MACROECONOMIC DETERMINANTS OF MANUFACTURED EXPORTS IN KENYA

M.A. RESEARCH PAPER

BY

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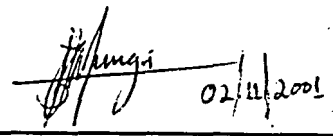
DECLARATION

This research paper is my original work and has not been presented for a degree in any other university.



Múnga Boaz Omori

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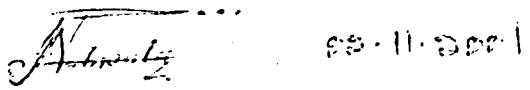
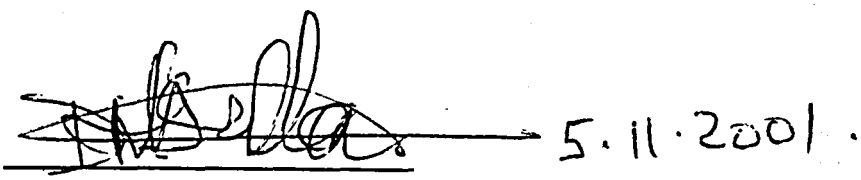


Dr. H. Ommeh



Mr. D.O. Abala

DEDICATION

I dedicate this work to my mum and dad.

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I would like to thank the African Economic Research Consortium (AERC) for its financial and academic support. I benefited immensely from the Collaborative Master of Arts Programme (CMAP), which to a large extent renewed the thought of studying international trade issues.

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As the author, I alone do bear the responsibility for this work, that is, its contents and remaining errors.

Munga B. Omori

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LIST OF ACRONYMS

BOPs	Balance of Payments
COMESA	Common Market for East and South African States
CPI	Consumer Price Index
DCs	Developed Countries
EAC	East African Community
EC	European Community
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IMF	International Monetary Fund
IPC	Investment Promotion Centre
KETA	Kenya External Trade Authority
LDCs	Less Developed Countries
NTXs	Non-Traditional Exports
OECD	Organization for Economic Co-operation and Development
RER	Real Exchange Rate
SAL	Structural Adjustment Loan
SAPs	Structural Adjustment Programme
SDR	Special Drawing Right
SITC	Standard International Trade Classification
SSA	Sub-Saharan Africa
TOT	Terms of Trade
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
WB	World Bank
WPI	Wholesale Price Index

ABSTRACT

Despite policy efforts to diversify exports, Kenya's export base is still dominated by primary commodities. Trade and commodity concentration has led to export earnings instability, which usually breeds balance of payments problems, budget deficit and does not allow for systematic planning. The general objective is pivoted on the premise that the road to diversification may be smoother if the important macroeconomic determinants of manufactures are isolated. The study sought to ascertain whether trade liberalization efforts were important and whether the small country assumption was valid for the exports of Kenyan manufactures. A structural model with dynamic characteristics is used. The model is estimated using time series data for Kenya. To obtain the structural estimates use was made of two stage least squares. Cointegration and error correction modeling was the approach used.

Price turned out to be important for demand. Export demand price elasticity measure was close to –1. Increases in incomes abroad unpredictably lowered demanded quantities suggesting that our goods are inferior. The insignificance of the error correction term in the demand equation reveals an unstable relationship.

Export supply estimates reveal a stable long run relationship amongst the variables (the error correction term is significant). The real exchange rate, capacity output, past export levels and the relative price measures are important for export supply. The capacity elasticity is small suggesting low capacity use reported in the literature. We concluded with the adduced evidence that Kenya is not a small country. The implication is that our supply decisions are important for the prices of our manufactured products. It is possible that reforms have not been decisive due to macro and political instabilities. Indeed shocks like the 1982 failed coup and the hostile macro environment thereabout 1997 produced significant and negative supply effects.

Policy implications are that we must get prices right and improve on product quality to boost demand. The importance of past export levels and capacity level (for supply) suggests that stability of the macro and political environment is crucial. Ensuring political and macro stability would buttress attempts made at reforms and hence rekindle the waning supply.

CHAPTER ONE

INTRODUCTION

In this study manufactured products are as defined in the Standard International Trade Classification (SITC). Manufactures comprise the commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods). Appendix 1 gives a detailed classification of commodities by SITC sections.

Our study topic discriminates micro variables; however, both micro and macro determinants are perhaps equally important in determining the level of exports of manufactured goods. Roberts, J.M. and Tybout, J.R. (1997) suggest that the unpredictable effects of macroeconomic conditions and policy variables on manufacturing exports - can be traced largely to ignored microeconomic characteristics of manufacturing sectors. Elbadawi and Schmidt – Hebbel (1996) postulate that macroeconomic reforms may be more important than micro and sectoral policies in terms of their effects on economic performance in general and on whether countries can avoid development crisis especially following external shocks. These views strengthen both micro and macro variables.

Less developed countries (LDCs) are generally characterized by a higher ratio of primary products to manufactured goods in their export bundles than in their import bundles, which has relevance to potential problems of export instability and terms of trade (TOT) behaviour that the LDCs face in international trade.

Real prices of the chief agricultural primary commodities exported by developing countries have fallen steadily since 1960, the fall accelerated in the 1980s.

Between 1982 and 1990 world market prices for coffee, cocoa and tea - then three of the developing world's major export crop earners fell at an average rate of 11% a year (UNCTAD, 1991). Obote (1981) concludes that, "the problem is that the production and supply of primary commodities are generally outpacing consumption and demand, which means that prices are likely to be low. Sizable reduction in the output of commodities would be needed to raise prices." This view has relevance today, World Bank (1998) states that for many agricultural commodities large price declines since mid 1997 were a reflection more of record world production than of the Asian financial crisis.

Sub-Saharan Africa's (SSA) importance in global trade has declined substantially over time. In the 1960s the region accounted for 3 per cent of world trade - this has fallen to 1.2 percent today. In the 1980s exports expanded at a rate of 1.8 per cent compared to a world average of 5.3 per cent (World Bank 1996). This poor performance is postulated to reflect (among others) the slow responsiveness of exports to the substantial (and contagious) economic reforms that African countries have implemented in the 1980s and 1990s.

1.1 Historical overview of exports in Kenya.

Kenya is also reliant on primary commodity exports and her trade deficit has been widening [1] with the trend expected to continue (Economic Survey, 2000). The range of exported goods has all along been narrow [Coffee, tea and petroleum remain by far the dominant commodity exports, (see table 1.1 below) accounting for 48.5 percent of total exports in 1998].

[1] The balance of trade deficit increased from K£ 1378 million to K£ 2892 million in 1995. This was 10.2 and 14.9 per cent in relation to GDP at current prices, respectively National Development Plan (1997-2001). The trade deficit was put at K£ 3830.40 million in 1998 (Economic Survey, 2000).

Export diversification is a recommended policy virtue, but it is riddled with constraints. The constraints are elaborated in the review of the literature.

Table 1.1: Top three exports as a proportion of Total Exports, %

SITC	Item	1980-4	1985-9	1990-4	1995-6	1997	1998
71	Coffee	27.6	68.8	22.7	24.7	14.7	11.2
74	Tea and mate	2.2	1.8	5.1	6.0	21.1	28.8
334	Petroleum products	16.3	5.4	4.8	3.4	9.0	8.5
	Total	46.1	76	32.6	34.1	44.8	48.5

Source: Kenya, Annual Trade Report, various issues.

The country's manufactured exports may be divided into three groups (WB, 1987). The first group comprises standardized products such as cement and paper, made in fairly large and modern plants. The orientation of these goods has been more towards the East African area in recent times. The second group – products sold mainly outside Africa – comprises exports based on distinctive natural resources. These include leather, wattle bark extract and woodcarvings. The third group, which comprises about two thirds of manufactured exports is sold almost entirely in Africa. Chemicals and iron and steel products feature prominently in this group (World Bank, 1987).

In the 1960s, the manufacturing sector in Kenya saw rapid expansion with textiles and garments, food, beverages and tobacco as the leading sectors. Import Substitution continued to be the main policy emphasis. In the 1960s and 1970s, Kenya was classed as an outward industry- oriented country as it had relatively high exports of manufactured goods. The share of manufactured exports has however declined over time, leading Syrquim (1992) to classify Kenya as a 'balanced' country as it did not fit easily into the outward primary, outward industry or inward orientation categories.

Exports of manufactured products comprised only 11.7% of total exports in the 1980s (down from 40% in the 1960s). Except for beverages and tobacco, the proportion of manufactured output exported by various industries declined in the 1980s. The decline in the share of manufactured exports in total exports as well as in total output in the 1980s has been attributed to a decrease in exports to the neighbouring countries, especially- Tanzania where the volume of imports from Kenya had not yet reached the levels attained before the breakup of the East African Community in 1977; growth in domestic demand for such products as paper; the anti export bias of the trade policies; and supply constraints, especially the intermittent shortage of foreign exchange to purchase intermediate inputs (Sharpley and Lewis 1988). Up to the early 1990s, the performance of manufactured exports had been poor, their contribution to the country's total exports having declined to thirteen percent in 1991 from sixteen percent in 1975.

Manufactured exports have rebounded, however, in the 1990s and comprised 26.6% and 28% of total exports in 1990-4 and 1995-6, respectively. Nearly all manufactured exports increased their shares in the 1990s. The authorities attribute this to trade reforms and the depreciation of the Kenya shilling achieved in the period. Another important source of manufactured export growth was rescue activities arising from turmoil in neighbouring countries, particularly Somalia and Rwanda (Mwega, forthcoming). During the period 1990-1999 manufacturing grew by 2.4 percent on average. In 1999 manufacturing grew by only 1.0 percent in real terms (see Economic Survey 2000). A look at the graph of exports of manufactures (see appendix 2) reveals that the real dollar value of manufactures has been on a general decline since 1997. A brief discussion of export related policy issues follows.

1.2 Export policy issues.

At independence the new Government inherited an industrial policy, which was based on import substitution (IS). The colonists were preoccupied with the protection of the colony (Kenya) as a producer of agricultural and other raw materials for England's manufacturing sector and a ready market for manufactured goods from Europe. The IS policy was a key influence on the development of the trade regime of Kenya over the first ten years since independence (the strategies were largely motivated by the Prebisch – Singer hypothesis of secularly declining TOT). The increasing resort to import licensing is thought to have been a product of Kenya's membership of a customs union (the East African Community) with Tanzania and Uganda, making use of tariffs difficult (WB, 1987). By mid 1970s it was clear that the IS strategy in Kenya was approaching its limits. Furthermore a major outlet for Kenya's manufactured goods, the East African Community (EAC) collapsed.

With the collapse of the regional markets, IS firms started operating at excess capacity and pressure swelled on the Kenyan Government to increase protection of local manufacturing – many of which were parastatals. As the import substitution regime progressed, a large bureaucracy was set to implement it, supervising and implementing import bans and controls, allocating foreign exchange, issuing trade licenses and such. By the end of 1970s the high cost of import substitution strategy to Kenya's economy was already evident. The evidence in Kenya was that manufactured exports were not performing well and this was partly due to the relative unprofitability of manufactured exports vis –a –vis sale to the domestically protected market. The fourth development plan (1979 – 83) confirming government's policy changes – acknowledged that 'past industrial growth had been fostered by excessive protection, resulting in an industrial sector which was uncompetitive, overly capital intensive in relation to Kenya's factor endowments and a heavy net consumer of foreign exchange.'

