imports (1972:4-2004:4) quarterly disaggregated	Mark-up pricing/PTM	Rolling regression with a fixed 10-year window	Pass-through has declined greatly over the past decade to 20%. Reduced share of material-intensive goods explains a fraction of the fall in aggregate pass-through; Foreign exporters set their prices in line with behaviour of U.S. domestic prices, consistent with PTM. The decline in pass-through is attribute dto global development in transport, reduction in trade barriers, and improved macroeconomic policies.
Mallick and Marques (2007)	India: Imports (1990-2001) 38 disaggregated 2-digit SITC sectors.	PTM	Panel estimation	Incomplete pass-through of both tariff rates and exchange rate changes during the reform period. Share of sector and effective protection contributes to differences in degree of pass-through

Source: Author's compilation

CHAPTER FOUR

THEORETICAL FRAMEWORK AND METHODOLOGY

4.1   Introduction

In this chapter, I shed light on the theoretical framework, estimation related issues and methodology adopted in our study. It also elucidates on the type and sources of data employed.

4.2   Theoretical Framework

The theoretical foundation on which the relationship between prices and exchange rate is based evolves from the principle of relative PPP, which recognizes the existence of trade barriers and transport cost. A detailed discussion on the principle of PPP is discussed in section 3.2. The principle is based from the neo-classical assumption where prices of homogenous products are eventually equalized across countries. The understanding of price determination in Nigeria informs the choice of the theoretical framework.

Following Moser (1995), I derive an eclectic model of domestic price which incorporates both demand and supply factors. The economy is divided into two inflation-generating sectors namely: tradable and non-tradable sectors. The tradable sector captures shocks from the foreign sector (mainly import prices) whereas the non-tradable sector represents disequilibria in the money market. The price of non-traded goods responds to disequilibria in the money market and movements in the exchange rates and foreign prices govern the price of traded goods. Thus overall domestic price level (P_t) is a weighted average of the prices of tradable goods (P^T) and the prices of non-tradable goods (P^N) and it may be represented in equation (4.1) below. The framework adopted here has been used in several studies (Blavy 2004; Ameyaw 2004; Ndaferankhande and Ndhlovu 2006, and Oyaromade and Olubusoye 2007).

$$P_t = \left(P_t^T\right)^\lambda \left(P_t^N\right)^{1-\lambda} \tag{4.1}$$

where λ represents the share of tradable goods in total consumption basket. In log linear form equation (4.1) can be expressed as:

$$\ln P_t = \lambda \ln P_t^T + (1-\lambda)\ln P_t^N \tag{4.2}$$

The basic relationship linking the domestic price to exchange rate follows from the Law of One Price (LOOP) which states that at equilibrium, the price of tradable goods in two markets

cannot differ when expressed in the same currency and thus, guaranteeing a complete pass-through. The price of tradable goods is sub-divided into prices of importable and exportable. The focus of this study is on the prices of importable goods; hence, the traded price is specified as import price $\left(i.e. P^T = P^m\right)$. Prices of imported goods are determined exogenously in the world market and are valued domestically according to the level of the exchange rate (Blavy, 2004). This also informs the specification employed in Sharma (2003). Thus, the relevant equation is:

$$P_t^m = E_t WEXP_t \qquad\qquad (4.3)$$

Where P_t^m is import price at time t, $WEXP_t$ is foreign price level (assumed to be exogenous), E_t is exchange rate, measured in units of the domestic currency per unit of the foreign currency, thus $EWEXP_t$ represents the domestic-currency price of the imported good.

Empirical studies however show that there is incomplete pass-through and hence, LOOP fails to hold. Possible explanations to the failure of the law of one price are, according to Engel and Rogers (2001), impediments to international trade such as tariff and other distribution services that are part of final goods prices. Nigeria is assumed to be a small country because of its share in the world market. Thus, Nigeria is regarded as a "price taker" and it is expected that movements in exchange rate will reflect in the traded goods prices. However, the protective trade policy in Nigeria leads to a departure from the tenets of absolute PPP with the existence of tariffs. The price of imported goods will therefore increase by the value of tariffs and other distributional costs, thereby creating a wedge between goods prices in the domestic and foreign markets[21].

$$P_t^m = WEXP_t\ E(1+\tau)_t \qquad\qquad (4.4)$$

where τ is tariff rate[22]. This follows from Sharma (2003), which decomposes the various contributions to changes in the domestic price of products (import prices). This study is more interested in the influence of exchange rate and tariffs on the import price of products.

The log linear form of (4.4) specifies the import price equation and it is expressed as:

$$\ln P_t^m = \ln WEXP_t\ + \ln E_t + \ln(1+\tau)_t \qquad\qquad (4.5)$$

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[21] This specification of the deviation from the Law of One Price is obtained from Haskel and Wolf (2000) and Frankel, Parsley and Wei (2004).
[22] The average applied MFN tariff rate was obtained from UNCTAD's TRAINS and WITS Database.

The pass-through process consists of two stages. In the first stage, exchange rate movements are transmitted to import prices as shown in equation (4.5). In the second stage, changes in import prices are transmitted to domestic prices. The extent to which those changes are reflected in the consumer price index (CPI) depends on the share of imports in the consumption basket. Typically, however, a change in the exchange rate will affect domestic prices through an additional channel: a currency depreciation which leads to higher prices for imported goods will, in turn, increase the demand for domestically produced goods that compete with imports. As demand rises, there will be upward pressure on domestic prices and nominal wages. Rising wages will exert further upward pressure on domestic prices. Consequently, I assume that the domestic price consists of the prices of imported finished goods and prices of domestically produced goods that make use of imported inputs.

In addition, I extend the framework to incorporate the role of inflation in affecting prices in our model. By way of illustration, the importance of monetary developments in determining rates of consumer price inflation is often disregarded in light of the importance of some exogenous factors.[23] However, recent monetary developments suggest that increases in the money supply may indeed foster a resurgence of high inflation. Thus, the goal of determining the extent of transmission of exchange rate changes to domestic prices requires a broad based analysis which will incorporate the monetary influence. The price of non-tradable goods is assumed to be determined in the money market where demand for non-tradable goods is assumed to move in line with demand in the economy. Consequently, the price of non-tradable goods is determined by the money market equilibrium condition: real money supply (M^s/P) equals real money demand (m^d).

$$m^d = \frac{M^s}{P} \qquad\qquad\qquad (4.6)$$

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[23] Prices of traded goods are determined exogenously in the world market and are valued domestically according to the level of the exchange rate. Tradable goods are defined as those goods and services that are imported/exported by a country as well as those goods and services that are close substitutes for the exportable and importable goods. The domestic prices of tradable goods are determined by the international market subject to the transportation cost, tariff rate etc. On the other hand, domestic supply and demand forces **exclusively** determine the domestic price of non-tradables.

Substituting for P and taking logs of the money market equilibrium in (4.6) and solving for P^N yields the following equation for non-traded goods sector[24]:

$$\ln P_t^N = \phi(\ln M^s - \ln m^d) \tag{4.7}$$

where P_t^N is the price of non-traded goods, M^s represents the nominal stock of money, m^d is the demand for real money balances, and ϕ is the scale factor capturing the relationship between economy-wide demand and demand for non-traded goods[25]. In addition, investors in Nigeria hold foreign currency vis-à-vis domestic currency for the purpose of transaction and not for asset holding[26]:

$$m^d = f(y_t, \pi_t^e) \tag{4.8}$$

where y_t is the real income level and π_t^e is the expected rate of inflation. Hence, with a constant expected inflation, the money demand function therefore yields:

$$\ln m^d = \psi_0 + \psi_1 \ln y_t \tag{4.9}$$

where $\dfrac{\partial m^d}{\partial y} > 0$, i.e., real money balances increases with a rise in real income and the ψ_s are structural parameters. The intercept term ψ_0 captures any trend element in the level of money demand. Thus, the price of non-tradable goods becomes:

$$\ln P_t^N = \phi(\ln M_t^s - [\psi_0 + \psi_1 \ln y_t]) \tag{4.10}$$

Equations (4.5) and (4.10) are therefore the basis for which the empirical specification of the model is derived in the next section.

$$m^d = \frac{M^s}{P} = \frac{M^s}{(P^T)^\lambda (P^N)^{1-\lambda}} \Rightarrow (P^T)^\lambda (P^N)^{1-\lambda} = \frac{M^s}{m^d} \equiv \lambda \ln P^T + (1-\lambda)\ln P^N = \ln M^s - \ln m^d$$

[24] $(1-\lambda)\ln P^N = \ln M^s - \ln m^d - \lambda \ln P^T \equiv \ln P^N = 1/(1-\lambda)(\ln M^s - \ln m^d) - \lambda/(1-\lambda)\ln P^T$

$\therefore \ln P^N = \phi(\ln M^s - \ln m^d)$

[25] Where $\phi = (1-\lambda)^{-1}$

[26] The explanatory variables commonly used in the literature are interest rates, expected inflation and real income. Nigerian money market has been regarded as less developed. Hence, the interest rate has not been regarded as a significant determinant. The expected inflation captures the rate of substitution between goods and money and it also represents the opportunity cost of holding money vis-à-vis real assets. However, for simplicity, the expected inflation is held constant in our model following Hossain (2002), and income thus becomes the most important determinant of real money balances.

4.3 Model Specification

The theoretical framework presented in the previous section identifies the factors behind movements in import prices, the determinants of the level or extent of exchange rate pass-through as well as the overall determinants of change in domestic price level. The domestic price equation in the economy can be obtained by substituting equation (4.5) and equation (4.10) into (4.2) to yield:

$$\ln P_t = \lambda[\ln WEXP_t + \ln E_t + \ln(1+\tau)]$$
$$+(1-\lambda)\phi(\ln M_t^s - [\psi_0 + \psi_1 \ln y_t]) \qquad (4.11)$$

Equation (4.11) therefore presents the relationship between exchange rate, world export price, tariff rate, and domestic price. The estimable import price function as derived from equation (4.5) is thereafter specified as:

$$\ln P_{i,t}^m = \beta_0 + \beta_1 \ln WEXP_t + \beta_2 \ln E_t + \beta_3 \ln(1+\tau) + \mu_t \qquad (4.12)$$

where $P_{i,t}^m$ is the import price at time t disaggregated into i product groups, $WEXP_t$ is the export price at the world or international market, E_t is the official exchange rate (an increase indicate depreciation), and μ_t is the stochastic error term. However, it is necessary to distinguish between pass-through, on the one hand, in the narrow sense of the determination of prices of goods that are physically imported versus, on the other hand, the broader sense of the determination of the general price level. The domestic price level (CPI) in Nigeria is therefore used as the dependent variable in equation (4.13) to examine the second stage of pass-through in our model. The estimable model for the domestic price level is therefore obtained as:

$$\ln P_t = \Phi_0 + \Phi_1 \ln WEXP_t + \Phi_2 \ln E_t + \Phi_3 \ln(1+\tau)$$
$$+\Phi_4 \ln M_t^s + \Phi_5 \ln Y_t + \zeta_t \qquad (4.13)$$

It is expected that $\beta_1, \beta_2, \beta_3, > 0$ in equation (4.12). This suggests that import price increases with an increase in world export price and exchange rate depreciation, and falls with tariff reduction, respectively. In addition, from equation (4.13), It is also expected that $\Phi_1, \Phi_2, \Phi_4, \Phi_5 > 0$. This implies that domestic price increases with an increase in world export price, exchange rate depreciation, money supply and real income, while $\Phi_3 > 0$ implies that domestic price falls with a decrease in tariff.

4.4   Variable Definitions

Income is represented by current level of gross domestic product (GDP). The use of this variable to measure income is standard in the literature. Money supply is measured by current value of M2 defined as money and quasi money. A 2-digit HS tariff rate is measured by applied average tariff rate for each product group and obtained by aggregating a 6-digit HS from 5113 product lines over 27 years. The aggregate average tariff rate is the mean of applied average tariff over the product lines for a particular year. The exchange rate is the official exchange rate measured in naira (Nigeria local currency) to a US dollar. The international price of export is measured by the world export price. The domestic price captures growth rate of consumer price index (CPI) and the import price is obtained by dividing the value of disaggregated imports (in naira) by its quantity (in kg.). The aggregate import price is the mean price of imports at 2-digit HS classification of product groups.

4.5   Estimation Technique

The time series characteristics of the data is first investigated to test whether the variables are stationary or not. By definition, a time series is said to be stationary if its means, variances and covariances are all invariant with respect to time[27]. The Augmented Dickey-Fuller (ADF) (as specified in Dickey and Fuller, 1979), and Phillips-Perron (Phillips and Peron, 1988) tests are employed. For the ADF, the null hypothesis is that the variable being considered has a unit root against an alternative that it does not[28]. The general model for the ADF is as specified below:

$$\Delta y_t = \alpha + \beta T + \gamma y_{t-1} + \sum_{i=1}^{P} d_t \Delta y_{t-1} + \varepsilon_t \qquad (4.14)$$

Where y_t is the variable being considered and ε_t is a random error term. T is the linear deterministic time trend and is included in (4.14) because the alternative hypothesis considered here is that y_t is stationary around a linear trend; [see Nelson and Plosser (1982)]. In other words, it is only allowed if significant. If the series y_t has a unit root and the linear trend is not significant, then the estimated coefficients γ and β in (4.14) should be zero. The ADF assumes that the random error term, $\varepsilon_{t,}$, is an *individually independently distributed* (iid) process. If this

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[27] This implies that a stationary series tends to return to its mean value and fluctuate around it within a more or less constant range, while a non-stationary series has a different mean at different points in time and its variance increases with the sample size.

[28] The presence of unit root in a variable implies that the variable is non-stationary i.e. it is integrated of order one I(1) and it has to be differenced to be made stationary, i.e. integrated of order zero I(0).

assumption is incorrect, then the limiting distributions and critical values obtained therein cannot be assumed to hold. The tests of Phillips-Peron (PP) are based on a relaxation of the assumptions about the random error term used in ADF. The PP test uses models similar to the Dickey-Fuller tests but with Newey and West (1994) non-parametric correction of possible serial correlation rather than the lagged variables method employed in ADF. Also Bartlett Kernel (Andrews, 1991) is used as an automated bandwidth estimator for lag truncation of the Newey and West non-parametric correction. The test statistics of the PP has the same distribution as that of Dickey-Fuller and critical levels provided by MacKinnon (1996) will be used. Both the PP and ADF are based on asymptotic theory. Thus, in both cases, it is important to consider how well the limiting distributions approximate the finite sample distribution of the relevant statistics (i.e. t-statistics for ADF and Z-statistics for PP). An indication as to whether the PP should be used in addition to (or in place of) the ADF regression might be obtained in the diagnostic statistics from ADF regression. If normality, autocorrelation or heterogeneity statistics are significant, one might adopt the PP approach. However, if a negative moving average component is suspected in the disturbances, then the PP should be avoided. I therefore use both the ADF and PP to determine the stationarity of our variables.

If the variables in our empirical model have unit roots from the ADF and PP tests conducted, then I can capitalize on the likelihood of co-movements in their behaviour hence the possibilities that they trend together towards a stable long-run equilibrium. Using Granger Representation Theorem-Engle and Granger (1987), the error correction model (ECM) is generally formulated as:

$$\Delta X_{1,t} = \sum_{i=1}^{l_1} a_{1i} \Delta X_{1,t-i} + \sum_{i=1}^{l_2} a_{2i} \Delta X_{2,t-i} + \alpha_1 Z_{t-1} + \varepsilon_{1,t}$$

$$\Delta X_{2,t} = \sum_{i=1}^{m_1} b_{1i} \Delta X_{1,t-i} + \sum_{i=1}^{m_2} b_{2i} \Delta X_{2,t-i} + \alpha_2 Z_{t-1} + \varepsilon_{2,t}$$

(4.15)

where X_t, X_2 and Z_t are the dependent and independent variables respectively.

Equation (4.15) implies that the first differences of the variables are explained by lagged differences and the lagged stationary linear relationship, Z_{t-1}. That is, if $X_{1,t}$, and $X_{2,t}$ are cointegrated, then either α_1 or α_2 (or both) are different from zero. However, if vector X_t contain

k time-series variables with T observations each, the cointegration method can be based on the p-lag Vector-autoregressive (VAR) model for X_t with Gaussian errors[29]:

$$X_t = \Pi X_{t-1} + ... + \Pi_p X_{t-p} + \varepsilon_t \tag{4.16}$$

The Π matrices are of order (k x k) and contain the VAR parameters. In addition, each and every variable is explained by p-lagged values of itself and all the other variables. By implication, all the variables are regarded as endogenous. Equation (4.16) is then reparameterize into the ECM formulation to yield:

$$\Delta X_t = \sum_{i-1}^{p-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t \tag{4.17}$$

where $\Gamma_i = -(\Pi_{i+1}... + \Pi_p)(i = 1,..., p-1)$ and $\Pi = -I + \Pi_i + ... + \Pi_{p.}$.

As long as ΠX_{t-1} is stationary, the ECM will be well defined, since ΔX_t is stationary. Stationarity of ΠX_{t-1} is equivalent to linear combinations of the X_t variables being stationary, that is, cointegration. Thus, the nature of the error-correction term, ΠX_{t-1} is what determines the nature of the cointegration relationships among the variables (Bentzen and Engsted, 2001). If the cointegrating relations (equilibrium conditions) are imposed, the error correction models describe the way import prices and its components will adjust towards their equilibrium state in each time period. In the short-run, deviation of import prices and its components from their long-run equilibrium path will feed back on their future changes in order to force their movement towards the long-run equilibrium state since the variables are supposed to be cointegrated. The cointegration term is known as the *error correction* term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The cointegrating vectors from which the error-correction terms are derived are each indicating an independent direction where a stable, meaningful long-run equilibrium state exists. The coefficients of the error-correction terms, however, represent the proportion by which the long run disequilibrium in the dependent variables is corrected in each short-term period.

There are two alternative techniques for running cointegration tests: the Engle-Granger (1987) two-step test described above and the Maximum Likelihood approach developed by Johansen (1988) and Johansen and Juselius (1990). The latter test is preferred when there are more than two time series variables involved because it can determine the number of

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[29] Johansen, 1988

cointegrating vectors. Furthermore, less error is involved in the Johansen technique because only one step is involved rather than the two steps required in the Engle-Granger technique. There are various things that need to be considered before the Johansen procedure is used. One important consideration to be made is the choice of lag length. The lag length is determined by selecting a "large" value for lag length and estimating equation (4.16). The system is then re-estimated for successively smaller values of lag values. For each import price product, I employed the Johansen procedure in order to further strengthen our empirical evidence on long-run relationships among the variables. This methodology is appropriate for establishing long-run relationships when the data used are non-stationary and have the advantage of accounting for all possible endogeneities among the variables used in estimation, thereby eliminating the single-equation bias. The Ordinary Least Square (OLS) estimation technique is adopted for the short run estimation of the variables. Thereafter, the general to specific procedure is used to arrive at the parsimonious model. The redundant variables are deleted from the model using the Akaike Information Criteria (AIC) and the Schwarz Criteria (SC) to delete the insignificant variables and arrive at the parsimonious model.

4.6   Sources of Data

Annual macroeconomic time series data for the period, 1980 to 2006 were used to accomplish this study. The data on average applied Most Favoured Nation (MFN) tariff rate were collected from the United Nations Conference on Trade and Development (UNCTAD) Trade Analysis and Information System (TRAINS) and World Integrated Trade Solution (WITS) Database, official exchange rate and inflation rates are sourced from various issues of the Central Bank of Nigeria (CBN) Statistical Bulletin. While the GDP was obtained from the World Development Indicators WDI CD ROM, 2007, the import prices were calculated from various issues of the National Bureau of Statistics (NBS) Nigeria Foreign Trade Statistics.

CHAPTER FIVE

EMPIRICAL ANALYSIS

5.1 Introduction

In this chapter, the results of the import price models are presented and discussed. This has been arranged into sub-headings: aggregate import price, disaggregated import price and consumer price index. The results of the disaggregated import price are discussed in three categories: consumer goods, intermediate and capital products. The policy implications of the empirical results are also discussed.

5.2 Statistical Properties of the Variables

The characteristics of the data series used in the regression analysis are presented in Table 5.1. It provides information about the means and standard deviations of the main variables. The mean value of the log of aggregate import price is 1.683 while the mean of the log of consumer price index and exchange rate stood at 1.220 and 1.171, respectively. In addition, the standard deviation of the consumer price index (LCPI) and gross domestic product (LGDP) are 0.337 and 0.866, respectively. The Table also provides the summary of statistics on other explanatory variables such as exchange rate (LEXR), money supply (LMSS), and the import price of base metals and machinery (LPBAM).

5.3 Unit Root Testing

The variables for our analysis are subjected to two types of unit roots test to determine whether they are stationary series or non-stationary series. The tests employed are the Augmented Dickey Fuller test (ADF) and the Phillips-Perron test (PP). For the ADF and PP tests, three models are considered: with constant; with trend and constant; and without trend and constant. The null hypothesis in both the ADF and PP test is the presence of unit root.

The ADF results in Table 5.2 shows that 95% of the variables are integrated of order one in the three models of unit root test considered. Only a few of the variables are significant at their levels and a reasonable number of such variables are at the 10% level. Few exceptions are however observable. These include: the log of prices of foodstuffs (LPFOD) and textile (LPTXT) product groups; log of prices of chemical (LPCHM) and optical (LPOPT) product groups.

Table 5.1: Summary of Statistics of the Variables used in the Regression Analysis

	Mean	Median	Maximum	Minimum	Std. Dev.	Obs
LAIMP	1.6831	1.6944	2.283	0.9794	0.408	27
LATRF	1.5589	1.5498	1.883	1.1388	0.186	27
LCPI	1.2205	1.1471	1.862	0.6776	0.337	27
LEXR	1.171	1.3402	2.123	-0.26	0.896	27
LGDP	11.859	11.986	13.14	10.701	0.866	27
LMSS	11.233	11.298	12.53	10.158	0.81	27
LPANM	1.0716	1.2164	2.327	0.0132	0.719	27
LPARS	0.976	1.1057	1.755	-0.079	0.558	27
LPBAM	1.6786	1.7107	2.543	0.6965	0.481	27
LPCHM	1.3688	1.3033	2.169	0.5491	0.475	27
LPFOD	1.0899	1.119	2.055	-0.196	0.658	27
LPLST	1.5907	1.5642	2.224	0.4552	0.526	27
LPMCH	1.9244	2.1133	3.135	0.6227	0.729	27
LPMIN	1.2855	1.3672	2.473	0.1162	0.661	27
LPOPT	1.9149	1.9259	2.799	1.0407	0.548	27
LPPMM	1.2433	1.1825	2.387	-0.109	0.662	27
LPTXT	1.4104	1.4806	2.563	0.2849	0.696	27
LPVEG	0.8638	0.9047	1.853	-0.071	0.629	27
LTANM	1.5405	1.5899	1.916	1.2345	0.213	27
LTARS	1.5812	1.5583	1.894	1.2369	0.167	27
LTBAM	1.416	1.4084	1.735	1.1056	0.167	27
LTCHM	1.3871	1.3904	1.717	0.9853	0.188	27
LTFOD	1.6992	1.6643	1.984	1.2811	0.173	27
LTMCH	1.2937	1.3084	1.636	0.8398	0.202	27
LTMIN	1.2132	1.1982	1.487	0.7523	0.171	27
LTOPT	1.4046	1.42	1.746	1.0862	0.184	27
LTPLST	1.4273	1.4046	1.731	1.0463	0.168	27
LTPMM	1.3387	1.3886	1.717	0.9774	0.224	27
LTTXT	1.6995	1.7619	1.974	1.2064	0.195	27
LTVEG	1.5359	1.5377	1.8	1.0864	0.185	27
LWEXP	2.0087	2.0185	2.115	1.8908	0.063	27

Source: Author's Computation

Others are log of tariffs on animal (LTANM), articles of stones (LTARS) and base metals (LTBAM) product groups. The LPFOD and LPTXT variables were found to be stationary in the model that includes a constant and a linear time trend at levels. These two variables are significant at 1% level. In a similar vein, LPCHM and LPOPT were found to be stationary and significant at 5% level in the model that includes a constant and a linear time trend at levels. From the unit root testing, about 89% of prices of the significant product groups were found to be stationary in the model that include a constant and a linear time trend at level while 78% of tariff of the significant product groups were stationary in the model with no constant and linear time trend.

However, the log of the gross domestic product (LGDP) is not significant in the ADF models that include a 'constant and time trend', and with 'neither constant nor time trend' but it is significant in the models that include 'only constant' in first difference. The PP test statistics reported in Table 5.3 reinforces the result in the model that include only constant in the ADF test but contradicts those models that include a constant and a linear time trend, and neither constant nor time trend where LGDP was found to be significant at 10% level in first difference.

The PP test results in Table 5.3 support the presence of unit roots in nearly all the series. This implies that most of the variables are only stationary at first difference. The few exceptions that were noticed in the ADF model however remain. For example, the log of world price (LWEXP) was found to be stationary in the model that includes only a constant and also in the model that includes neither a constant nor a linear time trend at the 5% and 1% level of significance respectively. It was however found to be non-stationary in the model that includes a constant and a linear time trend at first difference. When consideration is given to series that are significant at the 10% level, none of the variables will be integrated of order 2. It is evident from Tables 5.2 and 5.3 that the variables become stationary series when appropriately differenced.

From the two types of integration tests carried out above, I may conclude that all the variables in our system contain unit roots. Therefore, I can safely proceed to use the co-integration method in analyzing our models as conventional regression models will generate spurious results due to the integration level of the series.