Kenya attempted to transform trade policies (shifting from IS to an export promotion strategy) as part of Structural Adjustment Programs (SAPs). The WB through the Structural Adjustment Loan (SAL) facility supported various programs in Kenya. Important policy highlights include:

- Export Compensation Act (the first incentive to be enacted) was implemented in 1976. The scheme (proposed in1974) was designed to provide compensation to offset the import duties paid on inputs used in the production of exports. Delays in payments and whimsical Changes made to the subsidy were decisive in making this promotional tool impotent.
- Kenya External Trade Authority (KETA) was established in 1976 to strengthen and reorganize export promotion. The organization was to develop specialized committees in the fields of export training, handicrafts, trade fairs and exhibitions, trade facilities and publicity. Other important institutional bodies include/included; Department of External Trade- established in the 1950s and Investment Promotion Centre (IPC)- established in 1982. The effectiveness of KETA and other institutional bodies was undermined by the level of resources – both financial and human - provided by the Government (Kenya Association of Manufacturers, 1989 p.48).
- Tariff reforms were implemented in the 1980s and 1990s. These had some impact in reducing the effective tariffs (Mwega, 1995).
- In 1983 the Central Bank imposed foreign exchange allocations (these were removed in 1993). Restrictions were mainly administered through import licensing.
- Between 1980 and 1982, the Kenya shilling was devalued by about 20 percent in real terms measured against the special drawing right (SDR). After this devaluation, the exchange rate regime was changed to a crawling peg in real terms by the end of 1982. This regime lasted until 1990 when dual exchange rate system was adopted that lasted till October 1993. Kenya adopted

in October 1993, an exchange rate policy that allows the nominal exchange rate to fluctuate freely in accordance with market/economic conditions (Amoko, 1996).

- There have been attempts made to strengthen government departments for export promotion (e.g. the Export Promotion Council).
- Manufacturing under bond was announced in the sessional paper No. 1 of 1986 and implemented in 1988. Government officials and manufacturers viewed it as an important step towards improving incentives for export-oriented manufacturing.

Glenday, G. and Ryan, T.C.I. (2000) comment that since independence Kenya has been through a process of protecting and controlling its markets that went through a buildup that peaked in early 1980s. Further it is argued that Kenya has only experienced a truly open trade and exchange rate policy since the major liberalization of 1993 – 94.

1.3 Structure and composition of exports.

Kenya's export profile reveals that there have been minimal attempts, or negligible success (or both) to mutually diversify export markets and products (See table 1.1). Fresh horticultural exports have been the only positive move towards diversification (Eliud M. and Kimuyu P. 1999).

Africa is currently the principal market for Kenya's total exports (in 1998 Kenya exported 45 per cent of its total exports to Africa). Although its share averaged 29% during the period 1987-92 this rose to 34% in 1993 and has exceeded 43% since 1994. By 1995, the largest African importers of Kenyan goods were Uganda (32%), Tanzania (25%), Rwanda (7%), Zaire (3%), and Sudan (3%). Apparently, the East and Central African region where Kenya exploits economies of proximity has dominated Kenya's export trade within Africa. Exports to Uganda and Tanzania stood at 29.4 per cent of total exports in 1998.

Kenya's second most important market is the European Community (EC). Up to 1993, the EC dominated Kenya's export trade, its share varying between 40% and 50% of the total. However by 1994, this share had fallen to 34%. Between 1994 and 1998 the EC's share has averaged about 32.4 per cent of the total exports. Within the EC, United Kingdom (UK) has been the leading importer, followed by West Germany and Netherlands. Since 1994, there has been a gradual shift from Western Europe as the principal destination for Kenya's exports to the African region [Mwega (forthcoming) notes that the shift may suggest declining competitiveness]. The share of exports going to the Far East and Australia remained torpid at about 10% of total export trade. Kenya's share of the export market in W. Europe, E. Europe, North and South America and Middle East has been stagnant.

1.4 Statement of the problem

Trade liberalization is a central plank of SAPs implemented in Africa and elsewhere. An important objective of these programs has been to enhance economic growth by increasing exports of manufactured items. The demand for manufactured commodities as compared to primary commodities is steadier and less cyclical, so that primary exporters are more subject to terms of trade (TOT) losses than exporters of manufactured items. Despite policy efforts to diversify exports, Kenya's export base is still dominated by primary commodities (see table 1.1). Although the possibility of short run price increases cannot be ruled out, the long term prospects of rising international prices (for Kenya's main primary commodities) are poor given worldwide overproduction and existing stocks. As long as primary commodities dominate Kenya's export sector, its performance is likely to be lacklustre. There is need therefore for diversification into higher value exports, mainly manufactured products. The way to diversification may be smoother if important determinants are isolated. Diversification of products and

markets is vital since commodity concentration and high trade concentration (revealed in the section above) lead to export instability. Export instability usually breeds Balance of Payments (BOPs) problems, budget deficit and does not allow for systematic planning.

In 1993 Kenya effected trade liberalization measures (removal of import licensing, quantitative restrictions and foreign exchange controls) and the increase in the value of imports that resulted, was (and is) not matched by a corresponding increase in export earnings {in the year 2000 exports and imports grew at 9.8 and 20.1 percent respectively (economic survey, 2001)}. There is therefore a need to have high value exports to provide adequate foreign exchange to stamp out foreign exchange difficulties, or problems (National Development Plan 1997 - 2001). The government, aware of the gravity of the problem has pursued liberal policies to promote export diversification. However, there has been little impact on the export trade. This suggests that there are serious constraints to export development and diversification that need to be investigated with care.

Amongst the studies done so far none has attempted to look at the role of external demand on the export of Kenyan manufactures. As an example, the real income of Tanzania (a major trading partner) declined by a third between 1980 and 1985 (see WB, 1987). The 'small country' assumption is usually used to exclude demand conditions. However, to explain policy performance such changes in foreign incomes should be taken into consideration.

1.5 Questions of the study

This study intends to answer the following questions.

1.What macroeconomic aspects have impeded (or aided) the supply response of manufactured goods?

2. What is the likely impact of a change in external economic activities (measured by changes in the incomes abroad) on manufactured export revenues?

3. Have trade liberalization measures been decisive in influencing export levels of manufactured items?

4. Does Kenya have monopoly power over the sale of its manufactures?

1.6 Objectives of the study

The general objective of this study is to analyse the macroeconomic determinants of manufactured exports from Kenya. The specific objectives of this study are:

1. Capture the effect of 'external conditions' on the exports of Kenyan manufactured products. Changes in 'external conditions' will be captured using the weighted GDP of Kenya's main trading partners.

2. Ascertain the importance of trade liberalization episodes in influencing the size of exports of manufactured goods (e.g. the trade liberalization episode of 1993 –94).

3. Ascertain whether the small country assumption is appropriate for Kenya in as far as export of manufactures is concerned. In the process the study will calculate multipliers relevant for policy decisions. These include export volume, export price and export revenue multipliers (elasticities).

1.7 Justification of the study

Policies to diversify the export base have not produced visible difference in the export statistics. This is in spite of the glorified newer and diverse opportunities brought about by globalization. This suggests that there are serious constraints to export growth and diversification, which necessitate careful investigation.

Exports of both primary goods and manufactured goods is an area replete with studies. However hardly any studies have attempted to capture the effect of changes in external economic activities on export revenues for developing economies (Kenya included). The findings of this study are expected to illuminate the policy decisions.

.8 Organization

The rest of the paper is structured as follows: chapter two reviews relevant literature (both eoretical and empirical) on the export of manufactured products. An overview is attempted at the end this chapter. Chapter three discusses the model to be used and the estimation strategy. The data type d sources are discussed in this section too. The third chapter is concluded by giving the time frame of study. Chapter four begins with a graphical analysis of the data, presents the unit root tests and lastly es the studies hypotheses. Presentation of results is done in the fifth chapter. We wind up the paper is customary) by giving the conclusions and policy suggestions in chapter six.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews the theoretical literature on the macroeconomic determinants of exports i general. The empirical literature essentially focuses on the literature related to this current study in th developing countries before focusing specifically on Kenyan literature.

2.1 Theoretical aspects

The Heckscher-Ohlin (HO) model (a neo-classical model) explains that a country will export thos commodities in which its most abundant factor is used relatively intensively and import thos commodities which incorporate the factors in which it is least endowed (Sodersten, 1995). The HO - model can be used to explain why LDCs, including Kenya (thought to be capital poor and labour rich export mainly primary commodities. The earlier Ricardian model of trade (dubbed as a classical model was silent about why comparative cost ratios differed between countries. Ricardo argued that labou productivity differentials between countries brought about trade. The Ricardian theory was based on th labour theory of value, which became a subject of great controversy thereafter.

Modern textbook writers discuss exports when the economy is finally 'opened' (that is, when the foreig sector is introduced). The export function (x), is typically given as,

$$X = X(P, e)$$

The above function states that for a given level of aggregate foreign demand and prices, real exports (X) will depend on the domestic price level (P) and the exchange rate (e). The relationship is such that real exports are negatively related to both P and e. Whether the money value of exports (x) rises or falls depends on the elasticity of foreign demand for exports. More recent works (see Roemer, 1996) analyse exports as a function of real exchange rates i.e. $X = X(p_f/p)$, where:

P = domestic prices

P_f = foreign prices.

The negative relationship between real exchange rates and exports is argued to be circumstantial if the Marshall-Lerner conditions are invoked (effectively making theory ambiguous).

Originally, the theoretical interest was on what role export diversification could play in reducing the variability of export earnings from the cyclical fluctuations in the International prices of primary commodities (Mac Bean, 1966; Mac Bean et, al., 1980). Countries that specialized in a narrow range of primary commodities are currently faced with declining export earnings and a loss in their share of the International export markets (IMF, 1986).

The trend since 1970 has fashioned a theoretical response, which argues that in a world of changing demand and supply conditions, international trade should be based on dynamic comparative advantage. The dynamic elements focused upon are demand and supply changes; risk evasion given imperfect foresight and changes in commercial policies.

2.1.1 Changes in demand

Engel's law predicts that necessities are income inelastic. As income in the consuming countr increases, the proportion spent on necessities declines. An exporter facing rising income in the importin country has to diversify by increasing the proportion of commodities which are income elastic an reducing the proportion of necessities in order to realize rising export earnings.

Even if incomes in the importing countries are unvarying, tastes change, and indifference maps shif over time, with changes in psychological preferences of different generations of customers. This call for diversification to generate new exports to cater for the changing, desires and needs. Both income and tastes have been changing over time in the European and African markets, which are the mai destinations of Kenyan exports (IMF, 1987).

2.1.2 Changes in supply

Dynamic comparative advantage calls for diversification to develop new exports as the countr adjusts its productive structure to changes in domestic resource endowments such as new skills fro education or better land utilization that nullifies diminishing returns, or changes in productio technology and input mix, or changes in the availability of imported inputs in response to the foreig exchange constraint. Even if resource base and inputs remained unchanged, a country's internationa competitiveness changes in response to the domestic macroeconomic environment, such as the rate o inflation and the competitiveness of other suppliers of identical commodities. Such changes will b reflected in movements in the real effective exchange rate, which signals a reallocation of resources int a new diversity of exports.

Complete specialization, especially in primary commodities with long gestation periods such as tre crops, creates an inflexible export structure in the short-run. Even if the price elasticities of supply o these commodities turn out to be large in the long run, a country cannot adjust to short-run booms o

decline in international prices. More importantly, it is also difficult to predict whether such price fluctuations are short-run and cyclical or whether they represent a secular trend that requires a re-allocation of resources.

Several well known theories explain the phenomenon of irreversibility in export supply relationships, sometimes called export hysteresis. If incumbent exporters incur sunk start up costs - they find it more profitable to continue selling abroad than do identical firms without exporting experience. Firm level studies (among Kenyan exporters) find that sunk costs are important in determining firms response to export incentives, implying that even if the exchange rate were to increase profitably the response may be limited unless profitability crosses the threshold at which firms are willing to invest in exporting (see Mwega forthcoming).

On the policy front this implies that a temporary devaluation, which induces new entry, may permanently increase the number of exporters. Similarly temporary unfavourable conditions for exporters can permanently reduce the export base (Baldwin 1988; Krugman 1989). Further the tendency of producers to 'stay put' in the face of exchange rate fluctuations is likely to increase with uncertainty about future exchange rates (Dixit 1989). Managers want to avoid repeatedly bearing start - up costs. So, if they can learn something about the medium term future by waiting to see how events unfold, they may do so.

Obstacles in the LDCs that prevent the appropriate supply response are related to deep-seated development problems such as the lack of rapid transport to deliver these commodities fresh to the markets, or lack of processing capacity to preserve them in the form that lengthens their shelf-life. The association between industrial and export capacity becomes relevant in this case: as industrial capacity grows, the evidence over the last fifteen years shows that processing capacity itself, plus the related

infrastructure, increase the country's flexibility to process and supply agricultural commodities with high income and price elasticities of demand (IMF 1987 and Harrylyshyn, 1990).

2.1.3 Dynamic effects

Expansion of output brought about by access to the large international markets permits the LDC to take advantage of economies of scale. Other dynamic influences of trade on economic development arise from increased investment resulting from the changes in the economic environment, the increased dissemination of technology into the developing country (e.g. the product cycle), exposure to new and different products.

International trade theory postulates that developing countries perceived as possessing abundant labour relative to capital should have a comparative advantage in labour intensive products in their trade with the rest of the world. However, low skill levels observed in Kenya's manufacturing are likely to limit the country's comparative advantage to primary products and away from manufactured products (Kimuyu 1998).

2.2 Empirical literature.

The general view is that the factors inhibiting export growth and diversification of exports are similar to those explaining Africa's low growth. They include human resources (including healthy and skilled workers), factors that affect transactions costs (including governance and infrastructure services), policies that ensure a stable and competitive macroeconomic environment, and geographic factors (see WB 2000). This section will dwell on factors related to the macro economy.

Indeed, the important variables that explain the movements in the level of exports are policy related variables. The main instruments of trade policy are trade taxes, import and export taxes and varieties of quantitative restrictions on trade. These vary from country to country. One such factor given prominence in the literature is the exchange rate (ER). The pro - exchange rate arguments may be summarized by the thoughts of Helleiner (1986). He notes, "so far, the keys to successful expansion of exports seem to have been realistic and stable exchange rates and sustained governmental support, not import liberalization and laissez - faire". He further argues that raising the quality of the public sector management may be more important than privatizing public enterprises or liberalizing markets.

Mwega (forthcoming) assesses the extent of response of non-traditional exports (NTXs) to the real exchange rate and trade liberalisation policies in Kenya (60% of the NTXs[2] are manufactures). His findings are that the real exchange rate (RER) coefficients are insignificant (at the 5 percent level) and suggest that the RER has not played a significant role in the promotion of NTXs in Kenya. The explanatory variables used in this study were, real GDP, the bilateral RER, a lagged value for NTX volume, and trade liberalization episodes.

2. In mwega's study NTXs are defined as including merchandise exports accounting for less than 3 percent of total exports in the base year.

It is noted that the ability of exporters to respond to ER and trade liberalisation policies will depend on non-price variables. Mwega gives four broad constraints.These include; availability of finance, infrastructural inadequacies with respect to transportation, water, energy, waste disposal, and security. Another constraint is lack of access to external markets arising from ignorance, poor quality of products, lack of interest (and experience) to sell abroad.

The exchange rate is also affected by the policy stance of the government. This is exemplified by the argument of Keesing on the ER and policy performance in protection. Keesing (in Meier and Steel, 1989) argues that if a country prefers high protection and direct control, a characteristic of several SSA countries (probably until recently), 'this in itself will push the exchange rate in a direction that discourages exports and natural, unassisted import substitution. Conversely if a country avoids any but the mildest protection, the resulting exchange rate will be more favourable to exports and make strong protection less necessary'.

Roberts M.J. and Tybout J.R. (1997) studied export booms among many firms in developing countries (concentrating on microeconomic aspects)[3]. Their study revealed that firms that were already exporting before the export booms did not dramatically adjust export volumes in response to devaluation. The explanations given for the response include demand elasticities that are not large, risk averse behaviour and near full capacity utilization. These explanations varied from one country to another in importance.

Several studies considered the effect of the RER uncertainty on exports. Using a simple risk model Caballero R.J. and Corbo V. used data from six developing countries[4] and found that the empirical relationship (between RER uncertainty and exports) is strongly negative - contrary to the ambiguity of

3.This study was conducted among firms in Morocco, Mexico and Colombia.
4. The study used data from Chile, Colombia, Peru, Philippines, Thailand and Turkey.

the theory. Several studies that have shown a negative relation between RER volatility and exports are given; these include Behrman 1976 on Chile, Diaz - Alejandro 1976 on Colombia, Coes 1979 on Brazil and Paredes 1986 on Peru.

There is a fair measure of consensus that the Capacity to produce, usually proxied by GDP is positive and significant (see Mwega (forthcoming), and Moran 1988). In a study of local firms, the Regional Programme on Enterprise Developed (RPED) over 1991-4. Bigsten et al. (1998) find that most (71 per cent) of the large firms in the RPED survey export; hence the problem is not enabling them to enter the external markets but understanding why they export relatively so little - on average less than 30 per cent of their output. Of the reporting firms, exporting firms had substantially less excess capacity (44.8 per cent) on the one shift basis than non -exporting firms (61.1 per cent). Overall 85 per cent of firms were operating below capacity, and cited, as explanations, lack of demand (71.7 per cent) high cost of credit (34.2 per cent), lack of credit facilities (15.8per cent), expensive labour (13.2 per cent), shortage of foreign exchange (7.9 per cent), and other factors such as dumping (58.3 per cent).

Wagacha (2000) analyses the determinants of export performance and the role of relative prices. Total exports regression analysis results indicated that Kenya's total exports responded to three key explanatory variables. These were relative export prices, the lagged value of relative export prices and real wages. Relative export price was defined as the ratio of total export price index, which is proxied by the price index of non - oil exports to the average weighted CPI.

Policy makers have suggested that protectionism by developed countries has played an important role (Yeats, 1981). Many development economists however maintain that inappropriate domestic policies greatly diminished Africa's ability to compete internationally. In answering the question, what has caused Africa's marginalization in world trade? Yeats A.J. et al. (1998) finds that there is little evidence that it was government imposed trade restrictions in OECD markets. Their view is that the

share of African exports subject to non - tariff barriers is far lower than that of other developing countries that launched successful and sustained export - oriented growth. This latter view is buttressed by the presence of other support schemes. An example is the recent United States' African Growth and Opportunity Act (AGOA) designed to remove quotas and tariffs for apparel and textile imports from SSA countries. Students of the region {Jonsson and Subramanian (2000); Coe and Hoffmaister (1998)} argue that among other factors, it is trade restrictions imposed by SSA countries that is responsible for the poor trade performance in manufactures and other exports. Unilateral trade liberalization by SSA countries is one of their policy implications.

A study by UNCTAD (1986) showed that, for a sample of developing countries that had successfully launched an export trade in processed commodities, government support in financing necessary transport, storage and other infrastructure, in training and research and development facilities, and in quality control standards, marketing coordination and gathering of marketing intelligence - had played a crucial role. There was also some evidence that control over marketing and distribution channels by transnational corporations had been; for certain processed commodities, an important obstacle to expanded sales by producers in developing countries.

The size of the domestic market for processed products (forms) is likely to constitute a key constraint on the ability of small, less diversified economies to export processed commodities on a competitive basis. This explains the widespread discussions on regional integration efforts. We may not exhaust all the determinants discussed empirically, however, foreign direct investment (FDI) is one factor that deserves mention. FDI-led restructuring contributed enormously to an impressive expansion in Hungarian exports, which was crucial in successfully tackling of what might have been a serious BOPs crisis in 1995 (Kaminski and Riboud, 2000). The FDI in Kenya has remained devoid of decisive changes in size.

2.3 Overview of the literature

The literature reviewed above reveals that RER might not have played an important role in Kenya (see Mwega). For total exports relative export prices and real wages have been shown to be significant. Domestic capacity (a supply factor) was important. No empirical measures were found for the foreign income elasticity of export demand for Kenya on manufactures. Mwega reports that the trade liberalization episode of 1993-94 was significant for NTXs, sixty per cent of which were manufactures.

CHAPTER THREE

METHODOLOGY

This chapter is primarily concerned with the theoretical presentation of a model, which can be used as a framework to test the important macro-determinants of manufactured exports in Kenya. We first present a simple structural model for export demand and supply and develop and discuss its dynamic characteristics. We then show how the estimations will be done. The chapter ends with a discussion of data requirements (and sources and the motivation for its use).

3.1 Model specification

This section presents a simple structural model[6] identifying separately the manufactured products export supply and demand equations.

3.1.1 Export supply

The supply design assumes that producers base their production decisions on two main factors: domestic capacity and the relative profitability of producing manufactured exports vis-à-vis producing other goods (including other exports, import substitutes, and home goods).

Measurement of domestic capacity presents great difficulties because sector wise capital stock data are usually not available. Three measures have been predominantly used in the literature as proxies for domestic capacity. The first, assumes that time or any other trend factor (e.g. trend Gross Domestic

Product, y*) can be taken as an indicator of domestic capacity (Bond 1985). This measure implicitly assumes that domestic resources are mobile across sectors (and also mobile across borders). A second measure is a capacity utilization index. This is normally defined as deviations from trend output, y-y*. This approach is equivalent to adding aggregate output (y) as an additional explanatory variable. The last measure assumes that a sector wise production index can be used as a proxy for domestic capacity (Balassa and others 1986). This measure has been criticized on the grounds that the production and export of industrial goods are jointly determined and are both affected by demand factors. Thus industrial production cannot be assumed to be exogenous in the structural estimation of an export model (Faini 1985 in Moran 1988).

To measure relative profitability, two separate measures of price effects are used. These are:

(1) The real exchange rate (RER), which indicates the relative profitability of producing tradables (T) versus non-tradables (NT). For measurement purposes the RER = PT/PNT where; PT_t = Price of tradables, in U.S. dollars, calculated as the ratio of value added in current and constant dollars originating in manufacturing, agriculture, and mining, obtainable from the World Banks National Accounts database.

PNT = PH_t = Price of home goods (non - tradables), in U.S. dollars, calculated as the ratio of value added in current and constant dollars originating in the remaining sectors (and including construction, electricity, and private and government services). This is usually proxied by the CPI.

Tradables are goods and services traded across countries borders. If data for PT and PNT are not available as is defined above, this study will employ a proxy for the RER. A suitable proxy is,

$$RER = e*WPI/CPI$$

Where;

e = nominal exchange rate,

WPI = Wholesale price index in the country's main trading partners. WPI (if used) will be accordingly weighted by the export price index, and

CPI = Consumer price index.

(2) The ratio of manufactured exports prices to other tradable goods prices (PX/PT), which indicates the profitability of exporting manufactured items relative to other traded goods (thus influencing the share of manufactured exports in total exports).

A linear version of the export supply equation can be written in the form:

$$x_t^s = \alpha_0 + \alpha_1 (PX/PT)_t + \alpha_2 (PH/PT)_t + \alpha_3 y_t^* \quad \text{.....(1)}$$

$$\alpha_1 \geq 0, \alpha_2 \leq 0, \text{ and } \alpha_3 \geq 0$$

Where:

x_t^s = Manufactured exports [standard International Trade Classification [SITC 5 to 9] in constant dollars: The value data are obtainable from national sources.

PX_t = Manufactured export unit value index, in current U.S. dollars.