Table 5.2: Augmented Dickey Fuller test (ADF)*

VARIABLES	LEVEL			FIRST DIFFERENCE		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
LAIMP	-2.571	-2.873	0.069	-5.620*	-5.502*	-5.670*
LATRF	-0.745	-2.570	-1.781***	-5.125*	-5.033*	-4.671*
LCPI	-3.030**	-2.972	-0.708	-3.030**	-4.707*	-4.857*
LEXR	-1.383	-0.647	1.551	-4.814*	-4.032**	-3.609*
LGDP	0.241	-1.951	6.285	-3.487**	-3.009	-0.774
LMSS	1.008	-2.866	2.412	-2.706***	-2.671	-1.129
LPANM	-1.458	-3.634	0.198	-7.682*	-7.557*	-7.557*
LPARS	-2.580	-0.741	0.065	-4.987*	-6.272*	-4.400*
LPBAM	-2.688***	-3.952**	-0.739	-6.356*	-6.196*	-6.480*
LPCHM	-1.833	-3.749**	-0.174	-7.220*	-7.077*	-7.209*
LPFOD	-0.758	-5.735*	1.057	-11.016*	-10.756*	-10.526*
LPLST	-1.793	-3.411***	0.101	-8.143*	-7.918*	-8.253*
LPMCH	-2.579	-2.907	-0.508	-5.846*	-5.816*	-5.910*
LPMIN	-2.930***	-1.745	-0.768	-6.827*	-6.685*	-6.978*
LPOPT	-1.227	-3.630**	0.941	-6.134*	-6.002*	-5.747*
LPPMM	-1.959	-4.006**	0.116	-6.973*	-6.792*	-6.969*
LPTXT	0.161	-6.440*	2.263	-9.788*	-3.278***	-9.475*
LPVEG	-1.140	-3.405***	0.346	-9.237*	-1.321	-9.255*
LTANM	-2.611	-2.280	-2.067**	-5.045*	-3.813**	-4.496*
LTARS	-0.909	-2.122	-1.960**	-5.335*	-5.215*	-4.742*
LTBAM	-1.120	-2.432	-1.964**	-5.050*	-4.938*	-4.540*
LTCHM	-1.098	-2.691	-2.086**	-7.106*	-6.973*	-6.409*
LTFOD	-2.138	-3.067	-1.538	-4.292*	-4.226**	-3.969*
LTCHM	-0.817	-2.391	-1.698***	-5.784*	-5.692*	-5.274*
LTMIN	-0.813	-1.514	-1.484	-5.366*	-5.340*	-5.049*
LTOPT	-0.967	-2.669	-2.656**	-6.516*	-6.380*	-5.427*
LTPLST	-0.872	-2.050	-1.758***	-5.486*	-5.384*	-4.987*
LTPMM	-1.409	-3.303***	-1.475	-6.507*	-6.365*	-6.105*
LTTXT	-0.361	-4.470**	-1.528	-3.372**	-5.761*	-5.262*
LTVEG	-2.120	-2.514	-1.130	-4.999*	-4.926*	-4.917*
LWEXP	-1.414	-2.395	1.219	-3.171**	-3.094	-3.003*

Source: Author's Computation

*The Null Hypothesis is the presence of unit root. Model 1 includes a constant, Model 2 includes a constant and a linear time trend while Model 3 includes neither in the test regression as exogenous. Lags were selected based on Schwarz Information Criterion. *, **, *** indicate significance at 1%, 5%, and 10% respectively.

Table 5.3: Phillips-Perron Test (PP)*

VARIABLES	LEVEL			FIRST DIFFERENCE		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
LAIMP	-2.576	-2.916	0.345	-5.875*	-5.721*	-5.744*
LATRF	-0.732	-2.235	-1.826***	-5.125*	-5.033*	-4.671*
LCPI	-3.050**	-2.985	-0.454	-3.050**	-8.013*	-7.893*
LEXR	-1.410	-0.540	1.240	-4.813*	-5.171*	-3.609*
LGDP	0.150	-2.123	5.501	-3.390**	-3.244***	-1.820***
LMSS	0.631	-2.485	5.721	-2.658***	-2.642	-0.877
LPANM	-1.877	-3.719**	-0.363	-9.576*	-10.595*	-7.794*
LPARS	-1.922	-2.535	0.028	-8.051*	-20.838*	-7.348*
LPBAM	-2.664***	-2.863	-0.565	-6.726*	-6.542*	-6.847*
LPCHM	-1.661	-3.779**	0.325	-8.500*	-8.318*	-7.732*
LPFOD	-1.997	-5.705*	0.239	-11.144*	-10.876*	-10.171*
LPLST	-3.662**	-3.619**	0.031	-8.143*	-7.918*	-8.253*
LPMCH	-2.553	-2.937	-0.508	-5.846*	-5.819*	-5.910*
LPMIN	-2.895***	-2.843	-0.916	-7.202*	-7.081*	-7.381*
LPOPT	-0.848	-3.615**	2.694	-9.000*	-8.671*	-5.808*
LPPMM	-1.809	-4.006**	-0.200	-10.244*	-10.832*	-7.652*
LPTXT	-2.043	-6.543*	0.571	-27.253*	-26.213*	-11.200*
LPVEG	-1.506	-3.488***	-0.522	-10.366*	-10.725*	-9.255*
LTANM	-1.177	-2.280	-2.121**	-5.045*	-4.974*	-4.495*
LTARS	-0.811	-2.122	-2.147**	-5.337*	-5.216*	-4.742*
LTBAM	-0.982	-2.223	-2.251**	-5.064*	-4.947*	-4.541*
LTCHM	-0.834	-2.713	-1.597	-7.067*	-6.928*	-6.290*
LTFOD	-1.155	-1.907	-1.390	-4.238*	-4.164**	-4.093*
LTCHM	-0.701	-2.391	-1.889***	-5.784*	-5.692*	-5.273*
LTMIN	-0.782	-1.602	-1.540	-5.366*	-5.340*	-5.049*
LTOPT	-0.853	-2.669	-2.948*	-6.545*	-6.413*	-5.425*
LTPLST	-0.733	-2.050	-1.942***	-5.490*	-5.386*	-4.987*
LTPMM	-1.065	-3.305***	-3.370*	-7.441*	-7.304*	-6.172*
LTTXT	-0.190	-2.533	-1.638***	-5.695*	-5.761*	-5.261*
LTVEG	-1.739	-2.277	-1.235	-5.006*	-4.928*	-4.918*
LWEXP	-0.813	-1.951	0.942	-3.180**	-3.107	-3.003*

Source: Author's Computation

The Null Hypothesis is the presence of unit root. Model 1 includes a constant; Model 2 includes a constant and a linear time trend while Model 3 includes neither in the test regression as exogenous. The Bandwith was chosen using Newey-West method with Barttlet Kernel spectral estimation, **, *** indicate significance at 1%, 5%, and 10% respectively.

5.4 Cointegration Tests

Following the findings that the data series are by nature, mostly non-stationary stochastic processes, econometric developments regarding the concepts of cointegration are particularly apposite in testing for equilibrium. Accordingly, the long run properties of the variables in the behavioural equations were examined using the Engle-Granger two-step procedure. Presented in Table 5.4 are the results of the unit root tests of the residuals of the static long run models. The regression residuals have zero mean, and as they are not expected to have deterministic trend, the unit roots exercise were conducted by excluding both the models that include constant, and constant with time trend. The ADF test statistics suggest that the disequilibrium errors are mostly I(0), and as such, the variables in the static equations are cointegrated.

However, in view of the problems with the Engle-Granger framework for testing cointegration, the results were validated using the Johansen (1991, 1995) approach. This framework provides the number of cointegrating equations and estimates of all cointegrating vectors in the multivariate case. The Johansen cointegration test results are contained in Table 5.5. The trace test and the max-eigen test were conducted to establish the number of cointegrating relations in each of the equations. The trace results are presented in the first part of the table while the max-eigen results were presented in the second part of the table. The null hypothesis of no cointegrating relationship is rejected if the calculated value of the statistic exceeds the critical value. Test results indicate the existence of one cointegrating equation in the equations at the 1% and 5% significance level. For example, the calculated trace test statistic of 49.10 in aggregate import price exceeds the critical value of 47.21for no cointegrating relationship. Therefore, the null hypothesis is rejected, implying that the trace test indicates one cointegrating equation for aggregate import price. In addition, the normalized cointegrating coefficients show that the variables in the equations are relatively important. The consistency in the test results confirms the existence of long run relationship among the exogenous and dependent variables in the model.

Table 5.4: Unit Root Test of Residual of ECM of Variables

EQUATION	AUGMENTED DICKEY FULLER TEST	PHILLIPS-PERRON TEST
Aggregate Import Price	-4.35124	-4.35811
Live animal; animal products	-5.21061	-5.21157
Vegetable products	-6.37012	-6.37012
Prepared foodstuff; beverages, spirits…	-5.00129	-5.03597
Mineral products	-3.86568	-3.87337
Product of Chemical and allied industries	-5.63340	-5.6136
Plastic, rubber and articles thereof	-4.3944	-4.4108
Paper making material; paper & paperboard	-5.8679	-6.1601
Textiles and textile articles	-6.5241	-6.5108
Articles of Stone, plaster, cement, mica…	-4.9595	-3.7675
Base metals & articles of base metals	-3.9812	-3.9939
Boilers, Machinery and appliances; parts..	-3.6112	-3.6343
Optical, Photographic, cinematographic…	-3.9435	-3.9435
Consumer price index	-4.0393	-3.5866

Source: Author's Computation

Note: (1) Lags were selected based on Schwarz Information Criterion in the ADF test (2) The Bandwith was chosen using Newey-West method with Barttlet Kernel spectral estimation in the Phillip-Perron test (3) The test statistics were all significant at 1% level of significance.

Table 5.5: Johansen Cointegration Test Results

EQUATION		TRACE TEST		MAX-EIGEN TEST		NO OF COINTEGRATING. EQUATIONS
	Eigen value	Trace statistic	5% Critical Value	Max-Eigen Statistic	5% Critical Value	
Aggregate Import Price	0.69974	49.10921	47.21	30.07763	27.07	1
Live Animal, Animal Products	0.642899	44.48317	39.89	26.77318	23.8	1
Vegetable Products	0.6971	56.87124	53.12	31.05316	28.14	1
Prepared foodstuffs;	0.630087	42.84354	39.89	25.85667	23.8	1
Mineral Products	0.793599	62.48587	47.21	39.44838	27.07	1
chemicals& allied industrie	0.724595	55.54904	53.12	33.52731	28.14	1
Plastic, Rubber,& articles thereof	0.78139	74.73375	62.99	36.49114	31.46	1
Paper Making Materials	0.677001	54.75526	53.12	29.38273	28.14	1
Textile and textile articles	0.729806	55.39017	53.12	34.02401	28.14	1
Articles of stone, plaster, and others	0.648776	48.07412	39.89	26.15826	23.8	1
Base metal & articles of Base metal	0.834763	85.59235	62.99	43.20899	31.46	1
Boilers, machinery and appliances;	0.858959	77.46122	62.99	47.00899	31.46	1
Optical, photographic,	0.76631	52.39781	39.89	33.43648	23.8	1
Consumer Price Index	0.86455	106.0434	94.15	51.97799	39.37	1

Source: Author's Computation

5.5 Error Correction Models

As the data series are non-stationary and the vector of variables in the equations appear to be cointegrated, execution of the second phase of the Engle-Granger technique led to the estimation of error-correction forms of the stochastic equations. The equations represent the short-run behaviour and the adjustment to the long run models. The residuals from the cointegrating regressions lagged one period were used as error correction mechanism in the dynamic equations. The Ordinary Least Squares (OLS) estimates of the preferred specifications obtained using general-to-specific method are presented in Tables 5.6 to 5.9 and discussed below. The results were evaluated using conventional diagnostic tests. For simplicity, the discussions of the empirical analysis were carried out in the following order: aggregate import price; import price of consumer products; import price of intermediate goods; import price of capital goods and consumer price index.[30]

5.5.1 Aggregate Import Price

The results of the aggregate import price equation in Table 5.6 are insightful. Evidence emerges that official exchange rate shocks lagged three period has a positive and significant effect on aggregate import price, implying that the depreciation of the exchange rate in the past three periods increases import prices. In the short run, a 10% depreciation of the exchange rate leads to 9.0% increase in import prices suggesting that exchange rate shocks in the past three periods are passed on to import prices in the present period. Also, tariff rate shocks in the second period have significant and positive effect on the aggregate import price in Nigeria. A 10% increase in the tariff rate leads to 19.8% pass through to import prices. This implies that aggregate import price reflects more than full benefit of the tariff liberalization. However, the world export price was not found to influence the aggregate import price in Nigeria. The result did not conform to the a-priori expectation of positive value. The error correction estimate of 0.823 indicates that 82.3% of the preceding period's disequilibrium was eliminated in the current

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[30] The classification were made in the following categories based on the nature of the products: Import price of consumer products (Mineral Products; Live Animal, Animal Products; Vegetable Products; Prepared foodstuffs, beverages, spirits and vinegar; tobacco); import price of intermediate products (Articles of stone, plaster, cement, asbestos, mica, ceramic; Optical, photographic, cinematographic; Product of chemicals& allied industries; Paper Making Materials; Textile and textile articles; and Textile and textile articles); import price of capital goods (Boilers, machinery and appliances; parts thereof; Base metal & articles of Base metal).

period, with immediate adjustments captured by the difference terms. In addition, the value of the R^2 shows that the model accounted for at least 57% changes in aggregate import price.

Exchange rate pass-through in the aggregate import price equation was found to be incomplete. Incomplete pass-through to import prices reflected departures from the law of one price (LOOP) in traded goods. According to the LOOP, in competitive markets free of transportation costs and official barriers to trade, homogeneous goods must sell for the same price when their prices are converted to a common currency, regardless of where those goods are sold. Violations of the LOOP can occur either because of trade costs or pricing-to-market (PTM)[31]. By way of illustration, if the currency of the importing country depreciates, import prices will rise, thereby causing a decrease in the volume of imports. The fall in imports will cause a fall in the marginal transport cost. As a result, import prices will not rise by as much as the currency depreciates. In other words, a country that relies on the expected impact of exchange rate depreciation on imports volume to achieve favourable trade balance may fall short of its intended objective. Thus, exchange rate policy cannot be used as instrument to maintain favourable trade balance.

5.5.2 Import Price of Consumer Products

In the live animals; animal products equation in column 2 of Table 5.7, the official exchange rate in the present period positively and significantly affects the import price of live animals; animal products in Nigeria (1.97%). For example, a 10% depreciation of the exchange rate in the official market in the present period results in about 19.74% increase in import price of live animals; animal products. This can be understood in the light of Nigeria's dependence on imported animal products such as milk and fish. In addition, tariff rate has a significant pass-through effect of about 1.82% to import prices of live animals; animal products. The basic lesson from this regression analysis is that exchange rate and tariff rate pass through are more than complete. Altogether, the explanatory variables explain 56.6% of the movements in the import of live animals; animal products while about 96.2% of the preceding period's disequilibrum are eliminated in the current period.

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[31]PTM is the ability of monopolistically competitive firms to (intentionally) practice price discrimination, setting different prices for different destination markets. As microeconomic theory suggests, under certain conditions, such behaviour can be optimal from the firm's perspective. It is clear, however, that PTM is possible only if there are economic and/or institutional constraints that prevent agents from exploiting international arbitrage opportunities in the goods market.

Table 5.6: Parsimonious Model of Aggregate Import Price equation.
Dependent variable: D (LAIMP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.068867	0.08538	0.806597	0.4317
D(LEXR(-1))	0.533474	0.453146	1.177266	0.2563
D(LWEXP(-1))	-3.31915	2.706754	-1.22625	0.2378
D(LEXR(-3))	0.89198**	0.408054	2.18594	0.044
D(LATRF)	-1.37229***	0.765218	-1.79333	0.0918
D(LATRF(-2))	1.98662***	1.049671	1.892613	0.0766
ECMAIMP(-1)	-0.8239	0.289848	-2.84251	0.0118
R-squared	0.579912	Mean dependent var		0.027424
Adjusted R-squared	0.422379	S.D. dependent var		0.338172
S.E. of regression	0.257015	Akaike info criterion		0.366428
Sum squared resid	1.05691	Schwarz criterion		0.712013
Log likelihood	2.786077	F-statistic		3.681205
Durbin-Watson stat	2.332646	Prob(F-statistic)		0.017212

Source: Author's computation.

Note: *, **, *** indicate significance at 1%, 5%, and 10% respectively.

Table 5.7: Parsimonious Models of Import Price of Consumer Products

	LIVE ANIMAL: D(LPANM)	PREPARED FOODSTUFF: D(LPFOD)	VEGETABLE PRODUCT: D(LPVEG)	MINERAL PRODUCTS: D(LPMIN)
Constant	-0.04476 [0.5608]	0.003252 [0.9535]	-0.0704 [0.372]	-0.07056 [0.5095]
World export Price (0)	-5.56839*** [0.0737]	-	-	-
World export Price (-1)	-	4.440192** [0.0407]	-	-8.56832** [0.0428]
World export Price (-2)	-	-8.58613* [0.0029]	-5.34872** [0.0283]	-
World export Price (-3)	-	-	3.772762*** [0.0948]	-
Exchange rate (0)	1.97436* [0.0006]	0.532674 [0.1097]	1.153651* [0.0013]	1.016481 [0.1201]
Exchange rate (-1)	-	-	-	-
Exchange rate (-2)	-	-	-	-
Exchange rate (-3)	-	-	-	-
Tariff rate (0)	-	-	-	-
Tariff rate (-1)	-	-	0.217491 [0.5883]	-2.41282 [0.0097]
Tariff rate (-2)	-	-	0.512491 [0.3992]	4.434976** [0.0228]
Tariff rate (-3)	1.818843*** [0.0638]	1.376779*** [0.059]	0.864264*** [0.0899]	2.673496 [0.2102]
ECM(-1)	-0.96239 [0.0001]	-0.71598 [0.0044]	-0.91163 [0.0002]	-0.6273 [0.0054]
R-squared	0.723716	0.782204	0.851428	0.764719
Adjusted R-squared	0.66232	0.70053	0.76653	0.676489
S.E. of regression	0.291829	0.205319	0.189386	0.389279
Sum squared resid	1.532958	0.674494	0.502139	2.42461
Log likelihood	-1.49019	7.951206	11.34471	-6.76262
Durbin-Watson stat	1.821166	2.027943	1.478866	2.510538
Mean dependent var	0.045724	0.060103	0.050045	-0.00421
S.D. dependent var	0.502199	0.375191	0.391952	0.68441
Akaike info criterion	0.564365	-0.08271	-0.20389	1.196749
Schwarz criterion	0.811211	0.262872	0.240436	1.542334
F-statistic	11.78759	9.57719	10.02883	8.667321
Prob(F-statistic)	0.00007	0.000148	0.000126	0.000265

Source: Author's computation.

Note: *, **, *** indicate significance at 1%, 5%, and 10% respectively.

Figures in square brackets, [ ] are probability values.

Estimates of the prepared foodstuffs; beverages, spirits and vinegar; tobacco equation in column 3 of Table 5.7 show that the first and second period lag of world price, third period lag of the tariff rate on prepared foodstuffs; beverages, spirits and vinegar, and tobacco, and exchange rate positively and significantly influence its import price at the 10% level of significance. Pass-through therefore occurs between exchange rate in the official market, tariff rate, and world export prices at their respective lags and the import price of prepared foodstuffs; beverages, spirits and vinegar; tobacco. The pass-through from the world export price however, appears very high. For example, a 10% increase in the world export prices of products in this category is passed through to about 44.4% increase in its import price. Considering the estimate of the exchange rate from the model, the influence seems to be instantaneous. A negative relationship however exists between the second period lag of the world export price and the import price of prepared foodstuffs; beverages, spirits and vinegar; tobacco. The coefficient of determination (71.5%) shows that the regressors explain changes in the import prices of prepared foodstuffs; beverages, spirits and vinegar; tobacco reasonably well.

The result of the equation for the vegetable products in column 4 of Table 5.7 demonstrates that the lags of the world export price in the third period, the official exchange rate in the present period and the tariff rate in the past third period are the important factors driving the import price on vegetables in Nigeria. Considering the present period case, the pass-through from the official exchange rate to the import price of vegetable products is 11.5% from a 10% depreciation of the exchange rate. The implication of this is that exchange rate policy measures which increase the exchange rate at the official market have positive spread on the import of vegetable products. In addition, a 10% decrease in the tariff rate results in 8.6% of the decrease in the import price of vegetable products. The measure of goodness of fit, the adjusted R^2, shows that the model accounts for about 76.6% changes in import price of vegetable products.

In the fifth column of Table 5.7, empirical evidence shows that the regressor of the exchange rate in the present period has a positive but insignificant impact on the price of Mineral products. The impact of the tariff rate on mineral products in the second period on the import price of mineral products is quite profound that a 10% increase in the former engenders a 44.3% increase in the latter. This is explainable by the fact that petroleum products constitute an important component of mineral products import which is driven by the fluctuations in the international oil market. Overtly, the result contains a well defined error correction term which

indicates a feedback of 62.7% of previous period's disequilibrium from the long run elasticities of the identified determinants. Altogether, the regressors accounted for 67.6% of the variations in the dependent variable.

Generally, pass-through of exchange rate to prices of most of the consumer goods products considered in this thesis is greater than one. This implies that exchange rate shock is completely transmitted to prices of consumer goods. The nature of the products and the overdependence on imports create a situation where additional cost is passed on to Nigeria by exporters. Consumer goods constitute about 78% of the total expenditure for the poor households; an increase in its price will further worsen their welfare.

5.5.3 Import Price of Intermediate Products

The import price of the product of chemicals and allied industries responds to the present period of the official exchange rate in column 2 of Table 5.8. This was however found not to be significant. The implication therefore is that exchange rate depreciation affects the import price of the product of chemicals and allied industries insignificantly. There could be other factors such as government policy on importation or domestic production of the products that makes the import price irresponsive to the exchange rate in Nigeria. A negative relationship however exists between the tariff rate in the present period, the first period lag of exchange rate, world export and the import price of the product of chemicals and allied industries. The negative relationship between tariff and the import price of product of chemicals and allied industries could be due to the fact that a decrease in the tariff rate of the product led to an increase in the import price of the product. The error correction term has the right sign and is highly significant indicating that adjustment is fast and the variables keep close to equilibrium. Overall, the independent variables account for 64.2% of the variations in the import price of the product of chemicals & allied industries.

The world export price emerges as the major factor that determines the import price of the plastic, rubber, and articles thereof as presented in column 3 of Table 5.8. A 10% increase in the world export price translates to 64.8% increase in the import price of the plastic, rubber, & articles products in Nigeria. The world export prices in the present period does not have the a-prior positive sign as in some of the other equations but negatively signed. About 96.2 % of the past period's disequilibrium is eliminated in the present period.

In the paper making materials equation result reported in column 4 of Table 5.8, the coefficient of world export prices in the second period is positive, indicating a pass through elasticity of 2.57% to the import price of the paper making materials. Similarly, the coefficient of the official exchange rate from the present period is positive indicating a positive pass-through from the official exchange rate to the import price of the paper making materials of the value 7.9% from a 10% depreciation of the exchange rate. The value of the adjusted R^2 shows that the model accounts for at least 77.7% changes in the import price of the paper making materials product. The disequilibrium in the last period is not however corrected for in the present period in this model, indicating that the model is only a short run phenomenon.

Table 5.8: Parsimonious Models of Import Price of Intermediate Products

	CHEMICAL PRODUCTS: D(LPCHM)	PLASTIC, RUBBER PRODUCTS: D(LPLST)	PAPER MAKING MATERIALS: D(LPPMM)	TEXTILE &TEXTILE PRODUCTS: D(LPTXT)	ARTICLES OF STONES: D(LPARS)	OPTICAL & PHOTOGRAPHIC PRODUCTS: D(LPOPT)
Constant	0.007255 [0.9062]	0.000268 [0.9975]	0.11138 [0.1176]	0.217836 [0.0235]	-0.09837 [0.1209]	0.241321 [0.0015]
World export Price (0)	-	-5.316 [0.1257]	-	-	3.823232 [0.1151]	-2.97264*** [0.0686]
World export Price (-1)	-	6.484884*** [0.0664]	-	9.149864* [0.0055]	-2.98534 [0.1571]	-
World export Price (-2)	-4.653** [0.0296]	-7.57713** [0.0195]	2.57289 [0.1045]	-	-5.35406** [0.038]	-
World export Price (-3)	-	-	-	-	6.515029* [0.0044]	-
Exchange rate (0)	0.444633 [0.162]	-0.72734 [0.2031]	0.79246** [0.0391]	-	0.601568*** [0.0976]	-
Exchange rate (-1)	-0.84603** [0.0226]	-	-	-	-	0.277996 [0.2438]
Exchange rate (-2)	-	-	-	-2.04759* [0.0096]	0.918693** [0.0217]	-1.2856* [0.0011]
Exchange rate (-3)	-	-	-1.83779* [0.0017]	-		-0.29833 [0.3052]
Tariff rate (0)	-	-1.99801*** [0.0541]	-	-		-
Tariff rate (-1)	-1.71354* [0.0065]	-1.5589 [0.1027]	-	1.799356** [0.0183]		-
Tariff rate (-2)	-2.46344* [0.0055]	1.897256 [0.2118]	-	-3.76538** [0.0217]	0.918693** [0.0217]	2.274112* [0.0027]
Tariff rate (-3)	-	-	-2.52581* [0.0005]	-	-1.21992 [0.224]	1.518143*** [0.0671]
ECM(-1)	-0.99901 [0.0001]	-0.96263 [0.0004]	-1.11485 [0.0000]	-0.96942 [0.0004]	-0.85381 [0.0002]	-0.91903 [0.0002]
R-squared	0.735415	0.758283	0.827776	0.764075	0.82103	0.854675
Adjusted R-squared	0.642032	0.629367	0.777122	0.69854	0.718762	0.74568
S.E. of regression	0.206725	0.303194	0.22404	0.306748	0.19459	0.140464
Sum squared resid	0.726499	1.378895	0.853298	1.693697	0.530115	0.236761
Log likelihood	7.916336	0.22673	5.247032	-2.24085	10.7212	18.63254
Durbin-Watson stat	2.006168	2.183588	1.833219	1.742465	1.964612	1.938832
Mean dependent var	0.044092	0.003903	0.068177	0.068367	0.05354	0.072502
S.D. dependent var	0.345518	0.498021	0.474561	0.558685	0.366931	0.278532
Akaike info criterion	-0.07636	0.731106	0.065475	0.686737	-0.14967	-0.78478
Schwarz criterion	0.267238	1.172876	0.361691	0.981251	0.294655	-0.28885
F-statistic	7.875255	5.882001	16.34176	11.65908	8.028186	7.841475
Prob(F-statistic)	0.000359	0.001636	0.000006	0.000039	0.000424	0.000802

Source: Author's computation.

Note: *, **, *** indicate significance at 1%, 5%, and 10% respectively

Figures in square brackets, [ ] are probability values.

The estimation result of the textile and textile articles equation reported in column 5 of Table 5.8 reveals that one period lag of the world export price and the tariff rate on textile and textile articles influence the import price of textile and textile articles. A 10% increase in tariff rate on textiles translates to a pass through of about 17.9% in the import price of textile and textile articles. Official exchange rate in the second period and tariff rate are however negatively related to the import price of the textile products. This does not conform to our a-priori expectation of positive relationship. This could be attributed to the fact that a decline in the tariff rate actually increases import price of the product. The regressors in the model nevertheless explain 69.8% of the variations in the dependent variable. Adjustment is quite fast in the model indicating that 96.9% of last period's disequilibrium is removed in the current period.

The result in column 6 of Table5.8 for articles of stone, plaster, cement, asbestos, mica, ceramic shows that movements in the world export price and the official market exchange rate significantly explain the import price of the product in Nigeria. Judged by its coefficients, there is a pass-through of 6.0% from a 10% change in the official market exchange rate to the import price of articles of stone, plaster, cement, asbestos, mica, ceramic products at the 10% level of significance. In addition, there exists a positive and significant effect of the world export prices in the third period on the import price of articles of stone, plaster, cement, asbestos, mica, ceramic. The coefficient of determination shows that the independent variables account for 71.8% of the changes in the import price of articles of stone, plaster, cement, asbestos, mica, ceramic products. The error correction estimate of 0.853 indicates that 85.3% of the preceding period's disequilibrium is eliminated in the current period, with immediate adjustments captured by the difference terms.

Column 7 of Table 5.8 presents the estimates of the optical, photographic, cinematographic equation. Exchange rate although positive was not found to be significant. Empirical estimates from the equation show that the second and third period lags of the tariff rate have positive and significant influence on the import price of optical, photographic, cinematographic product. For example, a 10% increase in the tariff rate translates into 2.8% increase in the import price of optical, photographic, cinematographic product. The adjustment mechanism also indicates that 91% of the disequilibrium in the past period is corrected in the present period.

5.5.4 Import Price of Capital Goods Product

The result of the import price of base metal and articles of base metal presented in Table 5.9 is in conformity to the other sets of results that pass-through occurs within a dynamic adjustment framework. World export prices in the past two periods and the tariff rate in the immediate past period are negative and significantly influence the import price of base metal & articles of base metal. For example, a 10% increase in the tariff rate results in about 27.0% increase in the import price of base metal and articles of base products. Exchange rate has no impact on the import price of base metal and articles of base metal. The value of the adjusted R^2 shows that the model accounts for about 54.3% changes in the import price of base metal and articles of base metal.

Estimates from the boilers, machinery and appliances and parts thereof in Table 5.9 reveal that the exchange rate in the official market positively and significantly affects the import price of the product. A 10% depreciation of the official market exchange rate leads to about 19.2% increase in the import price of boilers, machinery and appliances and parts thereof. The error correction model of 76% is statistically significant and correctly signed.

5.5.5 Consumer Price Index

Finally, I examine whether exchange rate and import price shocks have any effect on consumer prices. Empirical estimates from the consumer price index equation in Table 5.10 indicate that the official market exchange rate in the current and third period lag are passed on to the domestic consumer price. The coefficient of the world export in the present period has a positive and significant effect on domestic price index. The a-priori positive signs of the coefficients were confirmed by the results reported in Table 5.10. Empirical evidence reveals that there is a pass-through from the official exchange rate to the consumer price index, with the effect being significant. By way of illustration, a 10% depreciation in the official exchange rate results in a pass-through of 7.5% in the consumer price index in current period. In addition, money supply in the present period was found to have positive and significant relationship with the consumer price index. Finally, the gross domestic product in the first and second period lag was also found to have a positive and significant relationship with the consumer price index variable. The error correction estimate of 0.316 indicates that 31.6% of the preceding period's disequilibrium is eliminated in the current period, with immediate adjustments captured by the

difference terms. The value of the adjusted R^2 shows that the model accounts for at least 90.2% changes in the consumer price index.

Table 5.9: Parsimonious Models of Import Price of Capital Goods Product

	BASE METALS: D(LPBAM)	BOILER & MACHINERY: D(LPMCH)
Constant	-0.09536 [0.2716]	0.060049 [0.7074]
World export Price (0)	-4.01373 [0.2400]	-6.04146 [0.2528]
World export Price (-1)	_	-
World export Price (-2)	-7.62661** [0.0174]	-
World export Price (-3)	-	-
Exchange rate (0)	-	1.920385** [0.0413]
Exchange rate (-1)	-	-
Exchange rate (-2)	-	-
Exchange rate (-3)	-	-1.03468 [0.2561]
Tariff rate (0)	1.63281 [0.1784]	-
Tariff rate (-1)	-2.70564** [0.0284]	-
Tariff rate (-2)	-	-
Tariff rate (-3)	-	-
ECM(-1)	-0.92003 [0.0003]	-0.76557 [0.0068]
R-squared	0.59368	0.458184
Adjusted R-squared	0.480813	0.337781
S.E. of regression	0.348791	0.54891
Sum squared resid	2.18979	5.423431
Log likelihood	-5.32355	-16.0208
Durbin-Watson stat	1.789332	2.073342
Mean dependent var	-0.03036	0.061195
S.D. dependent var	0.484064	0.674528
Akaike info criterion	0.943629	1.827894
Schwarz criterion	1.238142	2.074741
F-statistic	5.260008	3.805404
Prob(F-statistic)	0.003766	0.020618

Source: Author's computation.

Note: *, **, *** indicate significance at 1%, 5%, and 10% respectively

Figures in square brackets, [ ] are probability values.

Table 5.10: Parsimonious Model of Consumer Price Index Equation.
Dependent Variable: D(LCPI)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.946040	0.102244	-9.252784	0.0001
D(LWEXP)	9.322716	1.803663	5.168768	0.0021
D(LWEXP(-3))	-22.14125	3.206372	-6.905392	0.0005
D(LEXR)	0.748506	0.220306	3.397578	0.0145
D(LEXR(-1))	-1.215954	0.319855	-3.801577	0.0090
D(LEXR(-2))	-1.314277	0.360282	-3.647908	0.0107
D(LEXR(-3))	2.600524	0.389326	6.679553	0.0005
D(LMSS)	8.717229	1.681381	5.184566	0.0020
D(LMSS(-1))	1.988427	1.440209	1.380652	0.2166
D(LMSS(-2))	-16.24867	2.551943	-6.367179	0.0007
D(LMSS(-3))	7.788336	1.482631	5.253049	0.0019
D(LGDP(-1))	1.822136	0.808934	2.252514	0.0652
D(LGDP(-2))	7.605302	1.322386	5.751197	0.0012
D(LGDP(-3))	-3.600664	0.892412	-4.034757	0.0068
D(LCPI(-1))	0.725817	0.245060	2.961795	0.0252
D(LCPI(-3))	-0.689532	0.131599	-5.239641	0.0019
ECMCPI(-1)	-0.316425	0.363805	-0.869765	0.4179
R-squared	0.973293	Mean dependent var		-0.017067
Adjusted R-squared	0.902073	S.D. dependent var		0.350095
S.E. of regression	0.109557	Akaike info criterion		-1.450224
Sum squared resid	0.072016	Schwarz criterion		-0.610946
Log likelihood	33.67758	F-statistic		13.66600
Durbin-Watson stat	2.558351	Prob(F-statistic)		0.001985

Source: Author's computation.

Table 5.11: Summary of Findings on Exchange Rate Pass-through

	Product group	ERPT coefficient	Technical interpretation	Economic interpretation
	Aggregate Import price	0.89	10% depreciation of the exchange rate leads to 9% increase in aggregate Import prices	Incomplete pass-through to aggregate import prices in Nigeria. Exporters pass about 90% of the changes in exchange rate to import price.
Consumer goods	Live animal	1.97	10% depreciation of the exchange rate leads to 19.7% increase in Import price of live animal products.	More than complete pass-through in this sector implying that exporters pass additional cost onto Nigeria as a result of their market share in this product group.
Consumer goods	Vegetables	1.15	10% depreciation of the exchange rate leads to 11.5% increase in Import price of vegetable products.	More than complete pass-through in this sector implying that exporters pass additional cost onto Nigeria. Local production of the consumer goods will reduce the exports' share in the market, thereby reducing the effect of exchange rate movements.
Intermediate goods	Paper making Material	0.79	10% depreciation of the exchange rate leads to 7.9% increase in Import price of paper making materials.	Incomplete pass-through. Price of paper materials increases by less than the change in exchange rate. The exporters absorb part of the changes in exchange rate.
Intermediate goods	Articles of stones	0.60	10% depreciation of the exchange rate leads to 6% increase in Import price of articles of stones	Incomplete pass-through. Price of articles of stone increases by less than the change in exchange rate. The exporters absorb part of the changes in exchange rate.
Capital goods	Boiler& Machinery	1.92	10% depreciation of the exchange rate leads to 19.2% increase in Import price of boiler& machinery products	More than complete pass-through in this sector implying that exporters pass additional cost onto Nigeria.
	Consumer price index	0.75	10% depreciation of the exchange rate leads to 7.5% increase in domestic prices	Incomplete pass-through to domestic prices in Nigeria. An instantaneous increase in price is expected from any change in exchange rate.

Source: Author's compilation

In summary, except in the prepared foodstuffs; beverages, spirits and vinegar; tobacco product category, exchange rate pass-through was found to be complete in the import price of products in raw material category such as live animal, animal products and vegetable products. In addition, in the import price category of the intermediate products, the import prices of articles of stone, plaster, cement, asbestos, mica, ceramic; paper making materials and optical, photographic, cinematographic were found to record incomplete exchange rate pass-through. The product cases where exchange rate pass-through was found to be complete could be attributed to the fact that the marginal cost is constant. In that case, the law of one price holds, and exchange rate movements are entirely transmitted to import prices.

However, explanation with respect to incomplete exchange-rate pass through to import prices is three-fold. The fact that exporters frequently appear to "price-to-market" provides one key explanation for incomplete pass-through to import prices.[32] In monopolistically competitive markets, optimizing firms vary their desired markup over marginal cost across different markets depending on the elasticity of demand that they face in each market. These demand elasticities depend on the firm's market share, which in turn is affected by exchange rates. Second, the combination of local currency pricing, meaning that an exporting firm sets the price of its good in the currency of the country to which it exports, together with nominal price rigidities implies that exchange rate fluctuations will have less impact on import prices, at least in the short run.[33] Third, several studies[34] have pointed out that distribution costs make up an important component of the retail price of imported goods. Because distribution costs are probably fairly insensitive to shocks driving the exchange rate or foreign costs, they help insulate the retail price of imported goods from the effects of exchange rate fluctuations. Finally, cross-border production can lead to lower pass-through. If production occurs in several stages in a number of different countries, then the final good embodies costs in various currencies that may not all move together, resulting in incomplete pass-through.[35]

The extent and speed of the pass-through to import prices will depend on several factors, including expectations as to the duration of the depreciation, the cost of adjusting prices, and

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[32] This was originally proposed by Krugman, 1987; and Dornbusch, 1987.
[33] This idea was argued by Devereux and Engel, 2002; Bacchetta and van Wincoop, 2005; Campa and Goldberg, 2005; Gopinath, Itskhoki, and Rigobon, 2007.
[34] These are Burstein, Neves, and Rebelo, 2003; Campa and Goldberg, 2005; Berger *et al*, 2007.
[35]The idea was generated by Bodnar, Dumas, and Marston, 2002; Hegji, 2003.

demand conditions. The pass-through process identified in this study consists of two stages. In the first stage, exchange rate movements are transmitted to import prices. In the second stage, changes in import prices are transmitted to consumer prices. Nevertheless, the extent (0.75) to which the changes have been reflected in the consumer price index (CPI) can be attributed to the share of imports in the consumption basket. Typically, however, a change in the exchange rate could affect consumer prices through an additional channel: a currency depreciation which leads to higher prices for imported goods will, in turn, increase the demand for domestically produced goods that compete with imports. As demand rises, there will be upward pressure on domestic prices and nominal wages. Rising wages will exert further upward pressure on domestic prices.

The consumption basket used to compute the CPI in Nigeria consists of domestically produced and imported goods. The extent of pass-through to the CPI will therefore depend on the rate of pass-through to import prices, the share of imports in the consumption basket, and the response of domestically produced goods to movements in the exchange rate. However, the fact that prices of domestically produced goods in our analysis respond to movements in the exchange rate provides an additional reason why the rate of pass-through to consumer prices need not be equal to the share of imports in the consumption basket even if pass-through to import prices is complete. It is worth emphasizing that the responsiveness of prices of domestically produced goods to exchange rate changes is a function of several factors, including substitutability with imports, adjustment costs of domestic prices, and nominal wage stickiness.

An interesting trend that relates the degree of exchange rate pass-through to the share of the product groups in the total imports also emerges from our result. Table 5.12 below and Appendix 5 show that product group which has a relatively higher pass-through coefficient, also has a higher share of the total imports. This confirms the conclusion of Mallick and Marques (2007) that the sectoral differences in exchange rate pass-through is related to the product group's share in total imports.

Table 5.12: Products share (%) of main import categories in Nigeria's total imports (1980-2005)

| Product Categories | AVERAGE SHARE OF IMPORT PRICE IN TOTAL IMPORT OF: | | | | | |
| | Consumer goods | | Intermediate goods | | Capital goods | |
Product group	Share	SR ERPT	Share	SR ERPT.	Share	SR ERPT
1	0.033	1.974	0.050	-0.846	0.044	0.000
2	0.034	1.154	0.025	0.000	0.106	1.920
3	0.031	0.000	0.014	0.792	-	-
4	0.022	0.000	0.005	-2.048	-	-
5	-	-	0.005	0.602	-	-
6	-	-	0.007	-1.286	-	-
Average	**0.030**	**0.782**	**0.018**	**-0.464**	**0.149**	**1.920**

Source: Author's computation

Notes: Product groups 1 to 6 in the first column represent the components of each of the product categories which were made in the following categories based on the nature of the products:

Import Price of Consumer Products [Live Animal, Animal Products (1); Vegetable Products (2); Prepared foodstuffs, beverages, spirits and vinegar; tobacco (3), and Mineral Products (4)];

Import Price of Intermediate Products [Product of chemicals& allied industries (1); Plastic, rubber (2); Paper   Making Materials (3); Textile and textile articles (4); Articles of stone, plaster, cement, asbestos, mica,   ceramic (5); Optical, photographic, cinematographic (6);]

Import Price of Capital Goods [Boilers, machinery and appliances; parts thereof (1); Base metal & articles   of Base metal (2)]

SR- Short run

5.6 Structural Analysis: Variance Decomposition Error

The variance decomposition separates the variation in an endogenous variable into the component shocks to the Vector Error Correction (VEC). It therefore provides information about the relative importance of each random innovation in affecting the variables in the VEC. Tables 5.13 shows the results of the variance decomposition of aggregate import price in Nigeria within a 10-period horizon. The result of the variance decomposition estimates in Table 5.13 indicates that the official exchange rate shocks explain about 10.48% of the variation in the aggregate import price in the tenth period. The impact of present period official exchange rate is a confirmation of the error correction estimates that pass-through to import prices in Nigeria is within a dynamic adjustment of about one or two period lag. About 49% of future changes in the aggregate import price are due to changes in the world export prices while tariff rate explains about 16.08% future impacts. Nevertheless, about 24.10% of future changes in the aggregate import price is due to changes in aggregate import price itself.

In the disaggregated model of import prices, the estimates of the future changes in the variables reveal that exchange rate and the world export price generate a higher pass-through than tariff in the disaggregated import price model. For example in Table 5.14 to 5.20, the exchange rate pass-through to the import prices of Live animal and animal products; Vegetable products; Mineral products; Plastic, rubber and articles thereof; Products of the chemical and allied industries; Paper making material; paper and paperboard, articles; and base metals and articles of base metals at 8.96%, 7.15%, 13.09%, 8.69%, 15.27%, 27.37%, and 4.70%, respectively. While the world export price generates pass-through of 10.69%, 19.82% ,27.79%, 61.25%, 10.88%, 5.68%, and 10.21%, for the same products respectively. It was only in the import prices of Mineral products, and Base metals and articles of base metals that the tariff rate generated a higher pass through of 43.20% and 41.73%, respectively more than both exchange rate and the world export price.

The effect of exchange rate on the CPI is however gradual in Table 5.21. It explains 1.57% in the second period, 3.72% and 11.11% in the third and fifth period, and later, 42.77% in the eighth period. The gross domestic product (GDP) explains only about 4.31% variation in the consumer price index in the first period.

Table 5.13: Variance Decomposition of Aggregate Import price.

Period	S.E.	LAIMP	LWEXP	LEXR	LATRF
1	0.231115	100	0	0	0
2	0.285101	72.33049	0.012789	12.98119	14.67553
3	0.365065	47.39186	19.16468	10.2614	23.18206
4	0.488412	32.23998	34.83042	12.3525	20.5771
5	0.561234	26.45964	44.08301	11.4502	18.00715
6	0.576642	25.06818	46.54657	11.29605	17.08919
7	0.579269	25.45227	46.17195	11.20054	17.17525
8	0.590072	24.98482	47.37566	10.89268	16.74684
9	0.599351	24.22187	48.94987	10.59117	16.23708
10	0.602407	24.10742	49.3211	10.48805	16.08343

Source: Author's computation

Table 5.14: Variance Decomposition of Import price of live animal products

Period	S.E.	LPANM	LWEXP	LEXR	LTANM
1	0.411983	100	0	0	0
2	0.429991	91.82087	1.358586	3.895989	2.924553
3	0.44712	85.79489	2.212829	5.6759	6.316384
4	0.460887	83.11531	3.199025	7.016443	6.66922
5	0.472899	81.20277	4.728972	7.518445	6.549817
6	0.485424	79.327	6.5888	7.719916	6.364287
7	0.496142	77.40501	8.329057	7.959861	6.306076
8	0.504922	75.82301	9.562436	8.27049	6.344065
9	0.511967	74.69679	10.29335	8.623787	6.386074
10	0.51776	73.9463	10.69842	8.960752	6.39452

Source: Author's computation

Table 5.15: Variance Decomposition of Import price of vegetable products

Period	S.E.	LPVEG	LWEXP	LEXR	LTVEG
1	0.294125	100	0	0	0
2	0.314147	87.98431	6.780044	2.228101	3.007549
3	0.342838	82.64829	9.875404	4.082642	3.393661
4	0.365732	74.96271	12.98608	4.777224	7.273986
5	0.384514	68.96588	16.11768	4.69506	10.22137
6	0.395607	65.67766	18.85164	4.623089	10.84761
7	0.401999	64.09579	20.24416	4.857001	10.80305
8	0.406544	63.2142	20.46401	5.519994	10.8018
9	0.410922	62.45789	20.1733	6.388387	10.98042
10	0.414948	61.80849	19.82037	7.150545	11.2206

Source: Author's computation

Table 5.16: Variance Decomposition of import price of mineral products

Period	S.E.	LPMIN	LWEXP	LEXR	LTMIN
1	0.43906	100	0	0	0
2	0.481247	83.43183	6.603583	9.404649	0.559934
3	0.984009	35.00543	8.160729	9.11187	47.72197
4	1.16079	27.77213	21.47378	13.29832	37.45577
5	1.276566	26.21259	26.60069	13.22586	33.96086
6	1.302722	25.1712	27.37723	13.34919	34.10238
7	1.30708	25.14797	27.58788	13.34529	33.91886
8	1.321642	24.75281	27.8613	13.05285	34.33303
9	1.323629	24.81385	27.88295	13.02628	34.27692
10	1.326408	24.904	27.79125	13.09816	34.20659

Source: Author's computation

Table 5.17: Variance Decomposition of Import price of Plastic, rubber and allied products

Period	S.E.	LPLST	LWEXP	LEXR	LTPLST
1	0.286086	100	0	0	0
2	0.313707	90.73164	7.738944	0.278251	1.251169
3	0.553026	29.26399	37.93897	0.667996	32.12905
4	0.637659	25.90533	43.70061	5.804633	24.58943
5	0.833274	16.94523	56.18812	6.127262	20.73938
6	0.882083	15.19638	58.66501	7.441839	18.69678
7	0.882986	15.19051	58.64159	7.495099	18.6728
8	0.894912	15.24404	58.76068	7.814262	18.18101
9	0.943078	13.734	60.85967	8.069205	17.33713
10	0.959946	13.27716	61.25643	8.697393	16.76901

Source: Author's computation

Table 5.18: Variance Decomposition of Import Price of Chemical products

Period	S.E.	LPCHM	LWEXP	LEXR	LTCHM
1	0.27133	100	0	0	0
2	0.296148	86.75934	0.118988	0.72002	12.40166
3	0.313133	78.61946	4.769681	2.467437	14.14342
4	0.345295	66.80862	8.464261	10.37529	14.35183
5	0.367888	63.50975	9.776126	12.49764	14.21648
6	0.373189	63.0022	9.692658	13.36647	13.93867
7	0.375239	62.53076	9.652401	13.91164	13.90519
8	0.377561	61.77773	9.958811	14.52787	13.73558
9	0.380052	61.03913	10.39349	14.99372	13.57366
10	0.382701	60.32	10.88111	15.27109	13.5278

Source: Author's computation

Table 5.19: Variance Decomposition of Import price of Paper and Paper making materials

Period	S.E.	LPPMM	LWEXP	LEXR	LTPMM
1	0.336945	100	0	0	0
2	0.386817	77.90074	2.586023	11.18616	8.327074
3	0.402233	72.06551	3.018304	15.46925	9.446929
4	0.411798	69.12894	2.87989	16.6539	11.33728
5	0.428969	64.33174	3.105835	21.00911	11.55332
6	0.43926	61.45704	3.622614	23.8356	11.08475
7	0.444045	60.33409	3.554623	25.25827	10.85302
8	0.448629	59.11074	3.872482	26.38367	10.63311
9	0.453426	57.86712	4.734592	26.96942	10.42887
10	0.458376	56.62992	5.687894	27.36961	10.31258

Source: Author's computation

Table 5.20: Variance Decomposition of Import price of Base metal &articles of base metals

Period	S.E.	LPBAM	LWEXP	LEXR	LTBAM
1	0.377916	100	0	0	0
2	0.401942	92.73876	1.116792	4.131042	2.013405
3	0.48942	64.0658	4.888315	3.120374	27.92551
4	0.565234	48.77304	8.529874	4.244081	38.453
5	0.616631	42.52303	9.979123	4.333296	43.16455
6	0.636652	42.80867	9.602548	4.540651	43.04813
7	0.643738	43.58675	9.631097	4.455475	42.32668
8	0.646845	43.3536	10.17191	4.511199	41.96329
9	0.64916	43.22191	10.3019	4.653327	41.82286
10	0.652222	43.35444	10.21211	4.700535	41.73291

Source: Author's computation

Table 5.21: Variance Decomposition of Consumer price Index

Period	S.E.	LCPI	LWEXP	LEXR	LATRF	LMSS	LGDP
1	0.282626	100	0	0	0	0	0
2	0.340175	69.39638	14.25461	1.574355	2.710527	7.755631	4.308497
3	0.427425	67.06734	11.01046	3.724495	2.845471	7.769651	7.582582
4	0.511377	61.03108	8.303291	6.606695	13.15955	5.584646	5.314728
5	0.599429	53.32642	6.694135	11.10833	20.11958	4.373242	4.37829
6	0.686623	44.22921	5.47208	21.37947	21.36059	4.093998	3.464647
7	0.783466	37.28898	4.204361	33.93591	18.46491	3.377038	2.728811
8	0.907806	33.82143	3.521538	42.77394	14.58394	2.51695	2.782204
9	1.066581	35.44324	3.740017	45.03672	10.86671	1.943024	2.970295
10	1.237732	39.497	4.518283	43.32852	8.20736	1.514934	2.933905

Source: Author's computation

5.7   Impulse Response

Although variance decompositions show the importance of a variable to movements in another variable, the direction of these movements can only be observed from the impulse response functions. The impulse response analysis is a devise to display the dynamics of the variables tracing out the future reaction of each variable to a particular shock at time t and thus, allow a sensible economic interpretation. All the impulse response graphs for each country are shown in Figures 5.1 to 5.14 in Appendix 4. From Figure 5.1, tariff rate and the official exchange rate impacts the highest shock on the aggregate import price among the variables in the system. The effect of the official exchange rate impulses is positive on the aggregate import price with it making its full impact starting from the second period. The effects of the degree of exchange rate die out at the end of the seventh period. This implies that a positive exchange rate shock affects the aggregate import price considerably in the future. The impulses from the world export price on the aggregate import price was initially negative but start generating positive impulses from the seventh period.