PT_t and PNT (PH_t) are as defined above.

y_t^* = Capacity output (Capacity output is proxied by GDP at market prices in constant dollars, obtainable from the World Banks National Accounts database).

All variables are expressed in logarithms. Caveats about the export supply equation (1) should be noted.

- Price indexes will reflect border prices, but exclude the effective taxes and subsidies received (or paid) by local producers and consumers. This exclusion of domestic taxes and subsidies (due to lack of relevant data) probably would limit the price responsiveness of the export estimates obtained here.

- The proxy variable used for domestic capacity (trend GDP) is also correlated with other structural effects which tend to evolve slowly - such as "learning by doing," entrepreneurial talent, and the quality of infrastructure (particularly in transportation and communications).
- The model developed here can only be understood in partial equilibrium terms in order to justify the exogeinity of the RER in the export supply equation.

3.1.2 Export demand.

The export demand specification assumes that external buyers make their decisions on the basis of relative prices and the growth of external demand.

Relative prices are measured by the ratio of a country's manufactured export prices to the price of manufactured exports in World markets, PX/PX^w.

The real scale variable, y_t^w, captures the growth of external demand for each country, reflected in a simple weighted average of real economic activity (GDP) for the countries main export markets. It assumes, implicitly, that the exporting country moves into other markets only with a lag, and hence the geographic distribution of its exports needs to be considered in the definition of external demand.

A linear version of the demand equation can be written in the form:

$$x_t^d = \beta_o + \beta_1 (PX / PX^w)_t + \beta_2 y_t^w \quad \text{.....(2)}$$

With: $\beta_1 \leq 0$, $\beta_2 \geq 0$ and

x_t^d = The quantity of manufactured exports demanded.

PX_t and t are as defined above.

PX_t^w = World price of manufactured exports, in current U.S. dollars.

y_t^w = Index of external demand, calculated as a weighted average of economic activity for the countries main trade partners.

Both equations (1) and (2) will be written in log linear form and thus constant elasticities will be assumed. This simplifies the interpretation and has been justified in the context of import behaviour (Thursby and Thursby 1984).

Both are written in terms of relative prices and hence assume that there is no money illusion on the part of the producers and consumers of manufactured exports.

3.1.3 Dynamic adjustment

Equations (1) and (2), which can be characterized as long run equilibrium relations, represent the basic structural export model used in the present study.

Moran, C. (1988) allows for the presence of short run disequilibria by assuming that export prices and quantities react with a lag to changes in the exogenous variables. Export quantities are assumed to respond positively to the suppliers desire to increase exports, whereas export prices are assumed to respond positively to excess demand i.e.

$$\Delta X_t = \gamma (X_t^s - X_{t-1}),\ 0 \leq \gamma \leq 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$\Delta PX_t = \lambda (x_t^d - X_t),\ \lambda \geq 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where Δ is the first difference operator.

Equation 3 arises from constraints on domestic production. This equation emphasizes the importance of domestic factors in the determination of export quantities (See Drapers 1985, Winters 1985). Equation 4 accounts for the slow adjustment of prices to excess demand.

Differences in the speed of adjustment between suppliers and consumers may have important consequences in the dynamic structure of the model. Two cases are distinguished here, and will be explicitly tested. The first case labeled model A assumes that both sources of disequilibria (supply and demand side), are important in adjustment towards long run equilibrium. Noting that;

$(px/px^w)_t = px_t - px_t^w$, $\Delta x_t = x_t - x_{t-1}$, and $\Delta px_t = px_t - px_{t-1}$, model A can be derived by substituting equation 1 into equation 3 and equation 2 into equation 4 to obtain

$$X_t = a_0 + a_1 (PX/PT)_t + a_2 (PH/PT)_t + a_3 y^*_t + a_4 x_{t-1} + u_{1t} \quad \ldots(5)$$

where:

$a_1 \geq 0$; $a_2 \leq 0$; $a_3 \geq 0$; $0 \leq a_4 \leq 1$;

and

$$PX_t = b_0 + b_1 PX_t^w + b_2\ y_t^w\ b_3 x_t + b_4 PX_{t-1} + u_{2t} \quad \ldots(6)$$

where:

$0 \leq b_1 \leq 1$; $b_2 \geq 0$; $b_3 \leq 0$; $0 \leq b_4 \leq 1$;

u_{1t} and u_{2t} are the error terms of equations (5) and (6) respectively.

The error terms are assumed to have zero means and constant variances.

The second case, labeled model B, assumes that the adjustment on the demand side is fairly rapid and completed in one year but that the adjustment of domestic producers is only partially completed within a year. This hypothesis seems attractive, as suppliers are likely to respond only slowly to changes in the exogenous variables. Buyers, however, can change their purchases from a particular country with relative ease. Under this condition, the export supply equation (5) will continue to be valid, but the equilibrium export demand curve equation (2) will replace the lagged adjustment equation (6). Equation 5 and 2 thus constitute the structural model B.

Macroeconomic time series data is often disturbed by exogenous shocks. Exclusion of such shocks (if present) may lead to estimates inconsistent with economic theory. As an example Mwega (forthcoming) identifies several trade liberalization episodes (shocks). It is for this reason that we express the general model to be estimated in the forms given below (that is equations 7 to 10).

Model A

$$x_t = \Sigma c_{1i}(PX/PT)_{t-i} + \Sigma c_{2i}(PH/PT)_{t-i} + \Sigma c_{3i} y^*_{t-i} + \Sigma c_{4i} x_{t-i} + \Sigma c_{5i} Di \quad \text{.....(7)}$$

$$PX_t = \Sigma d_{1i}\, PX^w_{t-i} + \Sigma d_{2i}\, y^w_{t-i} + \Sigma d_{3i}\, x_{t-i} + \Sigma d_{4i} px_{t-I.} \quad \text{..... (8)}$$

Model B

$$x_t = \Sigma c_{1i}(PX/PT)_{t-i} + \Sigma c_{2i}(PH/PT)_{t-I} + \Sigma c_{3i} y^*_{t-i} + \Sigma c_{4i} x_{t-i} + \Sigma c_{5i} Di \quad \text{.....(9)}$$

$$X_t^d = \beta_0 + \beta_1 (PX/PX^w)_t + \beta_2 y_t^w \quad \text{.....(10)}$$

Where:

$c_{1i} \geq 0;\ c_{2i} \leq 0;\ c_{3i} \geq 0;\ 0 \leq c_{4i} \leq 1-\gamma$ and Di represents the step or impulse dummy to capture impact of trade liberalization episodes. Further; $0 \leq d_{1i} \leq 1 d_{2i} \geq 0;\ d_{3i} \leq 0;\ 0 \leq d_{4i} \leq 1.$

$\beta_0, \beta_1,$ and β_2 are as defined above.

It shall be judicious to incorporate the advice of Lyakurwa, W.M (1991) who observes that very few issues of export development and export promotion lend themselves to quantitative analysis. A cause and effect type of equation may be quite difficult to formulate. The analysis may have to be based on more qualitative empirical evidence.

3.2 Estimation strategy

There is evidence that very few of the time series we meet in practice are stationary. It is common to encounter non-stationary series (long memory series) or even random walk series (As an example see Pindyck & Robinfeld, 1995). Non-stationary series do not have finite variance and hence many of the standard analysis will be invalid. If the variables follow random walks, a regression of one against another may yield spurious regression. Ours is a time series and logically the methodology will seek to detect for such spurious correlation. General characteristics of the process like series mean, variance, plot, innovations and order of integration will help to characterize the series and help to determine whether it is stationary or not.

Testing the order of integration will utilize the unit roots introduced by Dickey – Fuller (the standard DF test). The standard DF tests are based on 'well behaved' errors. However presence of serial correlations in errors will call for a modification of the standard DF test. In this case the augmented Dickey- Fuller test (ADF) or the Phillips-Perron test will be useful. The tests will allow us to reject (or fail to reject) the hypothesis that a variable is not a random walk. If in any case the test(s) fails to reject the hypothesis of a random walk we shall seek solace on cointegration. The whole idea of cointegration is that a linear combination of two random walk variables may be stationary. The existence of co integration among variables suggests that there is a long run economic relationship among the variables. If co integration is supported then the error correction model (ECM) is justifiable.

Overall it shall be tested whether the Autoregressive (AR) models or Moving Average (MA) models or both generate the processes. It is likely that the ARMA model may prove to be the best characterization. If this is the case and further we find that the AR and MR processes have long memory – it will be inevitable to perform diagnostic checking to finally specify the most suitable model. The model presented here should thus be viewed as a tentative one.

In a nutshell, the strategy of estimation will follow the suggested Box – Jenkins (1976) three-stage approach of identification, estimation and diagnostic checking. Adequacy of the model will be confirmed and a suitable model selected. The final characterization will have a bearing on the suitable estimation technique.

3.2.1 The small country assumption

The estimation strategy will test for the validity of the small country assumption, using the estimates of the reduced form. If the small country assumption is rejected this will be evidence that the country faces a much smaller demand price elasticity. The export supply and demand equations are then estimated using cross-section time series analysis. The price elasticity of export demand (β_1) is a key parameter in the specification of the appropriate model, for it permits the adoption of the small country assumption. Export prices can be regarded as exogenous in the export supply equation only if the export demand curve is infinitely price elastic. To test this assumption, the reduced form of model A, will be estimated. The F values associated with the general and restricted reduced-form expressions for the price and quantity equations will be calculated. Large values of F indicate that the small county assumption can be rejected by the data.

3.2.2 Structural estimates

To obtain the structural estimates use was made of two stage least squares (2SLS). The aim was to eliminate the simultaneous equation bias (a bias whose source is the existence of endogenous variables in the set of explanatory variables of the function. In the first stage we applied ordinary least squares to the reduced form equations to obtain estimates of the reduced form coefficients. The estimated

coefficients were used to obtain a set of estimated values for the endogenous variables that appear as explanatory variables (Koutsoyiannis, 1993).

3.3 Data requirements and sources.

This study utilized annual time series data from a variety of secondary sources. The data required individual observations of manufactured exports (x_t), manufactured export unit value index (PX_t), world price of manufactured exports (PX_t^w), price of tradables (PT_t), price of home goods (PH_t), capacity output (y_t^*), and index of external demand (y_t^w).

x_t was obtained from the international trade statistics yearbook (U.N) – the source classified exports by S.I.T.C sections. The value of manufactured exports (X_t) was deflated by the unit price index for manufactured exports (PX_t). PT_t, PH_t (proxied by the CPI) and y_t^* (proxied by GDP at market prices) were obtained from the International Financial Statistics (I.F.S). y_t^w required a few manipulations. Following Moran (1988) we define $y_t^w = \Sigma\, w_{it}\, y_t^i$ where y_t^i = GDP at constant market prices for region i, and $w_{it} = (X_{it} / X_t) + (X_{it\,-1}/X_{t-1})$. X_{it} = value of exports to region i at time t. X_t = total manufactured exports for year t. value of exports by region was not available in S.I.T.C sections. The statistical abstract however had the value of re-exports to various regions by S.I.T.C sections. This study therefore used re-exports of manufactured goods in place of X_{it}. Re-exports (of manufactured goods) are mainly sold in African markets, so are the aggregate manufactured exports. The former are therefore likely to give a correct bearing of the direction of the latter. The regions used were (1) Uganda (2) Tanzania (3) Sudan, Somali and Ethiopia (4) Rwanda, Zaire and Burundi and (5) the European Union. The regional classification was in tandem with classification in the secondary data sources. It is noticeable that a few

other regions were omitted – the motivation for this is that the regions above accounted for the bulk of Kenya's export trade.

For y_t^w United Kingdom, Germany and Netherlands represented the European union. All the values used in this study are real dollar values.

CHAPTER FOUR

DATA ANALYSIS AND HYPOTHESIS

This chapter begins by analyzing the data graphically. Graphs were observed for shocks, structural breaks, trend (broken or otherwise), and stationarity conditions of the series. The DF and ADF test statistics were used to supplement the preceding graphical inferences. The findings that most of our variables are integrated of order one meant that cointegration tests were important to avoid spurious and inconsistent regressions. In testing for cointegration we also discuss the Error Correction Modelling (ECM) procedure. We end the chapter by stating the hypotheses to be tested. In all subsequent analyses L is used to denote 'logarithm of', and D (or Δ) is used to denote 'difference of.'

4.1 Graphical analysis of the data

The series LX_t (L is used to represent logarithms) does not exhibit any clear trend (it also has a non zero mean). A look at the first difference of the series reveals periodic disturbance by shocks (including the periods 1977,1981,1983,and 1998). Several events may explain the shocks. In 1979-1980 the second oil crisis struck after the first in 1973/74. In 1982 Kenya experienced the failed coup attempt that led to capital flight (RPED, 1993). The decline from 1997 is attributed to: inadequate rains, power rationing, adverse effects of basic infrastructure constraints among other factors (Economic Survey 1997). Otherwise, the series is stationary after differencing once. The series LPX_t and Ly_t^w also do not reveal obvious trends; however, both may have broken trends. LPX_t rises rapidly till 1978 and thereafter reveals stationarity (see appendix 2).

The series LPX_t^w, LPH_t, LPT_t, and Ly_t^* show clear trends. Ly_t^* is the only series that has a downward trend (more or less), this implies that our real dollar GDP (proxy for y_t^*) has been on a

general decline. The first difference of these series indicate that all are stationary. The ratios PX/PT, PH/PT and PX/PX_t^w were also analysed. PH/PT and PX/PX_t^w remotely reveal characteristics of stationary processes - both vary around a zero mean.

Of importance to cointegration analysis, the series PX_t^w, LPT_t and LPH_t all move upwards throughout the period under study. Ly_t and PX/PT on the other hand have strong downward trends.

4.2 Unit root tests

It was earlier pointed out that time series variables that are not stationary individually may yield inconsistent and spurious correlation. Use is made of the Dickey- Fuller (DF) and Augmented Dickey-Fuller (ADF) Unit root tests to analyse the various series.

The DF t-test for the presence of a unit root runs the regression of the form $\Delta y_t = \rho y_{t-1} + \varepsilon_t$ and the ADF test is constructed with the regression model of the form $\Delta y_t = \rho y_{t-1} + \sum \gamma_i \Delta y_{t-j} + \mu_t$ (j is set to ensure that the error term is distributed as white noise). The significance of ρ is tested against the null that $\rho=0$ and the alternative hypothesis that $\rho < o$. For the DF and ADF tests the null hypothesis of a unit root is rejected against the one-sided alternative if the t-statistic lies to the left of (is less than) the critical value.

In both tests, there is the problem of whether to include a constant, a constant and a linear trend, or neither in the test regression. Hamilton (1994, p.501) suggests that a general principle to follow is to choose a specification that is a plausible description of the data (under the null and alternative hypothesis). It is argued that inclusion of irrelevant regressors in the regression reduces the power of the test, possibly concluding that there is a unit root when, in fact there is none.

In series that reveal the presence of a trend, we included both a constant and a trend in the test regression. Series that had non-zero means and had no trend exhibited, were regressed with a constant

only. Finally, when the series fluctuated around a zero mean we included neither a constant nor a trend in the test regression. To operationalise the test we now define the following:

DF= Dickey-Fuller t-test no constant or trend term included.

DFc = Dickey-Fuller t-test with the constant included.

DFct = Dickey-Fuller t-test with both constant and trend included and

ADF = the augmented Dickey-Fuller test.

The results of the findings of the tests are summarized in the table below. This should bump up the graphical analysis of the data presented earlier.

Table 4.1: Unit root test results on log-levels and first differences

Variable	DF	DFc	DFct	ADF (one lag)	Conclusion
DLX_t	–	-3.770618 (-2.9750)	–	-2.331811 (-2.9798)	I (1)
LPX_t	–	-2.307355 (-2.9665)	–	-2.989542 (-2.9705)	I (0)
DLy_t^w	–	-3.753874 (-2.9705)	–	-3.843099 (-2.9750)	I (1)
LPX_t^w	–	–	-4.286333 (-3.5796)	-4.117159 (-3.5867)	I (1)
$DLPH_t$	–	–	-5.034037 (-3.5867)	-5.050821 (-3.5943)	I (1)
$DLPT_t$	–	–	-5.211874 (-3.5796)	-2.303806 (-3.5867)	I (1)
DLy_t^*	–	–	-3.700155 (-3.5796)	-3.380407 (-3.5867	I (1)
$DL(PX/PT)_t$	–	–	-6.914294 (-3.5796)	-3.360670 (-3.5867)	I (1)
$DL(PH/PT)_t$	-8.202611 (-1.9535)	–	–	-3.261356 (-1.9540)	I (1)
$DL(PX/PX_t^w)_t$	-5.369679 (-1.9535)	–	–	-3.358596 (-1.9540)	I (1)

L before a variable was used to denote the logarithm of the variable
D means "difference of"
I (d) is read 'integrated of order d'

All but one of the variables are integrated of order one [I (1)]. We varied the lag length of the ADF test and found out that an increase in the lag length (up to the fourth lag) did not change the conclusions of the ADF test. Although we hinted that the series PH/PT and PX/PX_t^w might be stationary the tests above show otherwise. Perhaps, after all, the return of the graphs to a mean value (if any) was not rapid enough. For the series that we had difficulties describing graphically we tested all the regression specifications indicated in the table above.

4.3 Cointegration and ECM modelling

Formally, if a series y_t~I (d) and x_t~I (b) and the linear combination of the two, namely $z_t = y_t - kx_t$~I (d-b), then y_t and x_t are cointegrated of order (d-b). A test for cointegration would involve performing unit root test on z_t (the error term). If we reject stationarity of the linear combination, then we can say that y_t and x_t are cointegrated. In this study we utilized the Engle and Granger (1987) two-step procedure where; first, we estimate a regression between export supply (and demand) on each of their regressors and upon obtaining the residuals, test the residuals for their order of integration. Concluding stationarity for the residual implies that there is cointegration. The export demand and supply theory is stated in levels and differencing the variables to render them stationary transforms theory into a relationship of changes (resulting in loss of long run information about the variables). However we can retain this long run information by the use of an error correction model.

4.4 Hypotheses of the study

The study will test will test the following hypotheses:

1. Kenya is a small country, that is, its manufactures export prices are equal to the world price (PX_t^w) of manufactured goods.
2. An increase in income abroad (external economic activity) lead to increased demand for manufactured exports.
3. The relative increase of the domestic price of manufactured goods to the price in the world markets decreases the quantities demanded of the manufactured goods.
4. Increases in the relative price of manufactured goods to the price of other tradables increases the supply of the manufactures.
5. An increase in the real exchange rate variable (PH/PT) reduces the level of supply of manufactured exports.
6. Increases in domestic capacity (y_t^*) lead to increases in the supply of manufactured goods.

CHAPTER FIVE

PRESENTATION OF RESULTS AND INTERPRETATIONS

This chapter presents and discusses the empirical findings. The issue of the small country assumption precedes the estimation of the structural estimates. For the structural estimates, use is made of models A and B (see methodology). The diagnostic tests are reported for each regression. Similar test statistics are given for each of the models. Before continuing it will be essential to expound on the test statistics used.

t-statistics are conventionally calculated to determine whether individual coefficients are significantly different from zero. The null hypothesis (H_0), of a zero coefficient is rejected for large values of t (that is, t values greater than or equal to a value of two). The standard error (std. Error) test serves a similar purpose. A variable has a significant coefficient if that coefficient is greater than twice its standard error. PartR^2 gives the explanatory power of each variable holding the other variables constant.

R^2 measures the goodness of fit of the regression. The F- statistic tests the null hypothesis that all the regression coefficients except the intercept are zero. In the case of the general overparameterized model in appendix 4 table 1 the F- statistic with 14 and 13 degrees of freedom for the numerator and denominator respectively is 13.949 and its probability value (of zero) is given in the square brackets {that is, F (14, 13) = 13.949 [0.0000]}. The reported F-statistic in the tables for similar degrees of freedom is 2.57 (at the 5% level). The calculated F is greater than the reported F and the null is rejected. Generally 'large' values of F will mean rejection of the null hypothesis.

σ is the residual standard deviation. It is the standard deviation of the difference between the actual and fitted values in the regression. Smaller values of σ are preferable. If movement from the

overparameterized model to the preferred model reduces the σ statistic then this implies that there is no loss of information in the exclusion process.

RSS is the residual sum of squares ($RSS=\sigma^2$ (T-K). If say model 2 has a higher RSS than model 1, then model 2 is nested in model 1.

AR tests for error autocorrelation (serial correlation) It is a Lagrange Multiplier (LM) test for autocorrelation. In some instances both the F-test and Chi^2 test are reported. The LM test is valid for models with lagged dependent variables, whereas neither the Durbin-Watson (DW) nor the residual correlogram provide a valid test in that case. The null hypothesis of no autocorrelation is rejected if the test statistic is too high.

The normality test checks whether the variable at hand (the residual) is normally distributed. The null hypothesis of normality is rejected at 5% if a test statistic greater than 5.99 is observed. In the case below (and in subsequent cases) normality test statistic is a chi test. In the preferred model in table 5.1 below the chi test with two degrees of freedom is 2.0174 with a probability value of 0.3647 given in square brackets (that is, chi^2 (2)=2.0174[0.3647]) and clearly normality is not rejected. The Regression Specification Test (RESET) checks if y (t) depends on its squared values [i.e. y^(t) ^{n} where n=2,3,4...] thus testing for functional form misspecification. The test statistics below is smaller than the reported value and we conclude that model is specified correctly.

Heteroscedasticity tests if the error terms have constant variances. The null hypothesis of no heteroscedasticity is rejected if the test statistic is too high.

In all the estimations we used the general-to-simple modelling strategy, which has the following general steps:

1. It begins with the dynamic model formulation
2. We check for data coherence and cointegration

3. Unwanted regressors are deleted to obtain a parsimonious model and

4. The validity of the model is checked by use of standard tests. Schwarz Criterion (SC), Hannan-Quinn Criterion (HQ), and σ-values monitor progress.

5.1 The small country assumption

To test the small country assumption, the reduced form of model A, (the most general model) was estimated. If the small country assumption can be rejected this is evidence that the country faces a small demand price elasticity.

5.1.1 The price equation

For a dynamic model formulation, we began by including lags for all the right hand side variables. The strategy was to begin with an over parameterized model and subsequently delete unwanted regressors to achieve parsimony. The general model results are summarized in appendix 4 table 1. The results of the preferred model are summarized in table 5.1 below.

Table 5.1: Preferred model estimates on LPX_t (Modelling LPX_t by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	PartR²
$DLPX^{w}_{t-1}$	0.47830	0.22329	2.142	0.0441	0.1793
$DLPT_t$	0.33213	0.15614	2.127	0.0454	0.1773
$DLPT_{t\_1}$	0.34439	0.11882	2.898	0.0086	0.2857
DLy^{*}_t	0.40588	0.14129	2.873	0.0091	0.2821
DLx_t	-0.23733	0.090129	-2.633	0.0155	0.2482
LPX_{t_1}	0.64021	0.17690	3.619	0.0016	0.3841
LPX_{t_2}	0.35466	0.17649	2.010	0.0575	0.1613

$R^2 = 0.99964$ $\sigma = 0.0969324$ RSS = 0.1973135589 for 7 variables and 28 observations

Other tests
AR F (2, 19) = 3.1405 [0.0663]
ARCH F (1, 19) = 0.34673 [0.5629]
Normality Chi^2 (2)= 2.0174 [0.3647]
RESET F (1, 20) = 0.69052 [0.4158]

There is no evidence of first or higher order autocorrelation in the equation errors, while other statistics support the view that the distribution of the errors is identically and homoscedastically normal. Nothing suggests that the price equation is mis-specified. Clearly the model captures the salient features of the data and is consistent with the main implications of economic theory.