With the exception of the import price of products of the chemical and allied industries, the main structure of the responses of the exchange rate, tariff rate for each of the products, and world export price is the same for most of the disaggregated import prices. The impact of exchange rate shock on import price of live animal and animal product begins with an impact at the end of second period and remains stable afterwards. Similar impacts are observable from the shock on import price of vegetable products, prepared foodstuffs, paper making materials and chemical products. The impulse response functions of the import price of these products in Appendix 4 indicate no short-run impact. On the other hand, the responses of import price of mineral products, plastic, textile materials, article of stone, and base metal to exchange rate shock show similar trend with significant impact beginning from the second period and most die out before the eighth period indicating short-run impacts.

Figure 5.14 shows the accumulated response of the consumer price index to One Standard Deviation Innovations. From the figure, the official exchange rate impacts marginal positive shock to consumer price index. This is surprising as it contradicts the inflation theory of exchange rate, where exchange rate is expected to have significant impact on inflation. This may be due to how the price system is constructed. Recall that the price system is constructed from the tradable and non-tradable sectors, and if the share of the non-tradable sector highly

overwhelms the tradable sector, there may not be any significant impact of the exchange rate on the consumer price index. However, the consumer price index responds negatively to shocks from the world export price and tariff.

The impulse response results indicate a temporary increase in the aggregate import price from the depreciation of the exchange rate. The disaggregated products results, which reveal mix results, require that products where depreciation leads to permanent increase in their prices should be brought into focus in the formulation of monetary policy. This will eventually insulate the domestic economy from the impact of depreciation.

5.8 Comparative Summary

In comparison to past studies, this study found similar results with the studies of Ahmad and Muzafar (1993); Athukorala and Menon (1994); Menon (1995); Kenny and MacGettigan (1996); Lee (1997); Yang (1997); Kiptui, Ndolo and Kaminchia (2005); Oladipo; and Mallick and Marques (2007). The studies found out that pass-through are incomplete but differed across commodities, though stable over the period. Pass-through varies between 66% and 71% in some of the studies. Specifically in the case of Nigeria, our result is similar to Oladipo (2007). He observed that incomplete pass-through was found at aggregate level and all sectors. However, some sectors have faster speed of adjustment than others, indicating their importance to the economy. The result from this study therefore confirms the outcome of other studies on small open economies. The difference recorded in the magnitude of the pass-through in the short run and long run for exchange rate, tariff rate and world export prices between this study and other studies may be attributed to the difference in the periods of analysis, sample size, extent of disaggregation, choice of the product groups, and the methodology adopted.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1   Introduction

In this chapter, a summary of the major findings is undertaken, followed by some policy recommendations and concluding remarks. Finally, areas of possible future research and the limitations encountered during this study are presented.

6.2 Summary of Findings

The need to have a stable exchange rate led to the adoption of the managed floating with no pre-determined path for the exchange rate in 1986 with the adoption of the Structural Adjustment Programme (SAP). This was to insulate the domestic economy from external shocks in the course of formulating an efficient monetary policy aimed at curbing inflationary pressures. This is because Nigeria is recognized for controls in the foreign exchange market, high import tariff, and a thriving parallel exchange market. Consequently, the exchange rate was depreciated using different framework that range from the Second-tier foreign exchange market to the wholesale Dutch auction system (WDAS). Concomitant to the depreciation of the exchange rate, inflation also witnessed certain rapid changes over the same period. Also, from 1986, there has been significant shift in trade policy direction towards greater liberalization. As a result of the adjustment policy, import prices fluctuated over the period.

These events occurred in line with the period of average annual increase in the consumer price index (CPI) of about 78% between 1985 and 1989. This however does not reveal the volatility of changes in CPI as the period entails years of rapid fall and increase in inflation. It was found that annual change in inflation actually rose well above 300% in 1988 relative to the previous year. This volatility has significant implications for the appropriate conduct of monetary policy in an open economy and hence the management of consumer price inflation and balance of payments which are affected by exchange rate movement, through its effect on prices of import. It is therefore necessary to examine the extent of pass-through of exchange rate to aggregate and the disaggregated import prices. Such investigation will assist us in understanding the process of price determination in Nigeria and consequently ensure a robust formulation of monetary policy aimed at curbing inflation.

Consequently, a price model that recognized the impact of impediments to international trade was articulated. The model drew largely on Sharma's price transmission analysis that was predicated on the purchasing power parity doctrine. In the estimation of the import price equation at the aggregate and disaggregated model, the time series properties of the variables were examined. Annual data were used for the estimation. In order to capture the effect of exchange rate pass-through to import prices across product groups, import and tariff data were disaggregated according to the harmonized system of trade classification. A good percentage of the variables in the empirical analysis was found to be integrated of order one. In addition, the cointegration test revealed that there exist long run relationships between the variables in each of the structural equation. Thereafter, a 'general-to-specific' methodology, which involved over-parameterised error correction specifications, was adopted. Import prices were categorized into consumer goods, intermediate products and capital goods products.

Exchange rate pass-through in the aggregate import price equation was found to be incomplete. In the short run, a 10% depreciation of the exchange rate led to 9.0% increase in import prices suggesting that exchange rate shocks were passed on to import prices. This reflects departures from the law of one price (LOOP) in traded goods which might have occurred due to the presence of trade costs or pricing-to- market (PTM) situation. While some of the products recorded complete exchange rate pass-through some other import prices exhibited incomplete pass through. For example, the prepared foodstuffs; beverages, spirits and vinegar; tobacco product category, exchange rate pass-through was found to be complete in the import price of consumer goods products while the import prices of live animal, animal products and vegetable products exhibited incomplete pass through. The explanation is that the product cases where exchange rate pass-through was found to be complete could be attributed to the fact that the marginal cost is constant. In that case, the law of one price holds, up to a constant, and exchange rate movements are entirely transmitted to import prices. In addition, a 10% depreciation raise domestic prices by 7.5%.

In the variance decomposition estimates, the official exchange rate shock explains about 10.48% of the variation in the aggregate import price in the tenth period. The impact of exchange rate is a confirmation of the error correction estimates that pass-through to import prices in Nigeria is within a dynamic adjustment. In addition, about 49% of future changes in the aggregate import price are due to changes in the world export prices while tariff rate explains

about 16.08% future impacts. Nevertheless, about 24.10% of future changes in the aggregate import price is due to changes in aggregate import price itself. In the disaggregated model of import prices, the estimates of the future changes in the variables reveal that exchange rate and the world export price generates a higher pass through than tariff in the disaggregated import price model.

In the impulse response function, the tariff rate and the official exchange rate impact the highest shock on the aggregate import price among the variables in the system. The effect of the official exchange rate impulses is positive on the aggregate import price making its full impact starting from the second period. The impulses from the world export price on the aggregate import price was initially negative but start generating positive impulses from the seventh period.

6.3 Some Policy Recommendations

The findings from the study present various policy implications for Nigeria policymakers in their attempts to achieve price stability.

- **The Central Bank of Nigeria should take account of incomplete pass-through in pursuing inflation targeting**

The knowledge of the pass-through to consumer prices could influence central bankers' forecasts of the future path of inflation, a key element in the conduct of monetary policy. Indeed, the successful implementation of monetary policy presupposes that central bankers have not only a good understanding of inflation dynamics, but that they are also relatively successful at predicting the future path of inflation. If inflation forecasts are based on estimates of exchange rate pass-through that do not take account of an incomplete pass-through, these forecasts could be overestimating the effects of changes in the exchange rate on inflation. The findings of incomplete pass-through to import and domestic prices recorded by this study should assist the CBN in its forecast of future path of inflation and as such provide one of the basic prerequisites of pursuing inflation targeting as a policy of stabilizing and curbing high inflation in Nigeria. The degree of exchange rate pass-through is a very important variable when designing monetary policies, particularly in response to an exchange rate shock. The low exchange rate pass-through to domestic prices provides greater freedom for pursuing independent monetary policy especially through inflation targeting regime.

- **Pursue Supply-side policies**

The complete exchange rate pass-through for a small country case was contradicted on the aggregate data but not in some product groups where pass-through estimates were even more than complete. In an open economy that is highly import dependent, such as Nigeria, the existence of varying degrees of more than complete and incomplete pass-through implies that exporters are able to pass the full effect of exchange rate shock and the cost of production in product groups like vegetable, and boiler and machinery onto the Nigerian market, while absorbing the exchange rate shock on some other product groups like Optical, Chemicals, and Paper making material either as a strategy to maintain their market share or as a result of low demand of products which could arise from high tariff on the products and/or the availability of cheaper domestically produced brand. However, there is a limit to the amount of absorption and in a context where the demand for such products have recovered; exporters will more readily pass on any increase in imported costs in the future. Efforts should be made to further enhance domestic production of these products through supply-side policies such as the disengagement of government from direct production and distribution of farm produce, commercialization of inputs procurement (e.g. fertilizers, chemicals etc.), and promotions on use of improved agricultural inputs. Increasing domestic supply capacity and enhancing international competitiveness should rank high among the strategic objectives of policies at the macro, sectoral and micro levels. Specific market failures, the lack of entrepreneurial base, imperfection in technology and capital markets as well as linkages and externalities among different sectors should be adequately factored into policy measures. The implementation of the various policies should also be monitored so that the intended objectives could be achieved.

- **Pursue a stable tariff policy**

Appropriate utilization of trade policy tools such as tariffs should be used in order to maintain import prices of products at a competitive rate. Although, tariff regimes have been significantly liberalized over the past two decades, further reduction and simplifications of the tariff regime are still possible. In addition, other restrictive measures such as import duties and taxes, import prohibitions, quantitative restrictions and licensing should be reduced to the barest minimum if not completely eliminated. This is because trade policy barrier was found in the study to have significant effect on import prices in Nigeria. For instance, the cases where I

recorded incomplete pass-through may have been as a result of departures from the law of one price (LOOP) in traded goods which might have occurred due to the presence of trade costs or pricing-to- market (PTM) situation.

- **Pursue a stable exchange rate policy**

Nigeria should continue to maintain a stable exchange rate policy in order to mitigate the shocks from the external sector. The naira has long been regarded by the government as a symbol of national strength, with successive government viewing any devaluation as a sign of weakness. Thus the exchange rate was driven more by political considerations than by underlying economic influences. For many years the naira was held unchanged at close to parity with the dollar, becoming increasingly overvalued, making non-oil exports uncompetitive and drawing in growing import volumes at the expense of domestic production. Under pressure from the IMF, however, the naira was devalued in 1986 and again during the structural adjustment programme. However, with the adoption of the structural adjustment framework a thriving parallel market developed, at well above the official rate, and undermined attempts to steer the naira slowly downwards. Nevertheless, the adoption of the wholesale Dutch auction system (WDAS) has reduced the market premium between the official exchange rate and the parallel market exchange rate. The government should therefore continue to maintain a stable exchange rate regime.

6.4 Conclusion

This study makes a contribution to the literature by empirically testing the extent of pass-through of exchange rates and tariffs in the context of an open economy undergoing deep structural change. Nigeria undertook extensive reforms in the mid-1980s, comprising both exchange rate depreciation and tariff reduction. Consequently, this study examines the responsiveness of Nigerian import prices to exchange rate changes and tariff variations and the world export prices. Assessing both the extent and origin of such a decline is important, given potential policy implications such as its effects on central bankers' inflation forecasts, expenditure-switching effects, the international transmission of monetary shocks, and the optimal choice of exchange rate regime and monetary policy regime.

The pass-through of changes in the exchange rate, tariff rates and world export prices into import prices was found to be incomplete or imperfect suggesting that the pricing behaviour of foreign exporters varies across industries and with exchange rate pass through being complete in some of the sectors, and incomplete in some others. The correlation between consumer price inflation and the rate of nominal exchange rate depreciation can indeed be high in an unstable monetary environment in which nominal shocks fuel both high inflation and exchange rate depreciation. A stable monetary policy-supported by an institutional framework that allows the central bank to pursue a policy independent of fiscal considerations and political pressures-effectively removes an important potential source of high pass-through of exchange rate changes to consumer prices. However, pass-through to import prices may not be a prerequisite to low pass-through to consumer prices.

6.5 Some Limitations and Possible Further Research

The basic limitation encountered in the course of the study is data availability on some specific variables such as data on non-tariff barriers, tariff data on intermediate inputs, trade-related infrastructure, and trade related inputs and services that would have made the study more policy relevant. While the study gives some useful guidance to policy makers, a number of points could be clarified by further work, and this should give greater specificity to policy guidelines. For example, the analysis has been mainly cross-sectional at a relatively high level of aggregation. A further disaggregated analysis (6-HS digit level) will be more informative. The use of a more robust cointegration approach like the autoregressive distributed lag (ARDL) model will also be insightful. The approach used in this study precludes in-depth analyses of many firm-specific issues that may be important. The analysis conducted here could thus be supplemented by detailed study of the individual importing firms, at best using a more robust analytical approach.

REFERENCES

Acheampong, K. 2005. The Pass-Through From Exchange Rate To Domestic Prices In Ghana. *Working Paper, Bank of Ghana*. WP/BOG-2005/14

Adenikinju A.F. 2005. African Imperatives in the New World Trade Order: country Case Study of the Manufacturing sector in Nigeria. *Nigeria's Imperatives in the New World Trade Order*. Eds. E. O. Ogunkola & A.S. Bankole. Ibadan: African Economic Research Consortium (AERC) and Trade Policy Research and Training Programme (TPRTP).Chapter 3:101-157.

Adolfson, M. 2001. Monetary Policy with Incomplete Exchange Rate Pass-Through. Stockholm School of Economics, *SSE/EFI Working Paper Series in Economics and Finance* No. 476.

Agu, C. 2005. Designing an exchange rate regime for growth and competitiveness in Nigeria. *African Institute for Applied Economics (AIAE)*, Nigeria.

Alexius, A.1997. Import Prices and Nominal Exchange Rate in Sweden. *Finnish Economic Papers*, 10 (2), pp 99 – 107.

Alston, J.M., Carter, C.A. & Whitney, M.D. 1992. Exchange Rate Pass-Through Effects in Agriculture. *Agriculture and Trade in the Pacific: Toward the Twenty-First Century,* eds. W.T. Coyle, D. Hayes & H. Yamauchi, Westfield Press, Boulder, pp. 261-294.

Ambler, S., Dib, A., & Rebei, N. 2003. Nominal Rigidities and Exchange Rate Pass-Through in a Structural Model of a Small Open Economy. *Working Paper 29, Bank of Canada*

Ameyaw, D. 2004. A Small Macroeconometric Model of Trade and Inflation in Ghana. *Warwick Economic Research Papers Department of Economics, No 696.* University of WarwickCoventryUK

Anaya, J. A. G. 2000. Exchange Rate Pass-Through and Partial Dollarization: Is there a Link?. *CREDPR Working Paper*, 81.

Andrews D.W.K. 1991.Exactly Unbiased Estimation of First Order Autoregressive-Unit Root Models. *Cowles Foundation Discussion Papers 975*, Cowles Foundation, Yale University

Athukorala, P. 1991. ERPT: The case of Korea Exports of Manufactured. *Economics Letters*, 35, pp 79 – 84

_____,and Menon, J. 1994. "Pricing to Market Behaviour and ERPT in Japanese Exports". *Economic Journal*, 104, pp 271-281.

Bache,I. W. 2002. Empirical Modeling of Norwegian of Import Prices. *Norges Bank Working Paper No. 1.*

_____ 2005. Assessing the Structural VAR Approach to ERPT. *Norges Bank Working Paper, No. 31*

Bachetta, P. and Van Wincoop, E. 2005. A Theory of the Currency Determination of International Trade. *Journal of International Economics*.

Baier S. L. and Bergstrand, J. H. 2001. The growth of world trade: tariffs, transport costs, and income similarity. *Journal of International Economics* 53 (2001) 1–27.

Bailliu, J and Fujii,E .2004. Exchange Rate Pass-Through and the Inflation Environment in Industrialized Countries: An Empirical Investigation. *Bank of Canada Working Paper no 2004–21 (Ottawa: Bank of Canada).*

Baldwin, R. E. 1988. Hysteresis in Import Prices: the Beachhead Effect. *American Economic Review* 78:773-85.

Baldwin, R., and Krugman, P.1989. Persistent Trade Effects of Large Exchange Rate Shocks. *Quarterly Journal of Economics*, 635-654.

Bankole, A. S. and Bankole, M. A. 2004. Industrial Trade and Export Promotion Policies and Revealed Comparative Advantage in Nigeria's Manufactured Exports, Eds. Garba, Abdul-Ganiyu et al . *Leading Issues in Macroeconomic Management and Development*, NES, Ibadan.

Barhoumi, K. 2005. Differences in Long Run Exchange Rate Pass-Through into Import Prices in Developing Countries: An Empirical Investigation. *Université de la Méditerranée AixMarseille II and REQAM,Centre. de la Veille* Charité,2 rue de la Charité, MarseilleCedex02,France.http://www.cerdi.org/colloque/AFSE2005/papier/Barhoumi

Batini, N .2004. Achieving and Maintaining Price Stability in Nigeria. *IMF Working Paper*, WP/04/97. June 1.

Bentzen, J.,and Engsted, T.2001. A Revival of the Autoregressive Distributed Lag Model in Estimating Energy Demand Relationships. *Energy* :26; 45-55.

Berger, D., Faust J., Rogers J. H., and Steverson, K. 2007. Border Prices and Retail Prices. Unpublished paper. *Washington: Board of Governors of the Federal Reserve System.*

Bergin, P. R. and R. C. Feenstra .2001. Pricing-to-Market, staggered contracts, and Real Exchange rate Persistence. *Journal of International Economics* 54, 333—59.

Bergin, P. R. .2006. How well can the New Open Economy Macroeconomics explain the

Exchange Rate and Current Account? In Press, *Journal of International Money and Finance*

Betts C. and Devereux, M. 1996. The Exchange Rate in a Model of Pricing-to-Market, *European Economic Review*, Vol. 40, Issue 3-5, pp.1007-21.

_____.2000. Exchange Rate Dynamics in a Model of Pricing-to- Market. *Journal of International Economics*, Vol. 50, 215-244.

Bhagwati, J.N. 1988.The pass-through puzzle: The missing price from Hamlet. *mimeo.*, Columbia University, December.

Bhundia, A, 2002. An Empirical Investigation of Exchange Rate Pass-Through in South Africa. *IMF Working Paper* No. 02/165

Billmeier, A. and Bonato,L. 2002. Exchange Rate Pass-Through and Monetary Policy in Croatia. *IMF Working Paper*, No. 109, Washington D.C.: International Monetary Fund, http://www.imf.org.

Blavy, R 2004. Inflation and Monetary Pass-Through in Guinea. *IMF Working Paper*, WP/04/223

Bodnar, G., B. Dumas, Marston and R. 2002.Pass-through and Exposure. *Journal of Finance*, 57, 199-231.

Branson, W. H. 1989. Comment on Hooper and Mann. *Brookings Papers on Economic Activity*,1989:1, 330-33.

Branson, W. H. 1972. The Trade Effects of the 1971 Currency Realignments. *BPEA, I:1972,* 15-65.

Burstein, A., Neves J., and Rebelo, S. 2003.Distribution Costs and Real Exchange Rate Dynamics during Exchange-Rate-Based Stabilizations. *Journal of Monetary Economics,*

Bushe, D.M., Kravis, I.B. & Lipsey, R.E. 1986. Prices, Activity and Machinery Exports: An Analysis based on New Price Data. *Review of Economics and Statistics,* vol. 68, no. 2, pp. 248-254.

Bussiere, M. 2007. Exchange Rate Pass-Through to Trade Prices the Role of non-Linearities and Asymmetries. *European Central Bank*. No 822 / October 2007

Ca' Zorzi, M. Hahnand, E. and Sánchez, M. 2007. Exchange Rate Pass-Through In Emerging Markets. *European Central Bank*. No 739 / March 2007.

Calvo, G. 1983. Staggered Prices in a Utility-Maximizing Framework. *Journal of Monetary*

Economics, Vol. 12, 383-398.

Campa, J.M., and. Goldberg, L.S 2002. Exchange Rate Pass-Through into import prices: a macro or micro phenomenon? *NBER Working Paper* No. 8934.

Campa, J. and Goldberg, L.S. 2005. Exchange Rate Pass Through into Import Prices. *Review of Economics and Statistics*, November, 87 (4): 679-690.

Campa, J.M., L.S., Goldberg, and J. M. Gonzalez. 2005. Exchange Rate Pass Though into Euro-area Import Prices. Staff Reports no. 219 (September*), Federal Reserve Bank of New York.*

CBN.1992. Central Bank of Nigeria,Bullion

CBN.2006. Central Bank of Nigeria Statistical Bulletin

CBN.2007. A Brief on the Central Bank of Nigeria (CBN) Act, 2007. Publication of Legal Services Division, Central Bank of Nigeria.

Chari, V. V., Kehoe, P. J., & McGrattan, E. R. 2002. Can Sticky Price Models Generate Volatile and Persistent Real Exchange Rates? *Review of Economic Studies*, 69, 533–563.

Chistiano, L, Eichenbaum, M. and Evans, C. 2005. Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy. *Journal of Political Economy*, 113

Choudhri, E., and Hakura, D. 2001. Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?. *IMF Working Paper*,Vol.1 No.194.

Choudhri, E. U, Faruqee H., and Hakura, D. S. 2005. Explaining the Exchange Rate Pass-through in Different Prices. *Journal of International Economics* Vol. 65 (March), pp 349-74.

Choudhri, E. U. & Hakura, D. S. 2006. Exchange rate Pass-through to Domestic Prices: Does the Inflationary Environment matter? *Journal of International Money and Finance*, 25, 614–639.

Coricelli, F. B. Jazbec and Masten, I. 2003. Exchange Rate Policy and Inflation in Acceding Countries:The Role of Pass-through*. William Davidson Institute Working Paper* Number 674

Corsetti, G. and Dedola, L. 2005. A Macroeconomic Model of International Price Discrimination.*Journal of International Economics* 67, 129—155

Corsetti, G. & Pesenti, P. 2005. International Dimensions of Optimal Monetary Policy. *Journal of Monetary Economics*, 52, 281–305.

Daly, D., Hellerstein, R, and Marsh, C. 2006. Have U.S. Import Prices Become Less Responsive to Changes in the Dollar? *Current Issues in Economics and Finance, Federal Reserve Bank of New York.*

Damania, R. 1998.The Scope for Exchange Rate Pass-Through in an Oligopoly. *Working Paper* no. 7, Department of Economics, University of Adelaide, South Australia.

Deardorff, A. V. 2000. Glossary of International Economics. Retrieved Nov.21 2007, from http://www-personal.umich.edu/~alandear/glossary/l.html

Devereux, M.B., and Engel, C. 2002. Exchange Rate Pass-Through, Exchange Rate Volatility, and Exchange Rate Disconnect. *Journal of Monetary Economics*, vol. 49 (July), pp. 913-40.

Devereux, M.B., Engel, C. and Storgaard, P.E. 2004. Endogenous Exchange Rate Pass-through When Nominal Prices are set in Advance, *Journal of International Economics* Vol.63 pp. 263-291

Devereux, M.B. and Yetman, J.2003. Price-Setting and Exchange Rate Pass-Through: Theory and Evidence, In Price Adjustment and Monetary Policy: *Proceedings of a Conference Held at the Bank of Canada*, November 2002, November 2003: 347-371.

Dickey, D. A. and Fuller W.A. 1979. Distribution of the estimator for autoregressive time series with a unit root. *Journal of the American Statistical Association* **74**, 427-431.

Dixit, A. & Stiglitz, J. 1977, Monopolistic Competition and Optimum Product Diversity, *American Economic Review* vol. 67 (June), pp. 297-308.

Dornbusch, R. 1987. Exchange Rates and Prices. *American Economic Review* 77, 93-106.

Engle, R. and Granger C. 1987. Co-integration and Error Correction: Representation, estimation, and testing. *Econometrica*, vol. 55, pp. 251-276.

Engel, C. and Rogers, J.H. 2001. Deviations from the Purchasing Power Parity: Causes and Welfare Costs.` *Journal of International Economics* 55, 29-57.

Engel, C. 2004. On the Relationship between Pass-Through and Sticky Nominal Prices. *Working Paper* 11/2004, Hong Kong Institute for Monetary Research.

Faruqee, H. 1995. Pricing to Market and the Real Exchange Rate, *IMF Staff Papers,* vol. 42, no. 4 (December), pp.855-881.

Faruqee, H. 2004. ERPT in the Euro Area: The Role of Asymmetric Pricing Behavior. *IMF Working Paper* WP/04/14, International Monetary Fund.

Faruqee, H. 2006. Exchange-rate pass-through in the euro area. *IMF Staff Papers*, 53, 63–88.

Feenstra, R.C. 1989. Symmetric Pass-through of Tariffs and Exchange Rates Under
Imperfect Competition: An Empirical Test. *Journal of International Economics*, **26**, pp. 119-137

Feenstra, R.C., Gagnon, J.E. & Knetter, M.M. 1993. Market Share and Exchange Rate Pass-Through in World Automobile Trade. *National Bureau of Economic Research, Working Paper* no. 4399 (July).

Feinberg, R. M.1989. The Effects of Foreign Exchange Movements on U.S. Domestic Prices. *Review of Economics and Statistics*, August 1989, 505-11.

Fischer, S .2001. Distinguished Lecture on Economics in Government-Exchange Rate Regimes: Is the Bipolar View Correct? *The Journal of Economic Perspectives*, Volume 15, Number 2, Spring 2001, 3-24.