In our preferred price equation all the variables have the expected signs and are significant. If Kenya is indeed a small country then the price for manufactured exports (PX_t) should be given {that is, dependent on the world price (PX_t^w) alone}. We accordingly imposed zero restrictions on all the right hand side variables aside PX_t^w (which was restricted to a value of one) and tested the null hypothesis that the coefficient terms of the variables are zero (that is, $d_{22}=d_{21}=d_{23}=d_{24}=d_{25}=d_{26}=0$; $d_{21}=1$).

The reported Wald test (an F-statistic) for linear restrictions was F (7,21) = 817.18 [0.0000] **. The null hypothesis tested (H_0) is that the restriction is binding. We conclude (because of the large F-statistic) that the restriction is not binding. There is evidence that Kenya is not a small country in as far as export of manufactured goods is concerned.

5.1.2 The quantity equation

The quantity equation was estimated following the same procedure. A look at the DLX_t graph in appendix 3 suggests that the series was disturbed by temporary shocks in the periods, 1981, 1983, 1998 and other minor shocks. Tests revealed that the other shocks were insignificant and were ignored to avoid loss of degrees of freedom. Accordingly we introduced impulse dummies for the years 1981,1983 and 1998 (these are; i1981, i1983, and i1998 respectively). The general model is given as table 2 in appendix 4. Exclusion of the unwanted regressors (that is, those with low t-values and part R^2) resulted in the estimation of the preferred model whose results are summarized in table 5.2 below.

Table 5.2: Preferred model estimates on DLx_t (Modelling DLx_t by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	PartR²
Constant	-0.11829	0.076235	-1.552	0.1381	0.1180
$DLPX_t^w$	0.29147	0.45959	0.634	0.5339	0.0219
DLy_t^w	0.15171	0.076061	1.995	0.0615	0.1810
DLy_{t-1}^w	-0.24867	0.095277	-2.610	0.0177	0.2746
$DLPT_{t-1}$	-0.64701	0.28982	-2.232	0.0385	0.2168
$DLPH_t$	1.5854	0.55588	2.852	0.0106	0.3113
i1981	0.41953	0.17242	2.433	0.0256	0.2475
i1983	-0.29914	0.16442	-1.819	0.0855	0.1553

$R^2 = 0.647863$ F (8, 18) = 4.1396 [0.0059] $\sigma = 0.154896$ RSS = 0.4318687973 for 9 variables and 27 observations

Other tests

AR F (2, 16) = 0.89163 [0.4294] and Chi^2 (2) = 2.7075 [0.2583]
ARCH F (1, 16) = 3.2853 [0.0887]
Normality Chi^2 (2)= 13.558 [0.0011] **
RESET F (1, 17) = 0.45485 [0.5091]

Diagnostic tests show the absence of serial correlation and heteroscedasticity. The equation is well specified. However the errors are not normally distributed.

Apart from the price of home goods (PH_t) the coefficients had the expected signs. If Kenya is a small country then the value of exports should not depend on the index of external demand (y_t^w) and the world price of manufactured exports (PX_t^w). We accordingly imposed the restrictions (the null hypothesis) that their coefficients are zero. The results of the F- tests are indicated in table 5.3 below together with the earlier results for the price equation.

Table 5.3: The Wald tests on the small country assumption.

	Quantity equation	Price equation
F-values (Wald Test)	3.52	817.18
Critical values (5%)	(3.52)	(2.49)

The results of this tests show that the small country assumption could clearly be rejected, at the conventional significance level of 5%. Kenya may thus have the market power in the manufactured goods it exports and could use this advantage to gain market shares by offering a reduced price for these goods. There is strong evidence of finite and relatively small demand price electricity. If the small country assumption could not be rejected we could argue that Kenya faces a much larger (possibly infinite) demand price elasticity.

5.2 Structural estimates

5.2.1 Export demand estimates (model B)

Use was made of the estimated value for the manufactured exports (x_t) derived from the equation of the form, $x_t = f\{(PX/PT)_{t-i}, (PH/PT)_{t-i}, y_{t-i}, x_{t-I}, (PX/PX^w)_{t-I}\}$, that is x_t on all the predetermined variables of the model. The generated x_t ($\hat{x}_t$) was used to estimate the long run equilibrium relationship of the form, $\hat{x}_t = f\{(PX/PX^w)_{t-i}, y_{t-i}^w\}$. The preferred model had the form given below and the overparameterized model is given in table 4 of appendix 4.

Table 5.4 Quantity equation preferred model (Modelling DL $\hat{x}_t$ by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
Constant	0.19065	0.21575	0.884	0.3879	0.0395
$L(PX/PX^W)_t$	-0.83724	0.18229	-4.593	0.0002	0.5261
$L(PX/PX^W)_{t\_1}$	0.53527	0.20193	2.651	0.0158	0.2700
Ly_t^w	-0.012497	0.023616	-0.529	0.6028	0.0145
i1981	0.32183	0.10434	3.085	0.0061	0.3337
i1983	-0.27925	0.10371	-2.693	0.0144	0.2762
i1998	-0.53863	0.11638	-4.628	0.0002	0.5299

R^2 = 0.802949 F (6, 19) = 12.904 [0.0000] σ = 0.099 DW = 2.04 RSS = 0.1862189188 for 7 variables and 26 observations.
Information Criteria: SC = -4.06175; HQ = -4.30293; FPE = 0.0124397
Other tests
AR F (1, 18) = 0.032799 [0.8583] and Chi^2 (1) = 0.04729 [0.8278]
ARCH F (1, 17) = 0.015296 [0.9030]
Normality Chi^2 (2)= 6.1255 [0.0468] *
RESET F (1, 18) = 0.98583 [0.3339]
Heteroscedasticity (in errors) Chi^2 (9) = 3.9024 [0.9177] and F-Form (9, 9) = 0.1766 [0.9917]

Residuals were generated from the preferred model. The generated residuals were tested for unit roots; the findings are summarized in table 5.5 below.

Table 5.5 Test on residuals	DF	ADF
Test statistic	-5.2080	-5.5423 (lag zero)
		-4.8017 (lag one)
Critical value (5% level)	(-1.955)	(-1.956)

Addition of the lag length to two did not change the initial findings (that is, the rejection of the null hypothesis of the presence of a unit root). Our variables may hence have a long-term relationship, which can be captured by an error correction term. We next estimated an ECM. The error correction coefficient was not significant and was actually dropped off in the iteration process. The overparameterized model is given in appendix 4 table 6. The preferred model estimates are of the form given in table 5.6 below.

Table 5.6: The preferred model (Modelling DL $\hat{x}_t$ by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
$DL(PX/PX^W)_t$	-0.86977	0.12816	-6.787	0.0000	0.7080
$DLy^W_{t\_1}$	-0.15287	0.030281	-5.049	0.0001	0.5729
i1981	0.32839	0.076419	4.297	0.0004	0.4929
i1983	-0.30338	0.075125	-4.038	0.0007	0.4619
i1993	0.24217	0.075860	3.192	0.0048	0.3491
i1998	-0.53733	0.075318	-7.134	0.0000	0.7282

$R^2 = 0.885737$ $\sigma = 0.0749832$ DW = 1.70 RSS = 0.1068271636 for 6 variables and 25 observations
Information Criteria: SC = -4.68289; HQ = -4.89428; FPE = 0.00697188
Other tests
AR 1- 1F(1, 18) = 0.38546 [0.5425] and Chi^2 (1) = 0.52413 [0.4691]
ARCH 1 F (1, 17) = 1.0082 [0.3294]
Normality Chi^2 (2)= 0.94348 [0.6239]
RESET F (1, 18) = 0.015911 [0.9010]
Heteroscedasticity (in errors) Chi^2 (8) = 6.224 [0.6222] and F-Form (8, 10) = 0.41436 [0.8876]

The ratio of the domestic price of manufactures to the price in the world markets enters the export demand equation with a negative sign. It is statistically significant at one percent and has a high elasticity value. An increase in the price of our manufactured exports relative to the world price depresses external demand.

Changes in the incomes abroad enter the demand equation at one percent significance with a lag of one. The result is however not consistent with a priori expectations (see hypotheses) that an increase in incomes abroad would increase demand for manufactured goods. We find that an increase in incomes abroad depresses demand for manufactured goods. Theoretically this is true for inferior quality goods.

All the demand dummies are statistically significant. The year 1981 can be described as one of very poor economic growth rates and high unemployment mainly as a result of the oil shock. 'The year was one of serious balance of payments difficulties for the majority of developing countries' (Economic Survey, 1982). It is possible that inferior quality goods would experience increased demand in this markets perhaps explaining the 1981 positive dummy. In 1982 there was a deepening of international recession, which depressed the state of demand globally. This, together with increased import

restrictions of our main buyers (due to the debt problems in that time) could explain the negative 1983 impulse dummy. Financial market turbulence originating in Asia, the ban on fish exports to the European Union and a reduction of the quota allocation for Kenyan garments (a major export) in 1998 could explain the negative 1998 impulse dummy.

In both models the error term is distributed as white noise. The Schwartz Criteria (SC) and σ have both declined implying no loss of information in moving from the general to the preferred model.

5.2.2 Export supply estimates (Model B)

Model B was represented by equations (9) and (10). In the first stage of the 2SLS we estimated an equation of the form $x_t = f((PX/PT)_{t-i}, (PH/PT)_{t-i}, y_{t-i}, x_{t-i}, (PX/PX^W)_{t-i}, i1981, i1983, i1998)$, that is x_t on all the predetermined variables of the model. The estimated coefficients were used to generate approximate values for manufactured exports ($\hat{x}_t$) from the relation $\hat{x}_t = x_t - e_t$. $\hat{x}_t$ is thought to be less correlated with the residuals. $\hat{x}_t$ was used in the second stage and the results of the initial over parameterized model indicated that there was evidence of the absence of heteroscedasticity and autocorrelation. Furthermore, the errors were distributed normally (see table 5 in appendix 4).

All the variables are integrated of order one and cointegration is likely. A long run relationship of the form $x_t = f((PX/PT)_{t-i}, (PH/PT)_{t-i}, y_{t-i}, x_{t-i}, (PX/PX^W)_{t-i})$, was estimated. So as to determine the order of integration of the generated residuals DF and ADF tests were performed. If we cannot reject the hypothesis that the e_t sequence is integrated of order zero then the variables may be cointegrated. The generated residual's (e_t) unit root results are summarized in table 5.7 below.

Table 5.7 Unit root tests on generated residuals

	DF	ADF
Test statistic	-6.1581	-6.5881(lag zero) -3.9430 (lag one)
Critical value (5% level)	(-1.955)	(-1.956)

We concluded that the e_t sequence is integrated of order zero. Addition of lag length to two though not reported, did not change the conclusion arrived at. Next, an ECM of the form, $\Delta L\hat{x}_t = a_0 + \sum_{i=1}^{m} \Delta L\hat{x}_{t-i} + \sum_{i=0}^{m} \gamma_{2i}\Delta L(PX/PT)_{t-i} + \ldots + \sum \gamma_{4i}\Delta L(PH/PT)_{t-i} + \beta ECM_{t-1} + Dummies$ was estimated. This gave us the preferred equation having a significant β (see table 5.8 below). This implied that there is a long run relationship amongst the variables estimated.