Frankel, Jeffrey,Parsley, D. and Shang-Jin Wei .2004. Slow Pass-through Around the World: A New Import for Developing Countries? *Harvard University*, July 8.

Friberg, R .1998. In Which Currency Should Exporters Set Their Prices? *Journal of International Economics*, Vol. 45, No. 1, 59-76.

Friedman, M. 1953. The Case for Flexible Exchange Rates. In *Essays in Positive Economics* 157–203.Chicago: University of Chicago Press.

Friedman, M. 1963. *Inflation: Causes and Consequences* .New York: Asia Publishing House.

Froot, K. and Klemperer, P. 1989. Exchange Rate Pass-Through when Market Share Matters. *American Economic Review*, Vol. 79, No. 4, 637-654.

Fuller, W.A. 1976. *Introduction to Statistical Time Series*. New York*:* Wiley

Gagnon, J. and Ihrig, J. 2001. Monetary Policy and Exchange Rate Pass-through, Board of Governors of the Federal Reserve System. *International Finance Discussion* Papers No.704 (July).

Gagnon, J. E. & Ihrig, J. 2004. Monetary Policy and Exchange Rate Pass-Through. *International Journal of Finance and Economics*, 9, 315–338.

Gagnon, I.E. and Knetter, M.M. 1992. Markup Adjustment and Exchange Rate Fluctuations: Evidence from Panel Data on Automobile Exports. *National Bureau of Economic, Research*, Working Paper no. 4123 (July).

Gal´ı, J. & Monacelli, T. 2005. Monetary Policy and Exchange Rate Volatility in a Small Open Economy. *Review of Economic Studies*, 72, 707–734.

Garcia, C.J. and Restrepo,J.E. 2001. Price Inflation and Exchange Rate Pass-Through in Chile. *Central Bank of Chile Working Paper* , 128.

Ghosh, A. and Holger W. 1994. Pricing in International Markets: Lessons from the Economist. *NBER Working Paper Series* No. 4806, July.

Giovannini, A. 1988. Exchange Rate and Good prices. *Journal of International Economics,* 24, pp 45 − 68.

Goldberg, L. and Tille, C. 2005. Vehicle Currency use in International Trade. *NBER Working Paper* 11127

Gopinath, G., O. Itskhoki, and Rigobon, R. 2007. Currency Choice and Exchange Rate Pass-through. *NBER Working Paper* 13432.

Goldberg, P. and Knetter, M. 1997. Goods Prices and Exchange Rates: What Have We Learned? *Journal of Economic Literature*, vol. 35, 1243-92.

Goldstein, M. and Khan M.S. 1985. Income and Price Effects in Foreign Trade, in R.W. Jones and P.B. Kenen, eds., *Handbook of International Economics*, Vol. II, 1040-1105

Goldfajn, I. and Werlang, S.R.C. 2000. The Pass-through from Depreciation to Inflation: A Panel Study. *Banco Central do Brasil Working Paper* No. 5.

Greene, J. Inflation in African Countries: General Issues and Effect on the Financial Sector. *Working Paper* WP/89/86, *International Monetary Fund*, October 1989.

Gron, A. and D. Swenson. 1996. Incomplete Exchange Rate Pass-Through and Imperfect Competition: The Effect of Local Production. *American Economic Review*, May: 71-76.

Gust, C. and Sheets, N. 2006. The Adjustment of Global External Imbalances: Does Partial Exchange Rate Pass-through to Trade Prices Matter? *International Finance Discussion Papers* 850, Board of Governors of the Federal Reserve System.

Hahn, E. 2003. Pass-through of External Shocks to Euro Area Inflation. *ECB Working Paper* No. 243 (Frankfurt: European Central Bank).

Hänninen, R.H. 1998. *Exchange Rate Changes and the Finnish Sawnwood Demand and Price in the UK Market*. Silva Fennica 32(1): 61–73.

Haskel, J. and Wolf H. 2001. The Law of One Price-A Case Study. *Scandinavian Journal of Economics* 103 (4), 545–558.

Hegji, C.E. 2003. A Note on Transfer Prices and Exchange Rate Pass-Through. *Journal of Economics and Finance* 27(3): 396–403.

Helkie, W.L. and Hooper P. 1986. *An Empirical Analysis of the External Deficit*. 1980-86. *External Deficit and the Dollar: The Pit and the Pendulum,* eds. R.C. Bryant, G. Holtham and P. Hooper, The Brookings Institution, Washington, D.C, pp. 10-46.

Helleiner, G. K. 1992. Introduction. in Helleiner G.K. Ed. *Trade Policy Industrialization and Development: New Perspectives*. Clarendon Press, Oxford.

Helleiner, G. K. 1995. *Trade Policy and Industrilization Reconsidered, World Development Studies* No. 6, WIDER (UNU), Helsinki

Herzberg, V. G. and Kapetanios ET S. Price.2003. Import Prices and Exchange Rate Pass-through : Theory and Evidence from the United Kingdom. *Bank of England Working Papers Series*, WP. no. 182,

Hooper, P. and Mann C.L. 1989. Exchange Rate Pass-Through in the 1980s: The Case of U.S. Imports of Manufactures. *Brookings Papers on Economic Activity*, 1: 297-337.

Hopper, P. and Marquez, J. 1993. Exchange rates, Prices, and External Adjustment in the United States and Japan. *International Finance Discussion Paper* no. 456 (October), Board of Governors of the Federal Reserve System, Washington, D.C.

Hossain, A. 2002. Exchange Rate Response to Inflation in Bangladesh. *IMF Working Paper* 02/166 (Washington: International Monetary Fund).

Hung, W. ,Kim,Y. and Ohno, K. 1993. Pricing Exports: A Cross-Country Study. *Journal of International Money and Finance*, No.12, pp. 3-28.

Hyder, Z. and Shah, S. 2004. Exchange Rate Pass-Through to Domestic Prices in Pakistan. *State Bank of Pakistan Working Papers*, No. 5 June 2004

Ihrig, J., Marazzi, M. and Rothenberg, A. 2006. Exchange-Rate Pass-Through in the G-7 Countries. Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, no. 851 January.

Im, K.S., Pesaran, H. Shin, Y. 1997. Testing for Unit Roots in Heterogenous Panels. *Universityof Cambridge, Working Paper* 9526.

Isard, P. 1977. How far can we push the 'law of one price?', *American Economic Review* 67, 942-948

Johansen, S. 1988. Statistical Analysis of Co-integration Vectors. *Journal of Economic Dynamics and Control* 12, 231-54.

Johansen, S. 1991. Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*. 59, 155 1-1580.

Johansen, S. 1995. *Likelihood-based Inference in Cointegrated Vector Autoregressive Model.* Oxford University Press.

Johansen, S. and Juselius K. 1990. Maximum Likelihood Estimation and Inference on Cointegration—With Applications to the Demand for Money. *Oxford Bulletin for Economics and Statistics* 52, 169-210.

Kadiyali, V. 1997. Exchange Rate Pass-through for Strategic Pricing and Advertising: An Empirical Analysis of the U.S. Photographic Film Industry. *Journal of International Economics* 43 (3-4): 437-461

Kahn, G.A. 1987. Dollar Depreciation and Inflation. *Federal Reserve Bank of Kansas City Economic Review*, Vol. 72, No. 9, November, pp. 32-49.

Kasa, K. 1992. Adjustment costs and pricing to market: theory and evidence. *Journal of International Economics* 32 (1e2), 1e30.

Kenny, G. and McGettigan D. 1996. Exchange Rate Pass-Through and Irish import prices. *Central Bank of Ireland, Working Paper* 6/RT/96.

_____.1998. Exchange Rates and Import Prices for a Small Open   Economy: the Case of Ireland. *Applied Economics*, 30, 1147-1155.

Khosla, A. and Teranishi, J. 1989. Exchange Rate Pass-through in Exports Prices – An International Comparision. *Hitotshubashi Journal of Economics*, 30, 31-48.

Khundrakpam, J.K. 2007. Economic Reforms and Exchange Rate Pass-Through to Domestic Prices in India. *BIS Working Papers*, No 225. Monetary and Economic Department. February 2007.

Kikuchi, A. and Sumner, M. 2002. Exchange Rate Pass-Through in Japanese Export Pricing. *Applied Economics*, 34, 279-284.

Kindleberger, C.P. 1963, *International Economics,* 3rd edition, Richard D. Irwin, New York.

Kim, Y. 1990. Exchange Rates and Import Prices in the U.S: A Varying Parameter Estimation of Exchange Rate Pass-Through. *Journal of Business and Economic Statistics*, 8 (3), pp 305 – 315.

_____.1991. External Adjustments and Exchange Rate Flexibility: Some Evidence from U.S. Data. *The Review of Economics and Statistics*, Vol. 73, No. 1, February, pp. 176-81.

Kim, K. H. 1998. US Inflation and the Dollar Exchange Rate: A Vector Error-correction Model. *Applied Economics*, 30, 613-619.

Kiptui, M., Ndolo, D. and Kaminchia, S. 2005. Exchange Rate Pass-Through: To What Extent

Do Exchange Rate Fluctuations Affect Import Prices and Inflation in Kenya. *Central Bank of Kenya Working Paper* No.1 April 2005.

Knetter, M. 1989. Price Discrimination by U.S. and German Exporters. *The American Economic Review*, Vol. 79, 198-210.

_____.1992a. Exchange Rates and Corporate Pricing Strategies. *NBER Working Paper* No. 4151, August

_____. 1993. International Comparisons of Price-to-Market Behavior. *American Economic Review* 83,473–486.

Kongsted, H. C. 2003. A Co-integration Analysis of Small-Country Import Price Determination. *Econometrics Journal*, 6, 53–71.

Kreinin, M.E. 1977. The Effect of Exchange Rate Changes on the Prices and Volume of Foreign Trade. *International Monetary Fund Staff Paper*, vol. 24 pp. 297-329.

Krugman, P. 1986. Pricing-to-Market When the Exchange Rate Changes. *National Bureau of Economic Research*, WP 1926,

_____. P.1987. *Pricing to Market When the Exchange Rate Changes*, in *Real-Financial Linkages Among Open Economies*. "ed". by S. W. Arndt and J. D. Richardson(Cambridge, Massachusetts: MITJ.

Lattimore, R. 1988. Exchange Rate Changes and Competitiveness in Australian Manufacturing. *Working Paper*, No. 48 (Bureau of Industry Economics).Canberra: Australian Government Publishing Service

Laxton, D. & Pesenti, P. 2003. Monetary Rules for Small, Open, Emerging Economies. *Journal of Monetary Economics*, 50, 1109–1146.

Leigh, D. and Rossi M. 2002. Exchange Rate Pass-Through in Turkey. *IMF Working Paper* no 02/204 (Washington: International Monetary Fund).

Lerner, A. 1944. *The Economics of Control.* Macmillan, London.

Limao, N. and Venables, A.J. 2001. Infrastructure, Geographical Disadvantage, Transport Costs and Trade. *World Bank Economic Review* 15: 451-479

MacKinnon, J. G. 1996. Numerical Distribution Functions for Unit root and Co-integration Tests. *Journal of Applied Econometrics*, 11, 601–618.

Magee, S. P. 1974. U.S. Import Prices in the Currency-Contract Period. *BPEA*, *1:1974,* 117-68.

Mallick, S. and Marques, H. 2007. Pass-through of Exchange Rate and Tariff into Import Price of India: Currency Depreciation versus Import Liberalization. *Accepted for Publication under Review of International Economics*

Mankiw, N. G. 2003. *Macroeconomics* (5th ed.). New York: Worth publishing.

Mann, C.L.1986. Prices, Profit Margins and Exchange Rates. *Federal Reserve Bulletin* 72, 366-79.

Marazzi, M., Sheets, N. and Vigfusson, R.. 2005. Exchange Rate Pass Through to US Import Prices: Some New Evidence. Federal Reserve Board of Governors. *International Finance Discussion Paper,* No. 833, April.

Marshall, A. 1923. *Credit and Commerce.* Macmillan, London.

Marston, R.C. 1990. Pricing to Market in Japanese Manufacturing. *Journal of International Economics*, 29, 217–236.

Marston, C. 1990. Pricing to Market in Japanese Manufacturing. *Journal of International Economics,* 29 (3-4): 217-236.

McCallum, Bennett, and Nelson, E. 2000. Monetary Policy for an Open Economy: An Alternative Framework with Optimizing Agents and Sticky Price. *Oxford Review of Economic Policy*,Vol. 16. No. 4.

McCarthy, J. 2000. Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in some Industrialized Economies. *Federal Reserve Bank of New York Staff reports 111.*

McCarthy, J. 1999. Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in some Industrialized Economies.*BIS Working Paper* No.79

McFarlane, L. 2002. Consumer Price Inflation and ERPT in Jamaica. *Research and Economic Programming Division Bank of Jamaic,* Octobe*r.*

Melick, W.1990. Estimating Pass-Through: Structure and Stability. *International Finance Discussion Paper*, No 387, Board of Governors of the Federal Reserve System,

Menon, J. 1992. Exchange Rates and Prices of Australia Manufactured Exports. *Weltwirtschaftliches Archiv*, 128 (4).

_____. J.1993a. Exchange Rate Pass-Through: Australian Imports of Motor Vehicles. *International Economic Journal*, Vol.7, pp 93 − 109.

_____. J. 1993b. Exchange Rates, Import Prices and the Macro economy. *Economic Papers*, 12, pp 37 − 48.

_____. J. 1995. *Exchange Rates and Import Prices for a Small Open Economy*. Applied Economics, 27, 297-301.

.1995. Exchange Rate Pass-Through. *Journal of Economic Surveys*, 9, 197-231

.1996. The Degree and Determinants of ERPT: Market Structure, Non-tariff Barriers, and Multinational Corporations. *Economic Journal* 106:434-444

Monacelli, T. 2005. Monetary Policy in a Low Pass-Through Environment. *Journal of Money, Credit, and Banking*, 37, 1047–1066.

Moreno, R. 1989. Exchange Rates and Trade Adjustment in Taiwan and Korea. *Federal Reserve Bank of San Francisco Economic Review*, 2, pp 30- 48.

Moser, G.G. 1995. .The Main Determinants of Inflation in Nigeria. *IMF staff Papers*, Vol.42, no.2: 271-289.

Mwase, N. 2006. An Empirical Investigation of the ERPT to Inflation in Tanzania. *IMF Working Paper* No. 05/35 (Washington, International Monetary Fund).

Naug, B. and Nymoen, R. .1996. Pricing to Market in a Small Open Economy. *Scandinavian Journal of Economics*, Vol. 98, No. 3, 329-350.

NdaferanKhande,M.D. and Ndhlovu,T.M. 2006. Inflationary experiences in Malawi: An investigation of the underlying Determinants (1980.1-2002.4). This paper is a Final Research Report presented to the African Economic Research Consortium, Nairobi, Kenya, February, 2005.

Nelson, C., and Plosser, C. 1982. Trends and RandomWalks in Macroeconomics Time Series: Some Evidence and Implications. *Journal of Monetary Economics*, 10, 139-162.

Newey, Whitney, K. & West, Kenneth, D. 1994. Automatic Lag Selection in Covariance Matrix Estimation. *Review of Economic Studies, Blackwell Publishing*, vol. 61(4), pages 631-53, October.

Nnanna, O. J. 2002. Monetary Policy and Exchange Rate Stability in Nigeria. *Proceedings of a One-day seminar organized by Nigerian Economics Society* held on 23 May 2002.

Obstfeld, M. 2001. International Macroeconomics: Beyond the Mundell - Fleming Model. *NBER working paper 8369*
.
Obstfeld, M. and Rogoff K. 1995. Exchange Rate Dynamics Redux. *Journal of Political Economy*, June 103 (3): 624–60.

_____.1998. Risk and Exchange Rates. *NBER Working Paper*, No. 6694.

_____.2000. New Directions for Stochastic Open Economy Models. *Journal of International Economics,* 50 (1): 117–53.

Ogunkola E. O, Bankole, A.S. and Adewuyi, A.O.2006. An evaluation of the impact of Nigeria's Trade and Investment Policy Reforms. *Trade Policy Research and Training Programme* (TPRTP) Department of Economics University of Ibadan, Ibadan , Nigeria.

Ogun, O. 2000. Exchange Rate Changes and Export Prices in a Small Semi-Open Economy. *Open Economies Review* No.11: 127-134

Ohno, K. 1989. Export Pricing Behaviour of Manufacturing: A U.S.-Japan Comparison. *International Monetary Fund Staff Papers,* Vol. 36, no. 3, pp. 550- 579,

Oladipo, O. 2007. Exchange Rate Pass-Through: A Case Study of a Small Open Economy. *Global Economy Journal*, Vol.7, 1ssue 3, Article 4.

Olaniyi, O .2005. Nigeria's Trade Policy from 1960 - 2004: A critical Review. Paper presented at the Workshop on Capacity Building on International Trade. National Assembly in Collaboration with Friedrich Ebert Stiftung (Nigeria), Jos, 25 - 27 July 2005.

Olivei, G. P. 2002. Exchange Rates and the Prices of Manufacturing Products Imported into the United States. *New England Economic Review*, First Quarter, 3-18.

Otani, A., Shiratsuka, S. and Shirota, T. 2003. *The Decline in the Exchange Tate Pass-Through:Evidence from Japanese Import Prices*. Monetary and Economic Studies, 21:53-81.

Otani, A., Shiratsuka, S. and Shirota T. 2005. Revisiting the Decline in the Exchange-Rate Pass-Through: Further Evidence from Japan's Import Prices. *IMES Discussion Paper Series* no. 2005-E-6, July.

Oyaromade, R. and Olubusoye, O.E. 2007. Inflationary Dynamics in Nigeria: A Reassessment. .*African Journal of Economics Policy*, Vol.14, No.2, December,2007.

Oyejide, T. A. 1999. Options for Future Trade Liberalization in Sub-Saharan Africa. Eds.T.A Oyejide, B. Ndulu and D. Greenaway. *Regional Integration and Trade Liberalization in Sub-Saharan Africa*. Vol. 4: Synthesis and Review, Macmillan, London.

Oyejide, T. A., Ogunkola E.O. and Alaba, O.B. 2005. The Impact of Agricultural Trade and related Reforms on Domestic Food Security: Nigeria Country Case Study. *Nigeria's Imperatives in the New World Trade Order*. Eds. E. O. Ogunkola & A.S. Bankole. Ibadan: African Economic Research Consortium (AERC) and Trade Policy Research and Training Programme (TPRTP).Chapter 5:241-329.

Parsley, D.C. 1993. Exchange Rate Pass-Through: Evidence from Aggregate Japanese Exports. *Southern Economic Journal,* vol. 60, no. 1, pp. 454-462.

Pedroni, P. 1996. Fully modified OLS for Heterogenous Cointegrated Panels and the Case of Purchasing Power Parity. *India University Working Paper in Economics,* 96-020.

Pedroni, P. 1999. Critical values for Cointegration Tests in Heterogenous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics*, 61: 653-678.

Phillips, R. W. 1988. The Pass-through of Exchange rate changes to Prices of Imported Manufactures. *Discussion Paper No. 197, Centre for Economic Policy Research*, Australian National University, Canberra.

Phillips, R.W. 1991. Exchange Rate Pass-Through and Import Prices. *The Economic Dynamics of   Australian Industry*, Ed. C. Hamilton, Allen & Unwin, Sydney, pp. 30-46.

Phillips P. and Perron, P. 1988 .Testing for a unit roots time series regression. *Biometrika* 75, 335-346.

Pigou A. C.1920. Some Problems of Foreign Exchange. *The Economic Journal*, Vol. 30, No. 120. (Dec., 1920), pp. 460-472.

Pollard. P. S., and Coughlin , C. C. 2004. Size matters: Asymmetric exchange rate Pass-through at the industrial level. *The University of Nottingham, Research Paper Series*, n. 13.

Rabanal , P., and Schwartz, G.2001. Exchange Rate Changes and Consumer Price Inflation: 20 months after the floating of the Real in Brazil: Selected Issues and Statistical Appendix. IMF Country Report N0. 01/10, IMF.

Radelet, S. and Sachs,J. 1998. Shipping Costs, Manufactured exports, and Economic Growth. Paper presented at American Economic Association meeting, Harvard University.

Reginaldo P.N.J.2006. Inflation Targeting and the Role of Exchange Rate Pass-through. Staff Paper presented at Department of Economics, University of Kent Canterbury.

Rincón, H., E. Caicedo, and Rodríguez. N.2005. Exchange Rate Pass-Through Effects : A Disaggregate Analysis Of Colombian Imports of Manufactured Goods.Retrieved from Borradores de Economia 002682, Banco de la República. http://ideas.repec.org/s/col/000094.html

Rotemberg, J. 1982. Monopolistic Price Adjustment and Aggregate Output. *Review of Economic Studies*, Vol. 49, 517-531

Rotemberg, J. J. & Woodford, M. 1997. An optimization-based econometric model for the Evaluation of Monetary Policy. *NBER Macroeconomics Annual*, 12(12), 297–346.

Sharma, R. 2003. An overview of FAO Studies on International Trade and Household Food Security and Methodology. Paper presented at Infosamak Expert Consultation on

International Fish Trade and Food Security, in cooperation with Fish Utilization and Marketng Service(FIIU) FAO Rome, Casablanca, Morocco, 27-30 January.

Slavov S. T. 2007. Does Monetary Integration Reduce Exchange Rate Pass-Through? Bulgarian National Bank (BNB) *Economic Research and Forecasting Directorate*

Smets, F. and Wouters, R. 2002. Openness, Imperfect Exchange rate Pass-through and Monetary Policy. *Journal of Monetary Economics*, 49:947–981.

Spitaller, E. 1980. Short-Run Effects of Exchange Rate Changes on Terms of Trade and Trade Balance. *IMF Staff Papers* 27:320-348.

Stulz, J.2007. Exchange Rate Pass-Through in Switzerland: Evidence from Vector Autoregressions. *Swiss National Bank Economic Studies.* Retrieved from http://www.snb.ch/en/ifor/research/id/research_studies.html

Taylor, J. 2000. Low Inflation, Pass-through, and the Pricing Power of Firms. *European Economic Review* 44 (7): 1389–408.

Thomas C., and Marquez, J. 2006. Measurement Matters for Modeling U.S. import Prices. Federal Reserve Board of Governors, manuscript.

UNCTAD. 2007. Handbook of Statistics

Venables, A. J. 1990.Microeconomic Implications of Exchange Rate changes. *Oxford Review of Economic Policy*, 6 (3), pp 18 – 27.

Webber, A., 2000. Newton's Gravity Law and Import Prices in the Asia Pacific. *Japan and the World Economy*. 12 (1): 71-87.

Wickremasinghe, G. And Silvapulle, P. 2004 Exchange Rate Pass-through to Manufactured   Import Prices: the Case of Japan. Mimeo, Monash University. [Online]: http://129.3.20.41/eps/it/papers/0406/0406006.pdf [Accessed 11 December 2007].

Williamson, J. 1995. Exchange Rate Policy and Development Strategy. AERC Plenary Session, *Journal of African Economies*, Supplement to Vol. 6 No 3 Nairobi.

WTO .2005. *Trade Policy Review*, Nigeria, Geneva

Woo, W. T.1984. Exchange Rates and the Prices of Nonfood, Non-fuel Products. *Brookings Papers on Economic Activity*, 1984:2, 511-30.

Yang, J. 1995. Exchange Rate Pass-Through in the U.S. Market: A Cross-Country and Cross-Product Investigation. *International Review of Economics and Finance,* vol. 4, no. 4, pp. 353-371.

_____. 1997. ERPT into U.S. Manufacturing Industries. *Review of Economics and Statistics*. Vol. 79: 95-104.

APPENDIX 1: Dutch auction system (DAS) Appraisal.

DUTCH AUCTION SYSTEM (DAS)	
OBJECTIVES	ACHIEVEMENTS
The determination of the exchange rate of the Naira through interplay of demand and supply; Conserve external reserve position; Reduce to the barest minimum the premium between official rate and that of the parallel market and or the bureaux de change (BDCs); Ensure stability of the naira exchange rate.	Premium between the CBN rate and that of bureaux de change (BDCs) and the parallel market was N16.8199/$1 and N16.3505/$1 respectively in early 2002. The situation improved to N7.3471/$1 and N6.8741/$1 by December, 2004. From a reserve position of US$8.0 billion in 2002, the country has as at end January, 2006 the sum of US$30.0 billion in the reserve-over 300% increase and about 30months of import level. The exchange rate has been stable since the commencement of DAS particularly in the year 2004. Year 2004 opened with a rate of N137.00/$1 and closed with an exchange rate of N132.85/$1, indicating an appreciation of N4.15 (or 3.03%). There was further improvement in 2005 as the naira appreciated by 2% from N132.00/$1 to N129/$1 as at end December, 2005. The Dutch Auction System (DAS) has succeeded in checking and reversing the pressure on the external reserve position since genuine demands were met. DAS succeeded in encouraging professionalism and transparency in foreign exchange transactions. This is because there is discipline among the end-users as they pay according to their bids. They are more careful and realistic in their bids, thereby encouraging stability and discourage speculation in the market.

Source: Central Bank of Nigeria, online information. Available at: http://www.cenbank.org December, 2007

APPENDIX 2: MAIN FEATURES AND POLICIES OF SELECTED SECTORS

| AGRICULTURAL SECTOR | **Main Features**

Nigeria's agriculture sector employs about 70% of the labour force, and accounts for over a quarter of GDP; it is an important element in the Government's poverty reduction efforts. Nonetheless, the sector remains generally underdeveloped, constrained by insufficient investment, and reliant on the vagaries of the weather. Agricultural production is largely a private sector activity. Government support to the sector is focused on: the supply of inputs; provision of extension services; stabilization of market prices for certain goods through a strategic reserve programme; and provision of financial assistance, albeit at a limited level. Protection for agricultural products (WTO chapter 1-24) are relatively high, and average applied tariffs increased from 30.7% in 1998 to 48.2% in 2003. Furthermore, import bans have been placed on several agricultural goods, for reasons of food security and to encourage value-added exports. Export taxes apply to some agricultural products. Agricultural output consists mainly of: food crops, such as cassava, yams, sorghum, millet, maize, groundnuts, palm fruit; cash crops, such as palm oil, rubber, cocoa, cotton, gum arabic, and shea butter; poultry, goats, lamb, pigs, and cows; fishery products; and forestry products. Nonetheless, Nigeria is a net importer of food, the major agricultural imports being wheat, rice, sugar, palm oil, milk, meat, and fish. Regular supply of these goods helps to meet the raw materials needs of agric-industries and ensure food security for Nigeria's households: the share of food in their total expenditures ranges from 66% for non-poor households to 78% for poor households. In 2003, food and live animals accounted for some 13.3% (₦261 billion) of import expenditure. The main agricultural exports are cocoa beans and products, rubber, and cotton lint. The sector accounts for only 0.1% of total foreign exchange earnings (insignificant, compared to oil's contribution, but still substantial (88%) in terms of non-oil foreign exports). The agriculture sector plays a significant role in the Nigerian economy; in 2003, it accounted for about 26.4% of GDP and thus remains important for the diversification of the economy, in particular its export structure and import substitutes.

Policy Developments

Nigeria's agricultural policy aims to ensure food security, promote domestic trade, enhance foreign exchange earnings, promote export diversification, enhance access to agricultural raw materials, encourage participation in preferential trade arrangements, and promote the use of modern technology and the quality of agricultural exports. During the period under review, the Federal Government provided support for: research activities and farmers for the development of high yielding, disease resistant and heat-tolerant seed varieties; the stabilization of market prices for fertilizers; the improvement of extension services; and the development of new fertilizers. Support for research activities is said to have been fruitful. The National Seed Service (NSS) continues to, *inter alia*, produce and distribute seeds, upgrade seed processing plants, produce seed certification tags, and engage in seed testing and seed crop inspection. Nigeria has, in recent years, deregulated its fertilizer market by |

allowing the private sector to participate in the supply of fertilizers. However, most fertilizer companies are owned by either the Federal Government or the states; some have been scheduled for privatization. The Government provides subsidies on the sale of fertilizers to farmers to stabilize prices at affordable levels. Between 1999 and 2003, a total of 497,346 tonnes of assorted fertilizers were procured and distributed throughout Nigeria at prices that were 25% subsidized by the Federal Government; in addition, some States provide further fertilizer subsidies to their farmers. Nonetheless, the sustainability of this subsidy programme is uncertain due to outstanding payments totalling some ₦ 4 billion in 2004. During 1999-04, funds were provided by the Federal Government for the purchase of 1000 tractors, which were sold to farmers at 25% below the purchase price. The Government also purchased, *inter alia*, vehicles, demonstration films, and agro-chemicals for extension services. Furthermore, since the costs of using tractors and other agricultural machinery are prohibitive, the Government is supporting the promotion of animal traction and hand-tool technology in order to improve the performance of small-scale farmers. During 1999-03, ₦53.7 million in loans were disbursed for this purpose to 2,003 farmers across all states.

The Government established a National Strategic Food Reserve Programme, to act as a buyer of last resort with the purpose of maintaining food security as well as price stabilization. Furthermore, various Presidential committees have also been established to draw up blue-prints for achieving increased agricultural production. The establishment of three multi-commodity development and marketing companies, owned and managed by farmers, is receiving support from the Government; an initial grant of ₦10 billion for seed has been approved for a period of four years, starting in 2004. These companies are to promote the production, processing, storage, and marketing of agricultural produce, and are to facilitate the timely availability of production inputs, and act as buyers of last resort on behalf of the Government. The Government also supported the formation of an umbrella organization for farmers, the Apex Farmers Association of Nigeria.

Various schemes are in place to make credit available to farmers. The Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB limited), is the main channel through which the Government offers financial support to farmers. During 1999-03, it provided some ₦412 million in subsidized credit in support of some 25,000 projects; the majority went to small and medium scale farmers. However, there have been complaints that credit is often diverted to support projects in urban areas to the detriment of farmers in rural areas. The state-owned Nigerian Agricultural Insurance Scheme offers risk protection to farmers on a range of agricultural products. Between 1999 and 2002, about 79,000 insurance policies, valued at ₦13.4 billion, were underwritten. Furthermore, the Central Bank of Nigeria (CBN), under its Agricultural Credit Guarantee Scheme Fund (ACGSF), either alone or in collaboration with Federal or State Governments, oil companies, and non-governmental organizations, provides credit or interest drawbacks to farmers under a variety of arrangements, including micro-credit schemes. However, many rural farmers are unaware of these incentives. Between 1999 and 2003, some 95,000 loans, amounting to ₦3.6 billion,

were guaranteed under the ACGSF, of which about 85% for food crops, 7.5% for livestock, and 1.6% for cash crops.

A Special Programme on Food Security (SPFS) commenced in 2002 with a US$42.5 million Unilateral Trust Fund. Projects to be implemented under the programme include water control projects, and activities to boost production systems, as well as the diversification of production. Nigeria is due to benefit from technical cooperation from Chinese experts and field technicians under the SPFS. The programme spans all 36 states and touches some 23,000 rural households. Furthermore, during the period under review, several product-specific (e.g. rice, yams, cocoa, and fish) and infrastructure-related (e.g. irrigation and drainage) projects were undertaken by the Federal Government, either independently or in collaboration with organization, such as the International Fund for Agricultural Development and the World Bank.

The most protected products (subject to a tariff of 100%) include butter; cheese and curd; edible vegetables and certain roots and tubers; edible fruits and nuts; vegetable oil; margarine; prepared or preserved meat products; sugar confectionery; food preparations containing chocolate; pasta; pastry; and rice. In addition, import prohibitions have been placed on wheat flour, sorghum, live or dead birds, frozen poultry and poultry products, cassava and cassava products, and fruit juice in retail packs, on food self-sufficiency, safeguard, or health grounds. Related price increases may have contributed to inefficient allocation of resources, adversely affected the purchasing power of consumers, especially poor households with a relatively large share of income spent on food, and increased the cost of production for some agro-processing industries. Given the importance of agricultural products in Nigeria's trade with other West African countries, these measures are likely to hinder trade with countries in the sub-region, and increase the incentive to smuggle these commodities from neighbouring countries, with the concomitant loss in public revenues. Hence, liberalization of Nigeria's trade in agricultural products would be beneficial to its economy and boost intra-ECOWAS trade.

Under Nigeria's Export Prohibition Act, the export of certain agricultural goods is prohibited for purposes of domestic food security and of local processing. Agricultural products banned from export include: raw hides and skin, timber (rough or sawn), unprocessed rubber latex and rubber lumps, rice, yams, maize, and beans. An administrative levy of US$5 per tonne applies to exports of cocoa beans, and US$3 per tonne to exports of other agricultural raw materials.

In 2003, the aggregate index of agricultural production increased by 6.1% (compared to 4.0% in the previous year); all subsectors contributed to the growth and consequently to the growth of the economy. According to the CBN, the sector is responding to the various government initiatives, including the import bans, which have increased domestic prices of agricultural products. Favourable weather conditions have also contributed to the price effects of the policy measures. Nonetheless, Nigeria's agricultural sector is operating far below its potential: productivity levels are declining; food production has not kept pace with population growth; malnutrition levels are high; the supply of agricultural raw materials to

the manufacturing sector is grossly inadequate; wages in the sector are low, and contribute significantly to national poverty; and foreign exchange earnings from the sector are minimal, due mainly to anti-export biases that the incentive schemes barely offset. This underperformance partly explains Nigeria's limited share in some of the markets where it has preferential access.

There are various reasons for the underperformance of agriculture, including: inadequate infrastructure (feeder roads, storage, packaging, processing, and retailing facilities), which weakens the bridge between producer and marketing centres; inaccessibility of fertilizers at affordable prices; widespread usage of rudimentary farm implements; shortage of farm workers due to urbanization; a complicated land tenure system, which creates a poor environment for investment, especially for mechanized farming; weak linkages between research, extension services, and producers; inefficiency in ensuring stable prices to farmers; limited access to credit by farmers, especially small-scale farmers, due to, *inter alia*, collateral concerns, and unpredictable weather conditions (accentuated by the limited irrigation facilities); soil degradation; and the prevalence of tropical plant and animal diseases. The development of agricultural exports has in particular been affected by the inadequate management of exchange rate policy over time and the related poor price incentive for diversification into agricultural exports; the "Dutch disease" effect of oil exploitation; taxation of agricultural exports; poor knowledge of potential markets; telecommunication problems; high tariffs and restrictive standards imposed by some trading partners; and fluctuating world prices of major cash crops. These factors have translated into low incomes in the sector; and as agriculture employs some 70% of the labour force, it also accounts for the bulk of Nigeria's poor. Hence, any attempt to reduce poverty in Nigeria must focus significant attention on development of the sector.

Private investment inflows are essential to enable the agriculture sector to realize its potential; in 2002, the sector received some 1% of total capital expenditure by the Federal Government. Though there are various incentives to attract investment in the sector, they have been inadequate. Given the relative investment attractiveness of Nigeria's mineral sector, the existing fiscal incentives will be insufficient to attract inflows to the agricultural sector. Easier access to land and credit facilities, improvements to agricultural infrastructure (feeder roads and irrigation facilities), and plant and animal husbandry practices would help to create a more investor friendly environment.

The current economic programme, NEEDS, emphasizes food security and poverty reduction through measures to encourage private sector participation in the sector; facilitation of linkages between the agriculture and industrial sectors; modernization of the sector; and improvement of agricultural yields. The targets set under NEEDS include: minimum annual agricultural growth of 7%; a rise of agriculture exports to US$3 billion in 2007; drastic reduction in food imports from 14.5% to 5% in 2007; an annual increase in cultivable land of 10%; promotion of environmentally friendly farming practices; and protection of all prime agricultural lands for continued production. The strategies to attain these targets include: various presidential initiatives on specific crops and livestock; effective use of the

	trade preferences available to Nigeria; improvement of agricultural research and extension services; development of a private-sector-led input supply and distribution system; improvement of the infrastructural needs of the sector; adequate capitalization of NACRDB; promotion of multi-commodity development and marketing companies, managed by the private sector; support for all season farming; a programme for large-scale production of tree crop seedlings; and promotion of sound environmental rehabilitation and management. In 2004, 2% of pubic expenditure was on agriculture.
MANUFACTURING SECTOR	**Main Features** Manufacturing accounts for some 5% of GDP. The sector remains constrained by various factors that affect its competitiveness, most importantly the availability of power. A plethora of incentives are in place to attract investment to the sector. Manufacturing firms also receive various government funded financial assistance schemes to alleviate the dearth of credit available to them. Tariff changes in the sector have been geared towards increasing the rates of effective protection (lower tariffs on intermediate goods and higher tariffs on final goods). In 2003 the average MFN applied tariff rate for manufactured goods was 28%, up from 24.4% in 1998. Import bans are also in place on several finished manufactured goods. Nigeria has a fairly diversified manufacturing sector The main subsectors (excluding petroleum refinery) produce plastic products, textiles, beverages, tobacco products, chemical products, pottery, earthenware, food products, electrical machinery, fabricated metal products, non-metal mineral products, paper and paper products, and transport equipment. About 96% of the enterprises are small (less than 100 employees) or medium-sized (less than 300). Firms in the sector are largely privately owned; however, the Government still owns concerns in the sugar, cement, newsprint, automobile, agro-processing, and steel industries. The sector employs some 7% of the labour force**,** and average minimum wages and salaries are above the national average. Manufactured output is consumed largely in the domestic market, with only a small fraction sold in international markets, including the West African sub-region. Manufacturing faces several obstacles. In a World Bank survey, Nigeria's manufacturing companies identified, in order of importance, the lack of infrastructure, access to finance, and uncertainty and inability to plan (due to fluctuations in government policies) as the three biggest problems. The most serious infrastructure problem was the deficient supply of electricity identified as a serious business constraint by 73.8% of firms. Access to finance is hindered by high interest rates and collateral requirements. Long-term access to finance is rare; larger firms are most likely to receive loans and SMEs are marginalized. The main sources of business uncertainty were identified to be the unstable macroeconomic environment and exchange rate volatility; and, to a lesser extent, the regulatory environment. Among the areas of regulatory concern were: the high degree of bureaucracy and corruption in obtaining of various permits from public institutions; and the arbitrary and capricious

manner in administering certain regulations. Other factors that affect the sector include: slow port operations; increasingly higher costs of imported inputs due to the persistent depreciation of the naira; and, until recently, state ownership of several large manufacturing units. Together, these factors render Nigeria's manufacturing sector uncompetitive with imports.

Policy Development

The Federal Ministry of Industry's policy objective is to transform the Nigerian economy from "its rural and agrarian form to a modern and competitively industrialized one". This is to be pursued by, *inter alia*, encouraging the private sector to play a pivotal role; providing services for the training and development of indigenous skills and manpower; and financial support. A number of measures were implemented during the period under review to support the sector. The average applied MFN tariffs on manufactured goods increased from 24.4% in 1998 to 28.5% in 2002 before decreasing marginally to 28% in 2003. Annual changes to the tariff schedule since 2002, have increased the effective level of protection for local industries, as tariffs on several industrial raw materials and intermediate goods were reduced, while tariffs on several finished goods were increased. Since 2002, imports of all industrial machineries carry a maximum tariff of 2.5% and are exempted from VAT. Manufactured products attracting the highest tariffs (between 40-150%) include: tobacco and related products; wine, spirit and beer; cosmetics; motor vehicles; textiles and clothing; articles of paper pulp; articles of iron and steel; pocket lighters; furniture; and soap.

Several manufactured goods are on the import prohibition list. These include: cement in bags; printed fabrics; textiles; exercise books; envelopes; men's footwear; leather bags; plastic; soaps and detergents; and assembled bicycles. The cascading tariff structure and import bans effectively distort the incentive structure for producers, as the profitability due to these measures may not reflect the economy's comparative advantage, and thus may lead to inefficient allocation of resources. A survey by the National Bureau of statistics (NBS) shows that the importance of import bans and lower tariffs on inputs for the growth of businesses has declined since 1999, in spite of the increased use of these measures; therefore, the manufacturing sector appears to have more fundamental problems, which cannot be solved by increasing effective protection rates. Liberalization of trade in manufactured goods would thus be beneficial to the economy. Other trade measures that have an impact on domestic industry include the policy to physically inspect all imports; and the intensified efforts to clamp down on dumping of sub-standard goods on the Nigerian market.

Investment incentives for the manufacturing sector include five-year tax holidays; tax relief for research and development; capital allowances; tax credits to industries using specified minimum levels of local raw materials; tax concessions on local value-added; and re-investment allowances. Under the privatization programme, the State has divested its interests in several manufacturing firms in the cement, fertilizer, pulp and paper, sugar, and automotive industries.

In 2001, the Government established the Bank of Industry (BOI) to assist ailing industries

and promote new ones. To be eligible for BOI support, projects must have a large transformation impact by supporting forward and backward linkages, use domestic inputs, generate large employment opportunities, and produce quality products for export. Furthermore, in 2001, a Small and Medium Industries Equity Investment Scheme (SMIEIS) was established by banks, through the setting aside of 10% of pre-tax profit, for equity participation in SMEs. As of July 2004, ₦6.5 billion had been invested in real sector, about half in the manufacturing sector. Other support to SMEs includes: capacity building programmes for export production; establishment of industrial parks for micro enterprises; standardization and quality control services; promotion of SME clusters and networks; and establishment of a Small and Medium Industries Development Agency to coordinate and support the development of SMEs. Reforms under way in the electricity, telecommunication, and transport subsectors will have a positive effect on the manufacturing sector.

Under the NEEDS programme, the Government's target growth for the sector is 7% per annum; and a capacity utilization rate of about 70% was expected in 2007. This is to be achieved by, *inter alia*, removing the remaining infrastructural constraints; providing appropriate institutional support; improving access to finance; providing adequate fiscal and investment incentives in support of export-oriented manufacturing activities; fostering the growth of SMEs; providing targeted financing for science, technology, and research and development projects; and providing incentives to facilitate joint ventures between foreigners and Nigerian counterparts.

Source: WTO Nigeria Trade Policy Review, 2005. http://www.wto.org/english/tratop_e/tpr_e/tp247_e.html (Retrieved on December 14, 2007)

APPENDIX 3:
Variance Decomposition of import price of prepared Foodstuff

Period	S.E.	LPFOD	LWEXP	LEXR	LTFOD
1	0.289463	100	0	0	0
2	0.310738	86.98184	2.197376	10.59755	0.223231
3	0.329971	82.64735	2.689574	10.83087	3.832199
4	0.347431	75.64992	4.180449	16.66697	3.502657
5	0.358818	71.47651	5.353908	19.17757	3.992015
6	0.366877	69.26366	5.213599	20.67928	4.843466
7	0.372438	68.21164	5.379726	21.31059	5.098048
8	0.378698	67.40043	6.18364	21.33881	5.077127
9	0.385421	66.47696	7.125179	21.21622	5.181645
10	0.392052	65.50907	7.865057	21.05165	5.574219

Variance Decomposition of import price of Textile products

Period	S.E.	LPTXT	LWEXP	LEXR	LTTXT
1	0.368219	100	0	0	0
2	0.430139	80.75292	6.064463	12.33631	0.84631
3	0.453153	74.01435	7.545833	13.24736	5.192459
4	0.485255	66.91851	7.447965	19.95206	5.681457
5	0.505601	64.11424	7.329363	23.30556	5.250841
6	0.514546	62.82161	7.141681	24.41973	5.616976
7	0.518347	61.93213	7.271644	24.601	6.19523
8	0.523283	60.81139	8.588579	24.31142	6.288613
9	0.530335	59.30923	10.7397	23.79867	6.152395
10	0.538944	57.46144	12.68945	23.35681	6.492298

Variance Decomposition of import price of Article of Stone

Period	S.E.	LPARS	LWEXP	LEXR	LTARS
1	0.280895	100	0	0	0
2	0.294023	91.73891	0.296955	4.630766	3.333373
3	0.364944	60.33824	9.791113	4.484505	25.38615
4	0.443095	41.26655	26.15827	3.380585	29.1946
5	0.488544	34.52204	36.3505	2.820183	26.30727
6	0.503596	32.65867	39.39405	2.667775	25.27951
7	0.508139	32.08641	39.61233	3.092955	25.2083
8	0.51125	31.71728	39.13213	4.128337	25.02225
9	0.516905	31.35675	38.99609	5.123336	24.52382
10	0.527621	30.75831	39.71266	5.638022	23.89101

Variance Decomposition of import price of Machinery and plants					
Period	S.E.	LPMCH	LWEXP	LEXR	LTMCH
1	0.579444	100	0	0	0
2	0.61119	96.30751	0.14163	0.048973	3.501885
3	0.656688	83.72738	5.151822	0.110922	11.00987
4	0.679886	78.46418	10.13777	0.185758	11.21229
5	0.700043	74.88493	12.99076	1.384025	10.74029
6	0.719132	71.7167	14.59657	3.056069	10.63066
7	0.728083	70.10762	15.07078	4.0891	10.7325
8	0.730504	69.64611	15.01925	4.536104	10.79853
9	0.731738	69.53523	15.05863	4.636017	10.77012
10	0.734107	69.37479	15.30022	4.61416	10.71083
Variance Decomposition of import price of Optical products					
Period	S.E.	LPOPT	LWEXP	LEXR	LTOPT
1	0.255613	100	0	0	0
2	0.275237	94.79724	0.105467	3.113699	1.98359
3	0.291914	84.87564	1.668483	9.507417	3.948465
4	0.314817	74.02833	3.229223	18.30165	4.440797
5	0.337487	67.7158	3.397296	23.85975	5.027147
6	0.355128	63.91451	3.083165	27.59423	5.4081
7	0.365322	61.5212	3.175636	29.86029	5.442881
8	0.371356	59.6753	4.105267	30.91207	5.307361
9	0.376562	58.14651	5.699471	30.97435	5.17967
10	0.382748	57.0858	7.401228	30.34571	5.167264