Table 5.8 Quantity equation preferred model estimates (Modelling DL $\hat{x}_t$ by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
$DL(PX/PT)_t$	-0.71743	0.13374	-5.364	0.0001	0.6427
$DL(PH/PT)_t$	0.46724	0.18006	2.595	0.0195	0.2962
$Dl\,y_t^*$	0.25758	0.13024	1.978	0.0654	0.1964
$DL\hat{x}_{t\_1}$	0.36321	0.11108	3.270	0.0048	0.4006
ECM_{t_1}	-0.76533	0.30017	-2.550	0.0214	0.2889
i1981	0.24307	0.086032	2.825	0.0122	0.3328
i1983	-0.48742	0.088318	-5.519	0.0000	0.6556
i1998	-0.60550	0.096177	-6.296	0.0000	0.7124

$R^2 = 0.8877$ $\sigma = 0.0813854$ RSS = 0.105977384 for 8 variables and 24 observations.

Other tests
AR F (1, 15) = 0.68025 [0.4224] and Chi^2 (1) = 1.0412 [0.3075]
ARCH F (1, 14) = 0.29195 [0.5975]
Normality Chi^2 (2)= 2.5948 [0.2732]
RESET F (1, 15) = 4.51 [0.0507]

The ratio of the price of domestic exports to the price of other tradables has a large elasticity value of –0.72 and is statistically significant at one percent. A rise in the price of manufactured goods relative to other tradables was expected a priori to increase supply.

The real exchange rate measure (PH/PT) is statistically significant at five percent and is positively related to the level of supply of manufactured exports.

Capacity level enters the supply equation with a positive sign. A one percent rise in the level of capacity would result in a 0.26 percent increase in manufactured export supply levels. At one place of decimal, its coefficient is just significant at the ten percent level.

Changes in the first lag of past export levels positively influence current supply. This is indicated by its elasticity estimate of 0.36, which is significant at the one percent level.

Despite the second oil shock of 1979/80 the 1981 impulse dummy indicates a positive impact on the level of manufactured exports. It is possible that investors were responding to announcements of World Bank supported reforms in the domestic economy in the early 1980s (WB, 1987).

The 1983 and 1998 impulse dummies are statistically significant at one and five percent levels respectively. The negative 1983 impulse dummy could be explained by the failed coup attempt of October 1982 that led to capital flight (RPED, 1993), and further there were major devaluations on the exchange rate (prior to 1983), which may have reduced the dollar value of manufactured exports. The only shocks witnessed after the 1993 reforms were in 1998. Events that are relevant to this period are highlighted in the Economic Survey (1997). It is stated in part that 'Inadequate rains, power rationing, adverse effects of basic infrastructure constraints, rises in manufacturing processing costs attributed to high prices of petroleum products and other key inputs, and prevailing high interest rates in 1996, led to lower capacity utilization of manufacturing establishments in food processing, beverages, and tobacco industries'. Furthermore, the year 1997 was an election year (election periods in Kenya are usually

marked by uncertainties that impact negatively on investment), there was also a ban on fish exports. All these factors explain the negative and significant impulse dummy of 1998 and the general decline of the dollar value of manufactured exports in subsequent periods.

The error correction term is significant at five percent. The coefficient of -0.77 for the ECM suggests that seventy seven percent of the error from the previous year is corrected in the current year. This is a high speed of adjustment.

Diagnostic tests show that there is absence of serial correlation as is indicated by the AR test and absence of heteroscedasticity as indicated by the ARCH test. The normality test shows that the residuals could still be approximated by a normal distribution. The model is well specified as the RESET test indicates significance at ten percent.

5.2.3 Export supply estimates (Model A)

We have two endogenous variables (for model A). The two are price of manufactured exports (PX_t) and the quantity of manufactured exports (X_t) that is supplied or demanded.

We estimated an equation of the form $PX_t = f(PX_{t-i}^{w}, y_{t-i}^{w}, x_{t-i}, PX_{t-i}, (PX/PT)_{t-i}, (PH/PT)_{t-i}, y_{t-i})$ that is price of manufactured goods on all the predetermined variables taking care to difference the variables integrated of order one. We used the generated residuals to obtain an estimated value for the price of manufactured goods using the relation $\hat{PX}_t = PX_t - e_t$, where, e_t are the estimated residuals. PX_t and $\hat{PX}_t$ are respectively the observed and estimated values for the price of manufactured goods.

The same procedure was applied to the quantity of manufactured exports (x_t). For x_t we estimated the function of the form, $x_t = f((PX/PT)_{t-i}, (PH/PT)_{t-i}, y_{t-i}, x_{t-i}, PX_{t-i}^{w}, y_{t-i}^{w}, y_{t-i}^{w}, PX_{t-i})$, that is, x_t on all

the predetermined variables in the model. To generate the estimated value of x_t ($\hat{x}_t$) we used the relation $\hat{x}_t = x_t - e_t$, where e_t are the generated residuals.

For both models the AR test indicated absence of serial correlation whereas the ARCH test indicated lack of heteroscedasticity. The normality test showed that the residuals could still be approximated by the normal distribution. Judging by the RESET test, the models were well specified.

Use was made of the value $\hat{x}_t$ generated in the first stage of the 2SLS estimation. Table 3 in appendix 4 gives the results of the overparameterized model.

For the quantity equation all the variables of the preferred model were integrated of the first order and accordingly we tested for the presence of cointegration. The steps of the process are given below.

We estimated the long run equilibrium relationship (i.e. without differencing) from which we generated the residuals e_t. DF and ADF tests were performed on the e_t sequence in Pcgive. The results indicated that the e_t sequence was stationary in levels. Further, a plot of e_t revealed that it fluctuated around a zero mean. Table 5.9 below presents the results of the unit root tests.

Table 5.9 Unit root tests on generated residuals

	DF	ADF
Residual test statistic	-2.4947	-2.4415
Critical value (at 5% level)	(-1.954)	(-1.954)

We next estimated the error correction model (ECM) of the form:

$$\Delta Lx_t = a_0 + \sum_{i=1}^{m} \gamma_{1i} \Delta L \hat{x}_{t-i} + \sum_{i=0}^{m} \gamma_{2i} \Delta L y^{w}_{t-i} + \ldots + \sum_{i=o}^{m} \gamma_{4i} \Delta L(PH/PT)_{t-i} + \beta e_{t-1} + i1981 + i1983 + \varepsilon_{it}$$

Generally, if $\beta=0$ then there is no error correction and the variables do not have a long-term relationship. Results indicated that the β coefficient was not statistically different from zero (it was actually dropped off in the first iteration). The implication is that there is no stable long run relationship amongst the variables. We proceeded to estimate x_t equation in the first differences; table 5.10 below summarizes the findings of the regression.

Table 5.10 Export quantity (x_t) preferred estimates (Modelling DLxt by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
Constant	-0.055894	0.039163	-1.427	0.1716	0.1070
$DL(PX/PT)_t$	-0.98281	0.26539	-3.703	0.0018	0.4465
$DL(PX/PT)_{t\_1}$	-0.33173	0.21382	-1.551	0.1392	0.1240
$DL(PH/PT)_t$	0.65510	0.31872	2.055	0.0555	0.1990
Dly_t^*	0.50536	0.27495	1.838	0.0836	0.1658
DLx_{t_2}	0.24278	0.18394	1.320	0.2044	0.0930
i1981	0.37554	0.17431	2.154	0.0458	0.2145
i1983	-0.48043	0.16417	-2.926	0.0094	0.3350
i1998	-0.45613	0.15991	-2.852	0.0110	0.3237

$R^2 = 0.706924$ F (8, 17) = 5.1257 [0.0023] $\sigma = 0.1454$ DW = 2.02
RSS = 0.3594016743 for 9 variables and 26 observations

Other tests
AR F (2, 15) = 0.46116 [0.6392] and Chi^2 (2) = 1.5061 [0.4709]
ARCH F (1, 15) = 0.2508 [0.6238]
Normality Chi^2 (2)= 4.0308 [0.1333]
RESET F (1, 16) = 0.42964 [0.5215]

Diagnostic tests attest that the model is well-specified and other evidence point to the absence of serial correlation and heteroscedasticity.

Changes in the relative price of manufactured exports to the price of other tradables negatively influences change in manufactured export supply. It records a high elasticity value of -0.98, which is statistically significant at the one percent level. Its first lag has the same sign but is insignificant.

The exchange rate measure (PH/PT) positively influences export supply at the ten percent significance level with a one percent increase in the ratio (depreciation) resulting in a 0.66 percent increase in export supply.

The capacity elasticity (coefficient of y_t^*) and past export levels (second lag) have the appropriate positive signs but are insignificant.

CHAPTER SIX

CONCLUSIONS AND POLICY IMPLICATIONS

The main thrust of this study was to identify the macro economic factors, which have had an effect on the demand and supply of manufactured exports in Kenya. Cointegration and error correction modelling was the approach used. Conclusions on demand and supply factors are preceded by findings on the small country assumption.

6.1 Conclusions

6.1.1 Small country assumption

The first major conclusion arrived at is that Kenya is a large country in as far as export of manufactured goods is concerned. This is probable given that trade in manufactures is skewed towards developing country markets. This statistical evidence of monopoly power has important implications on policy.

6.1.2 Export demand estimates

The table below reproduces initial findings to facilitate easier interpretation.

Table 6.1 Export demand estimates

	PX_t^w	(PX/PX^w)	y_{t-1}^w	1981	1983	1993	1998
Model B	N.A	-0.870	-0.153	0.328	-0.303	0.242	-0.537
	N.A	(-6.787)	(-5.049)	(4.297)	(-4.297)	(3.192)	(-7.134)

The income elasticity estimate (coefficient of y_t^w) has an unexpected sign. We expected world economic activity to positively influence export demand. The theoretical explanation we can seek reassurance from is the argument that the demand for low quality goods declines as incomes improves. Our manufactures may thus be inferior products.

The coefficient of the relative price of manufactured exports to the manufactured exports in the world market (PX/PX^w) has the appropriate sign and is highly significant. As was expected an increase in the price of Kenya's manufactured exports relative to the world price decreases the demand for our manufactured goods. Kenya's price elasticity of export demand is –0.87.

The insignificance of the error correction term (dropped off in the iterations) can be interpreted to mean that our variables lack a stable long-run relationship.

The 1983 impulse dummy is negative perhaps reflecting the deepening of the world recession in1982 following the oil shock. Financial market turbulence and ban on fish exports to Europe explain the negative 1998 impulse dummy.

6.1.3 Export supply estimates

The table below summarizes the findings of the previous sections to facilitate easier interpretation.

Tables 6.2 Export supply estimates

	$(PX/PT)_t$	$(PX/PT)_{t-1}$	$(PH/PT)_t$	y^*_t	X_{t-1}	X_{t-2}	ECM_{t-1}
Model A	-0.983	-0.332	0.655	0.505	N.A	0.243	N.A
	(-3.703)	(-1.551)	(2.055)	(1.838)	N.A	(1.320)	N.A
Model B	-0.717	N.A	0.467	0.258	0.363	N.A	-0.765
	(-5.364)	N.A	(2.595)	(1.978)	(3.270)	N.A	(-2.550)

We next interpret the findings of our preferred model; model B (B is preferred because the results above indicate that Kenya is a large country).

The export supply price elasticity measure $(PX/PT)_{t-i}$ is –0.7. This can be interpreted as the long
price elasticity. The coefficient of $(PX/PT)_t$ is statistically significant at the one percent level. Mo
(1988) reported short run price elasticity of manufactured export supply oscillating around 0.2. Bala
and others (1986) estimate price elasticities for Greece and the republic of Korea of between 1.5 and 2
If there is truth in the finding that Kenya is a large country (in as far as exports of manufactures to
mainly regional markets is concerned) greater supply (ceteris paribus) can only be achieved at
expense of a reduced price. A rise in the price of exports depresses quantities demanded hence supply.