Source: Author's computation

APPENDIX 4: Impulse Response Functions

Response to Cholesky One S.D. Innovations
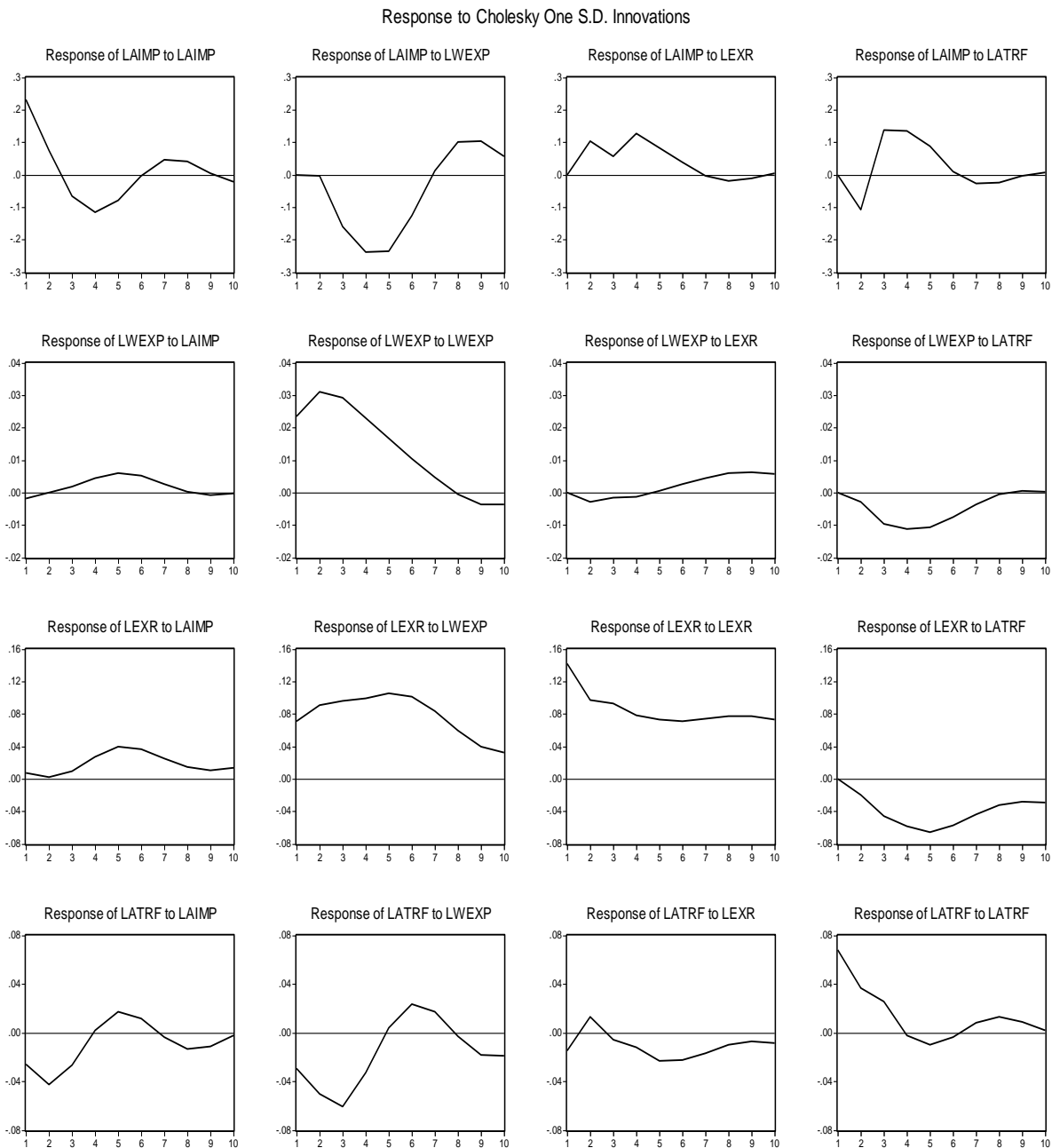
Figure 5.1: Accumulated impulse response functions for the *aggregate Import price*. The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.
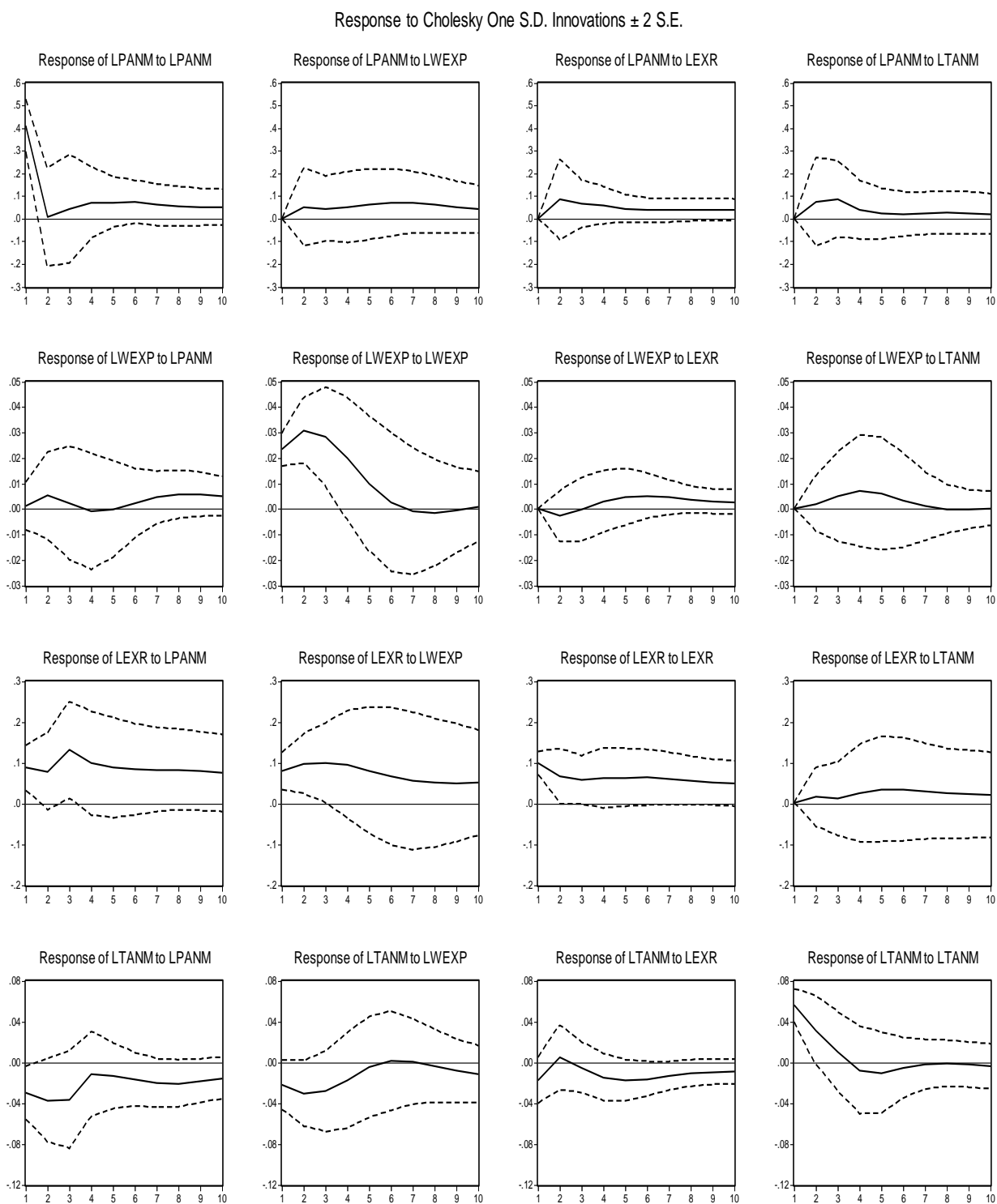
Figure 5.2: Accumulated impulse response functions for the import price of *Live animal; animal products.* The dashed lines are 95% bootstrap confidence bounds.
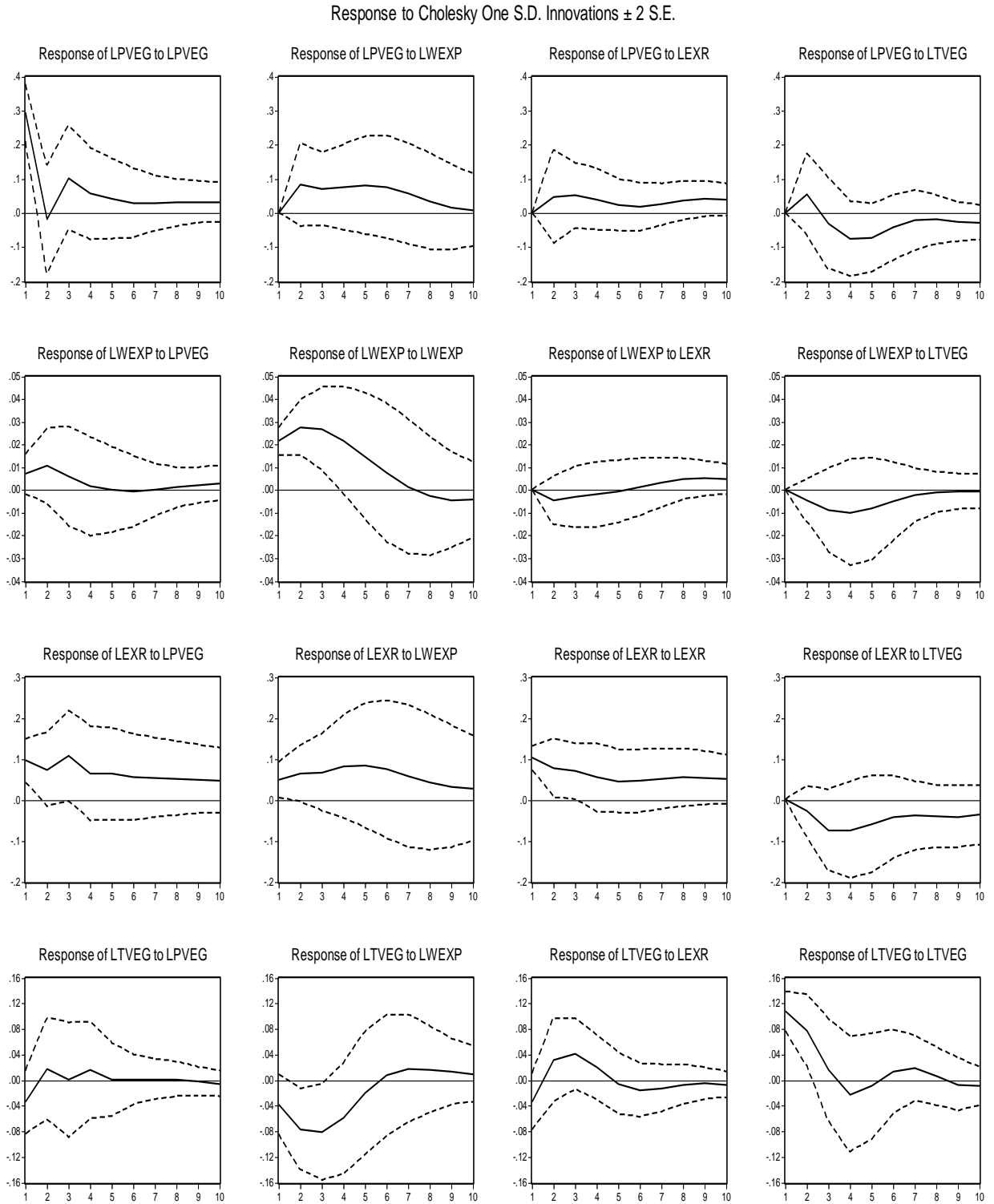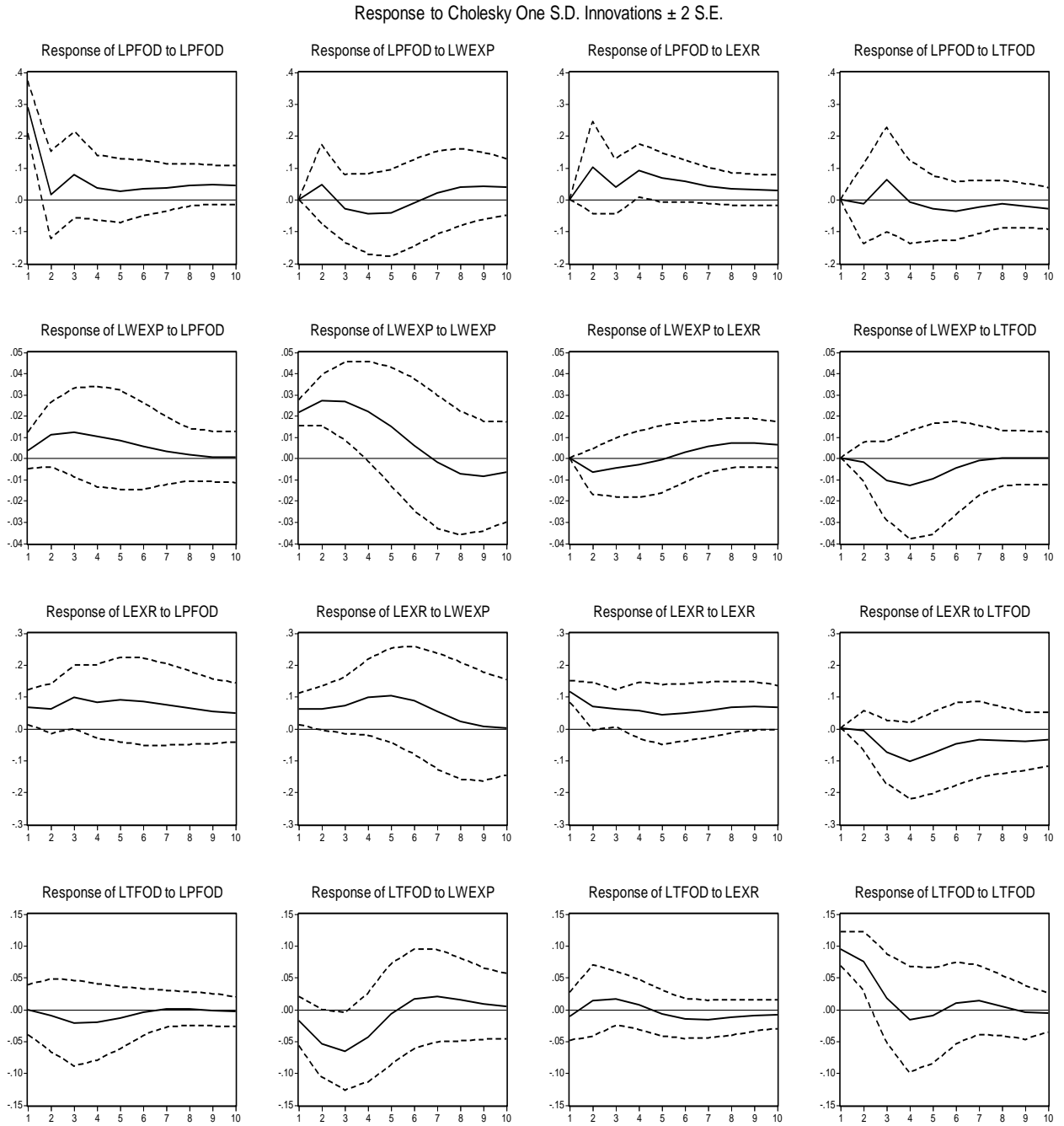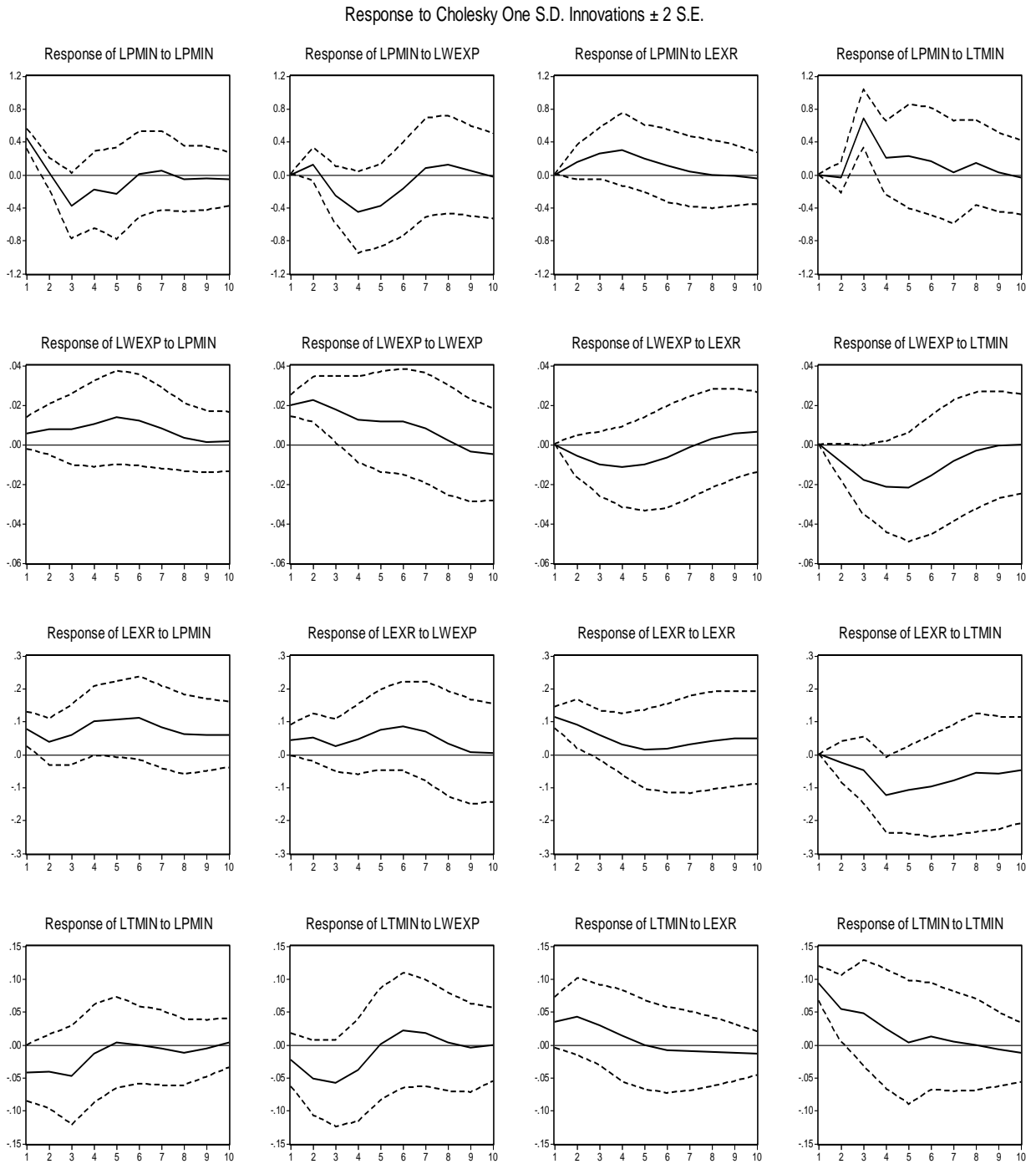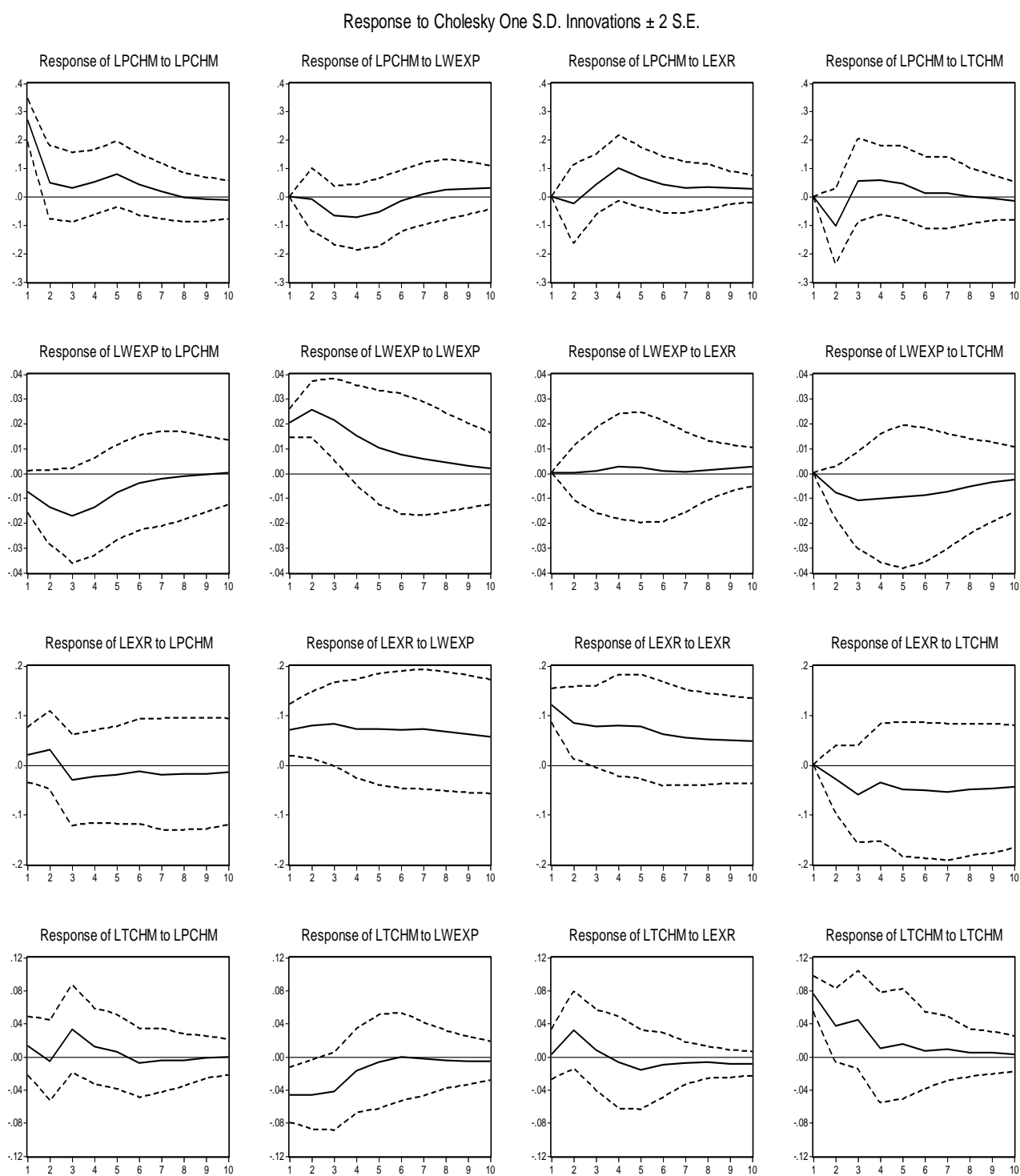
Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.3: Accumulated impulse response functions for the *import price of vegetable products.* The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.4: Accumulated impulse response functions for the *import price of Prepared foodstuffs; beverages, spirits and vinegar; tobacco.* The dashed lines are 95% bootstrap confidence bounds.
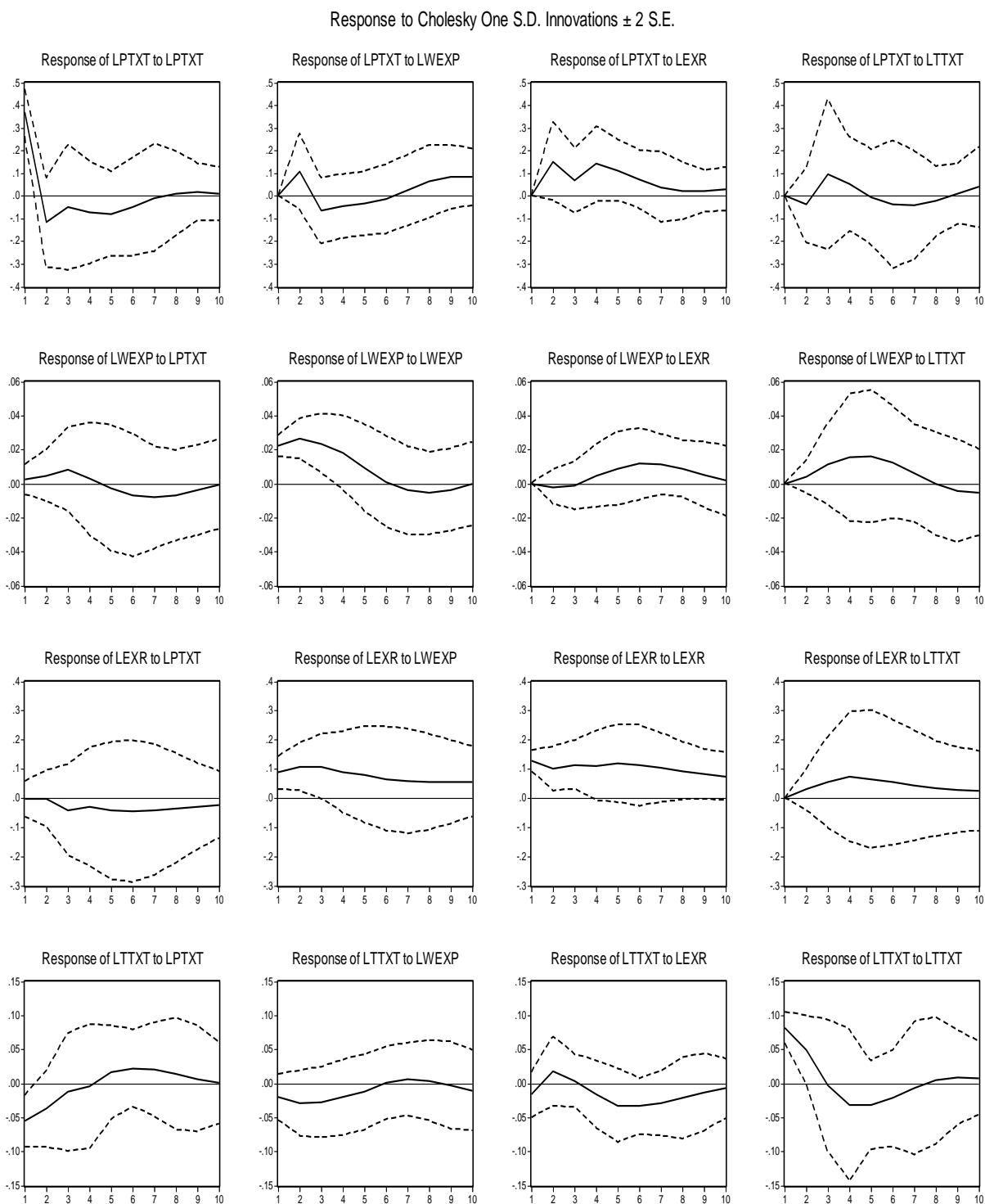
178

Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.5: Accumulated impulse response functions for the *import price of Mineral products*. The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.6: Accumulated impulse response functions for the *import price of products of the chemical and allied industries.* The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.
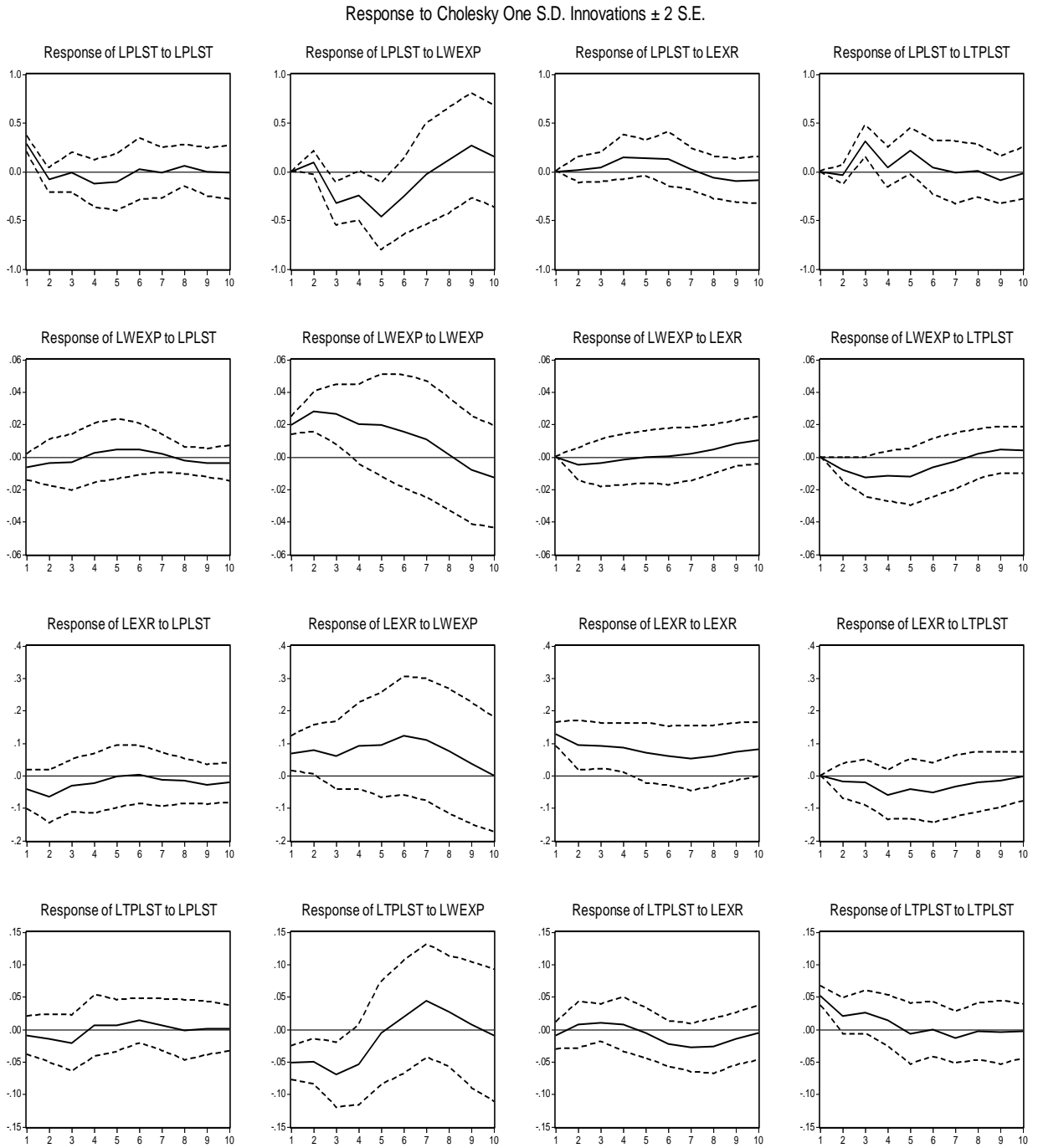
Figure 5.7: Accumulated impulse response functions for the *import price of plastic, rubber and articles thereof.* The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.
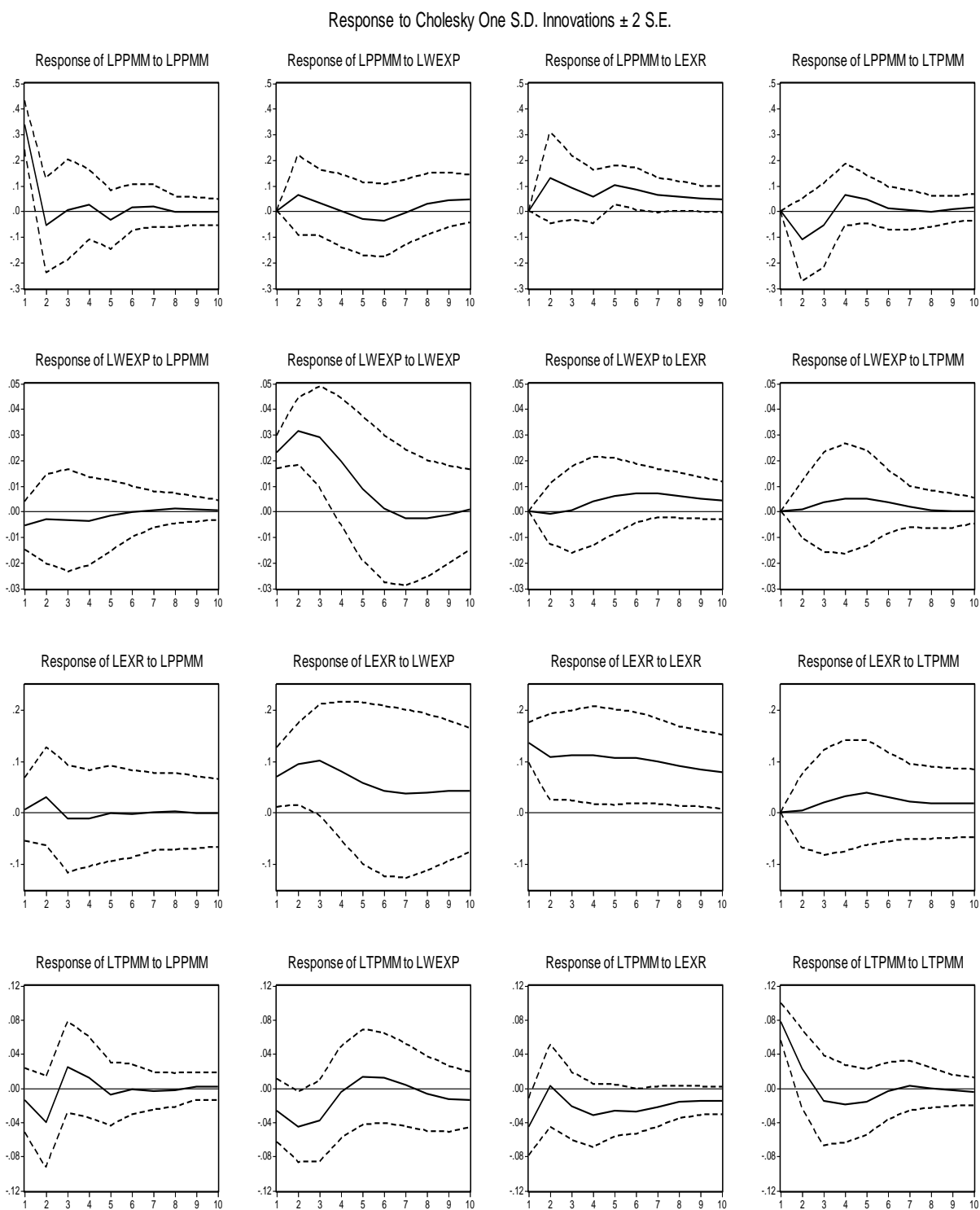
Figure 5.8: Accumulated impulse response functions for the *import price of paper making material; paper and paperboard, articles.* The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.9: Accumulated impulse response functions for the *import price of textiles and textile articles*. The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.
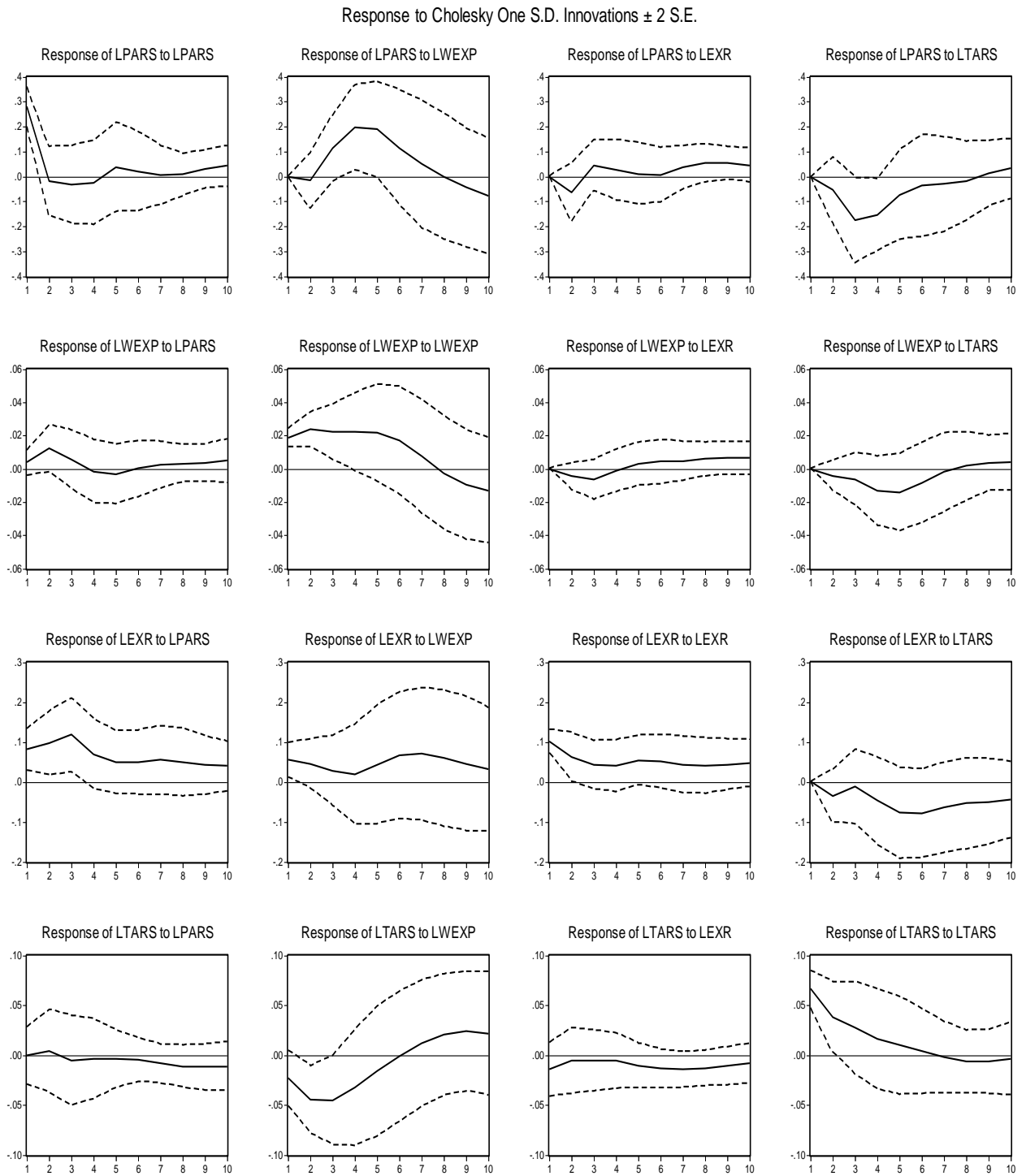
Figure 5.10: Accumulated impulse response functions for the *import price of Articles of stone, plaster, cement, asbestos, mica, ceramic.* The dashed lines are 95% bootstrap confidence bounds.
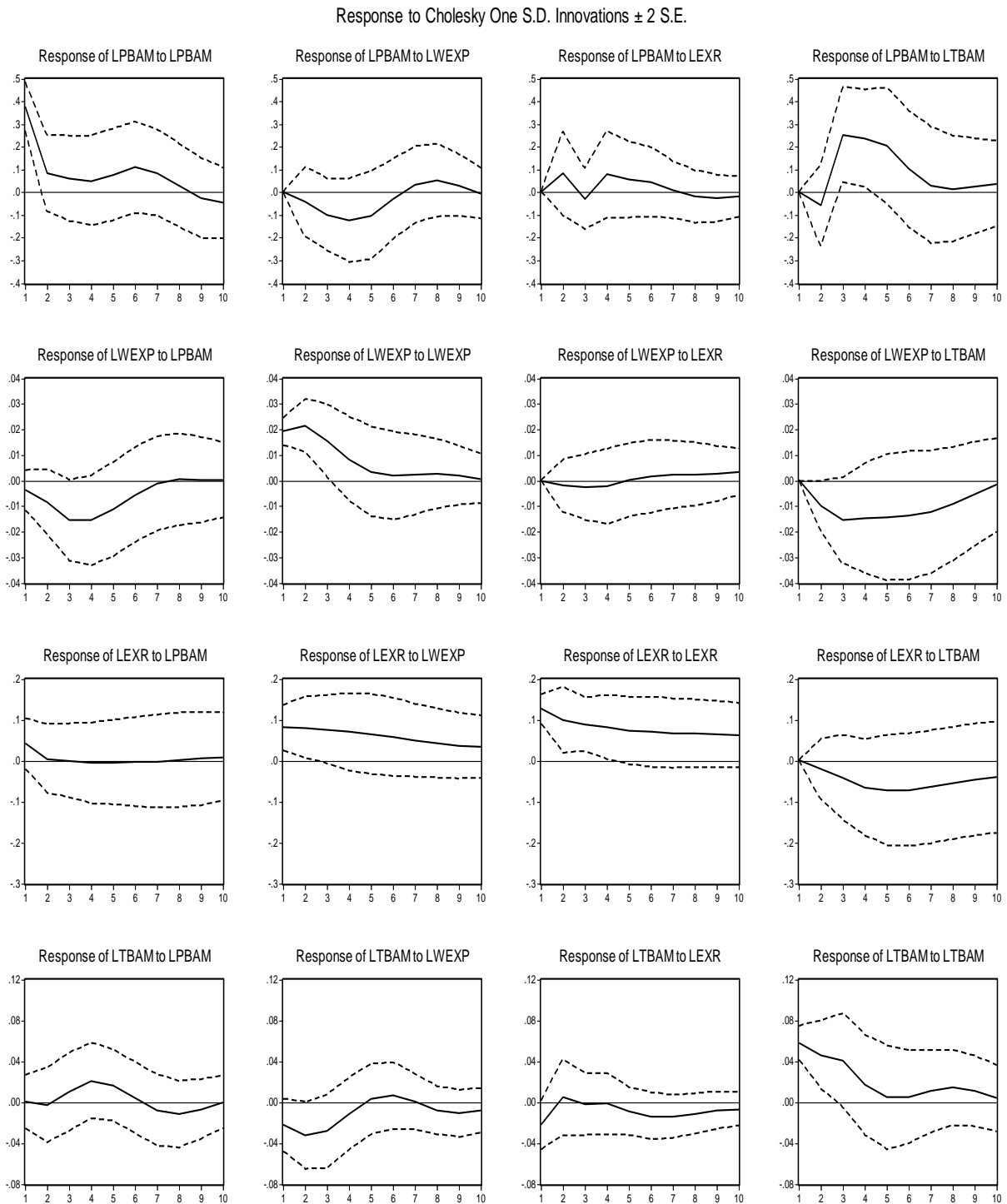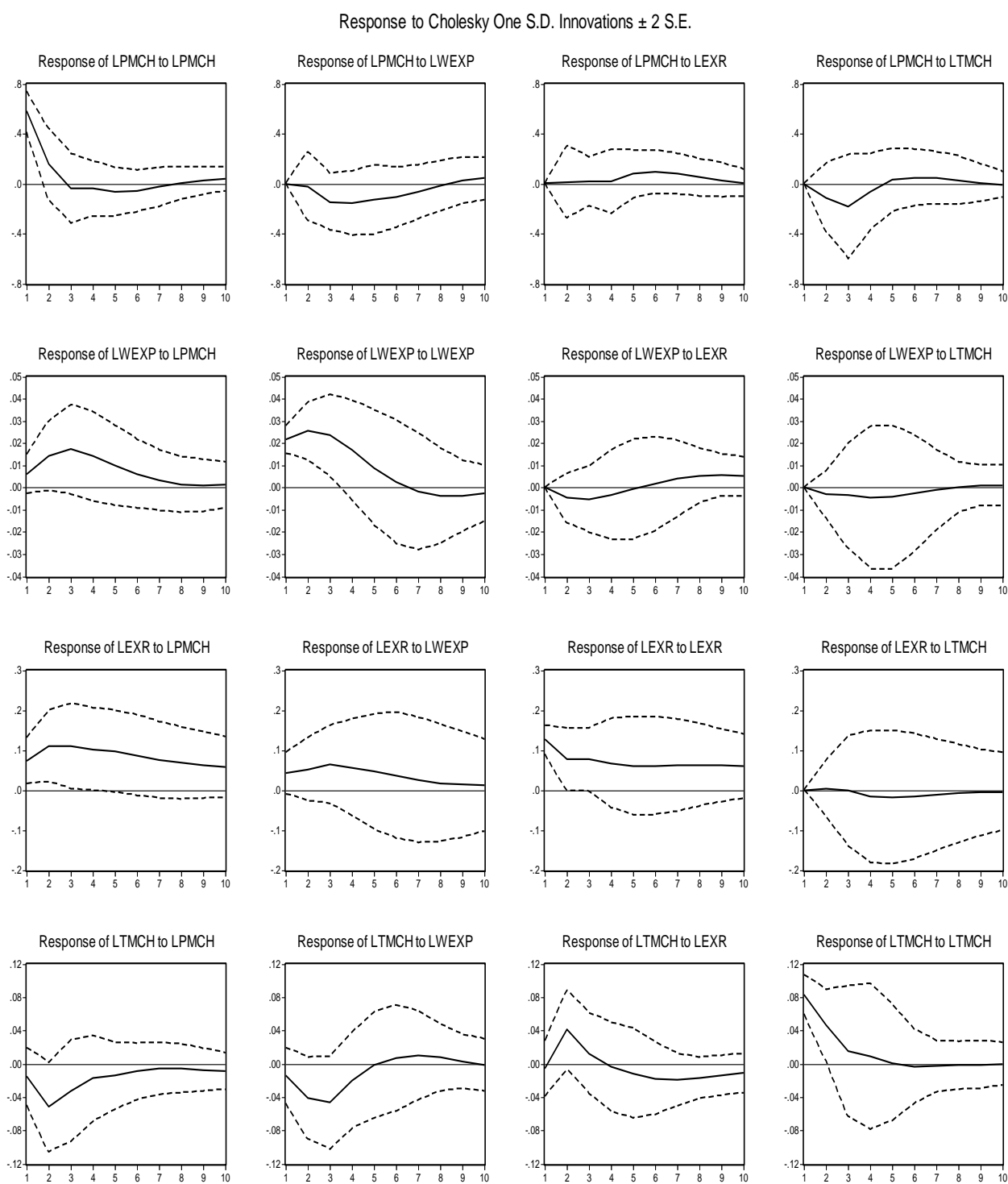
Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.11: Accumulated impulse response functions for the *import price of base metals and articles of base metals*. The dashed lines are 95% bootstrap confidence bounds.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.12: Accumulated impulse response functions for the *import price of Boilers, machinery and appliances; parts thereof.* The dashed lines are 95% bootstrap confidence bounds.

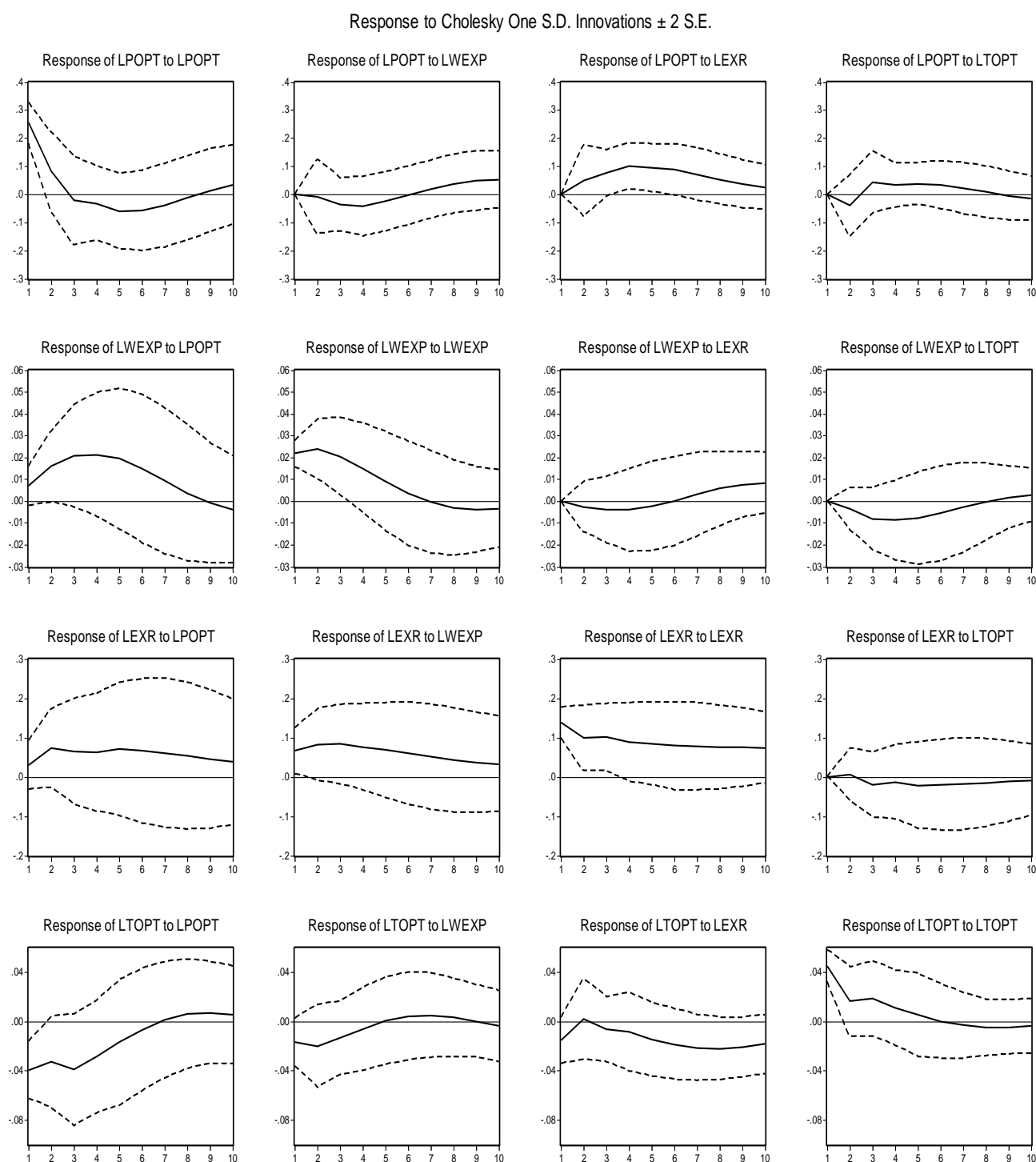Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5.13: Accumulated impulse response functions for the *import price of Optical, photographic, cinematographic, measuring appliances.* The dashed lines are 95% bootstrap confidence bounds.
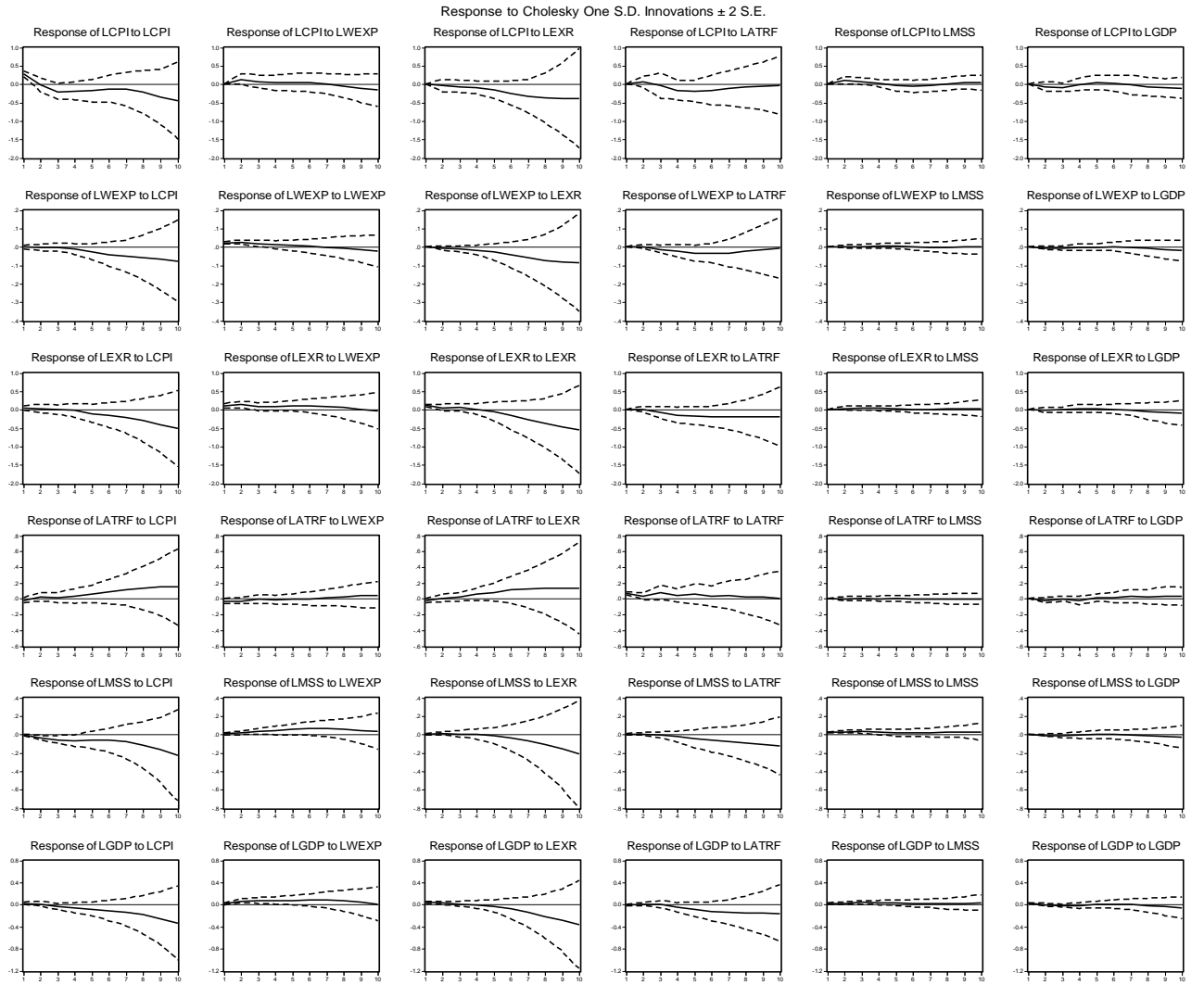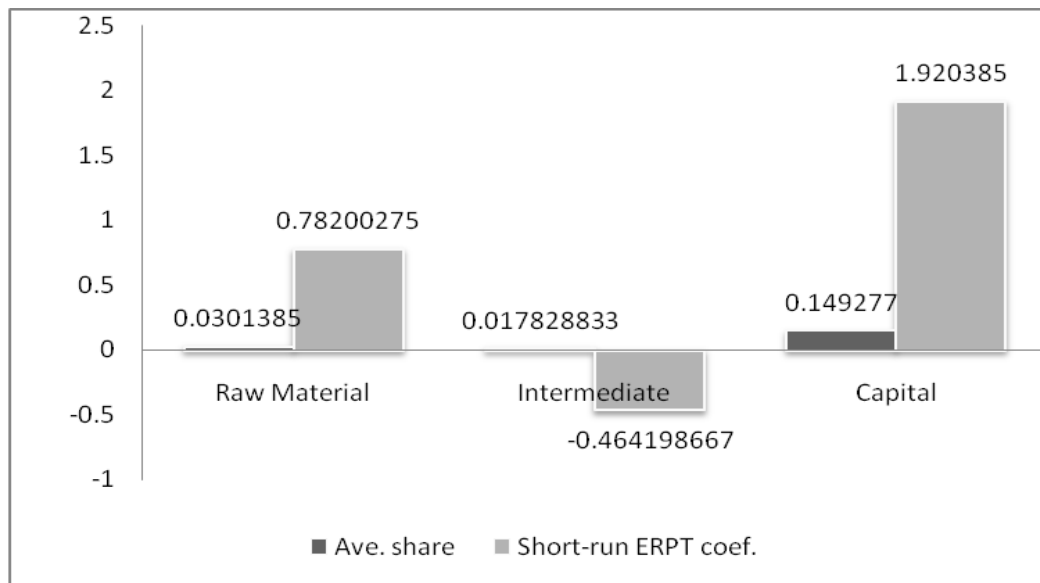
Figure 5.14: Accumulated impulse response functions for the *consumer price index*. The dashed lines are 95% bootstrap confidence bounds.

APPENDIX 5: Products share (%) of main import categories in Nigeria's total imports (1980-2005)

Source: Author's computation