The real exchange rate elasticity {coefficient of $(PH/PT)_t$} has a value of 0.47 and is statistica
significant at the five percent level. As expected an exchange rate depreciation (rise in PH/PT) increa
the level of supply of manufactured goods.

The long run capacity elasticity (coefficient of y_t^*) is statistically significant at the ten percent lev
It is small, having a value of 0.26 – perhaps reflecting the reported low level of capacity utilizati
(RPED, 1993). Its positive value implies that capacity level and exports of manufactured goods move
the same direction. The low level of capacity elasticity may mean that export levels may va
significantly without major changes in the former. The long run capacity elasticity fluctuated around 1
to 1.5 in Moran's study, whereas the short run capacity elasticity varied between 0.1 and 0.4.

Past export levels (x_{t-1}) have a positive influence on current supply. This is indicated by the positi
long run elasticity estimate of 0.36, which is statistically significant.

The results of the preferred model show the ECM to be significant at five percent. The coefficient
–0.76 for the ECM suggests that seventy six percent of the error from the previous year is corrected
the current year. This suggests a high speed of adjustment.

All the impulse dummies were significant. There is some indication that the announcement of t
World Bank supported trade reforms in 1980 triggered a positive shock in 1981. This explains t

positive and significant 1981 impulse dummy. The upward surge was however reverted in 1982 when we had the failed coup attempt, which led to capital flight (RPED, 1993). The effects of the coup explain the negative and significant 1983 impulse dummy. The only other significant shock was experienced in 1998. In 1996 and 1997 Kenya experienced several problems that impacted negatively on the supply level of manufactured exports. The Economic Survey of 1997 lists 'inadequate rains, power rationing, adverse effects of basic infrastructure constraints, rises in manufacturing processing costs attributed to high prices of petroleum products and other key inputs, and prevailing high interest rates in 1996' as factors that led to 'lower capacity utilization of manufacturing establishments in food processing, beverages and tobacco industries'. These factors are thought to be responsible for the decline in the dollar value of manufactured exports after 1996. Further, this combination of factors may explain the negative and significant 1998 impulse dummy.

The absence of a shock in 1993 despite major reforms is noteworthy. The absence of an expected fillip may be explained by Foroutan's observation that; between 1990-93 private and public investment fell by fourteen and twenty three percent respectively. This was attributed to the stabilization programme. The decline in real private investment may have rendered the reforms made in 1993 less effective (Foroutan, 1998). Further the year 1993 recorded the highest inflation rate in Kenya (46%), which could have wiped out the probable positive effects of the exchange rate depreciation.

Our export supply therefore has responded to: the ratio of manufactured exports prices to other tradable goods prices $(PX/PT)_t$, the real exchange rate, capacity output (y_t^*), and past export levels (x_{t-1}). Apart from a short stint in the early 1980s, trade liberalization episodes have not been decisive in influencing manufactured exports positively. It should however be noted that it took a long time (a decade or so) before the Asian tigers reaped the benefits of trade liberalization.

The empirical results reviewed here indicate that prices clearly affect export demand and s
Export supply is significantly influenced by domestic capacity and the real exchange rate, wi
increases in external economic activity suppress export demand.

6.2 Policy implications and recommendations

The policy conclusions touch on the small country assumption, export demand and export supply estimates.

6.2.1 The small country assumption

Empirically, we found Kenya to be a large country in as far as exports of manufactured goods is concerned. Pricing policy becomes a vital tool in such a case. Kenya can use this advantage to gain market shares by offering a reduced price for its manufactured goods.

6.2.2 Export Demand

The foreign income elasticity (coefficient of y_t^w) is negative and this suggests that our manufactures are inferior products. If its estimation is accurate, then the implication is that Kenya cannot rely on external growth alone to generate adequate manufactured export earnings. It can be argued that slow growth in our main trading partners should not be an impediment to increased manufactured export revenues. Quality improvement (by increasing competition) and encouragement of investment in export-oriented activities are suggested policy options.

The large price elasticity measure (–0.87) of export demand (coefficient of PX/PX^w) indicates that pricing policy plays a key role in determining demanded quantities.

6.2.3 Export Supply

Real exchange rate devaluation/depreciation has been shown to be important for exported quantities. It is therefore important that the variables that matter for exchange rate determination must be properly managed. Edwards (1989) lists terms of trade, trade liberalization, net capital inflows, government expenditure on non-tradables and productivity growth in favour of tradables as important determinants of the real exchange rate.

The domestic capacity (y_t^*) matters for the supply of manufactured goods. Moran (1988) argues that the proxy variable used captures a host of other factors that tend to evolve slowly through time (such as the quality of the infrastructure). The importance of domestic capacity therefore suggests that adjustment programmes designed to encourage exports should promote domestic investment, improve the quality of infrastructure (particularly in transport and communications), and provide other services essential for exports.

Liberalization efforts in Kenya do not show a good report card yet; nonetheless, trade liberalization measures have succeeded elsewhere (most notably in East Asia) in turning agricultural based economies to exporters of chiefly manufactures. Although there have been several starts at liberalization in Kenya (early 1980s and 1990s) the country is yet to reap benefits. The impulse dummy for 1981 was positive and significant but it was followed by a significant negative shock in 1983. The 1993 impulse dummy was consistently insignificant in the export supply equations used. Shocks (e.g. the 1982 coup and hostile macroeconomic environment prior to 1998) were significant in the export supply equation. The significance of the negative shocks suggests that maintenance of an

environment devoid of political and macroeconomic instability would boost manufactured exports supply. The ineffectiveness of reforms suggests that for reforms to be successful other supply bottlenecks must be addressed concurrently.

The strong and lingering effect of past export levels on current supply further emphasizes the importance of macro and political stability.

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APPENDICES

APPENDIX 1: Commodities according to the S.I.T.C(Rev.2)

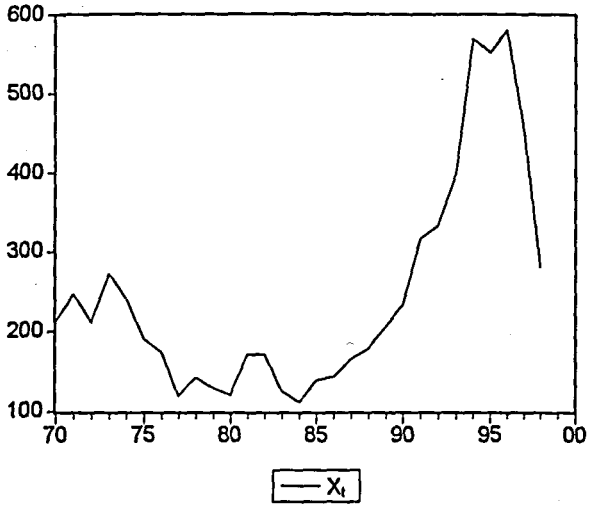
SITC CTCI	COMMODITY
	All commodities
0	Food and live animals
01	Meat and preparations
014	Meat prepf, prsvd, nes etc
01469	Other prepared, preserved meat
03	Fish and preparations
034	Fish, fresh, chilled, frozen
0344	Fish fillets, frozen
04	Cereals and preparations
044	Maize unmilled
05	Vegetables and fruit
054	Vegetables etc frsh, smply prsvd
0542	Leguminous vegetables dry
0545	Other fresh vegetables
05459	Fresh vegetables nes
056	Vegetables etc prscd, prepd
0565	Vegetables prsvd, prepd nes
05659	Other veg presvd, prepd nes
057	Fruit, nuts, fresh, dried
0577	Nuts edible, fresh, dried
05773	Cashew nuts, fresh, dried
0579	Fruit fresh or dried nes
05795	Pineapples, fresh, dried
05797	Other trop fruit, fresh, dry
058	Fruit preserved, prepared
0585	Fruit or vegetable juice
05854	Pineapple juice
0589	Fruit preprd, presrvd, nes
05899	Fruit, nuts nes, preserved
07	Coffee, tea, cocoa, spices
071	Coffee and substitutes
0711	Coffee green, roasted, sub
07111	Coffee green, husks, skins
074	Tea and mate
0741	Tea
1	Beverages and tobacco

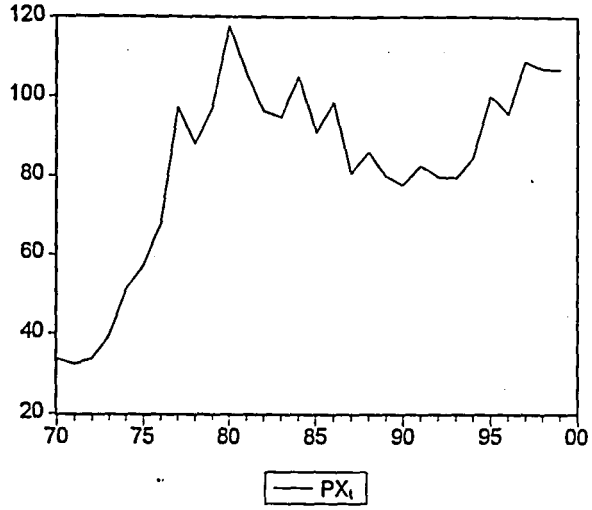
11	Beverages
112	Alcoholic beverages
1123	Beer, ale, stout, porter
12	Tobacco and manufacturers
122	Tobacco, manufactured
1222	Cigarettes
2	Crude materls, excl fuels
21	Hides, skins, furs undressed
211	Hides, skins, exc furs, raw
2111	Bovine, equine hides, raw
2114	Goat and kid skins, raw
2117	Sheep skin without wool
26	Textile fibres and waste
265	Veg fibre, excl cotn, jute
2654	Sisal, gave fibres, waste
27	Crude fertlzr, minrls nes
278	Other crude minerals
2783	Common salt, etc
2785	Quartz, mica, felspar, etc
27854	Felspar, flourspar, etc
2789	Minerals crude nes
27899	Mineral substances nes
29	Crude animal, veg mat nes
292	Crude veg materials nes
2927	Cut flowers and foliage
29271	Cut flowers
2929	Other crude veg materials
29291	Vegetable saps, extracts
3	Mineral fuels etc
33	Petroleum and products
334	Petroleum products refin
3341	Gasoline other light oils
33411	Motor, aviation spirit
3342	Kerosene, other medium oils
33421	Kerosene including jet fuel
3343	Gas oils
3344	Fuel oils, nes
3345	Lubs, petroleum oils nes
33451	Lubs (high petroleum cont) etc
5	Chemicals related, prod nes
53	Dyes, tanning, colour prod
532	Dyes nes, tanning prod

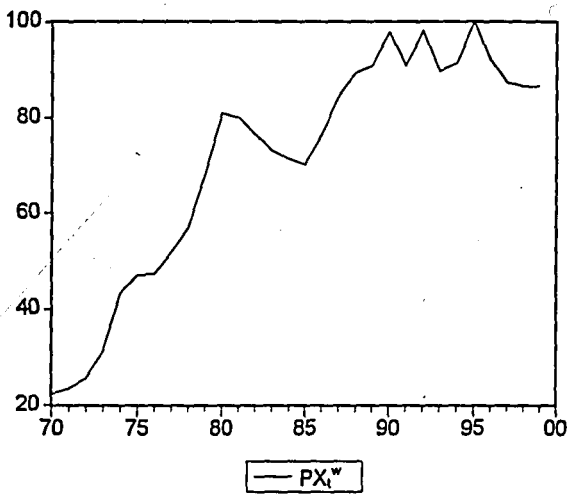
5322	Dye, tanning extracts, tanning
53221	Vegetable tanning extracts, tannings
541	Medicinal, pharm product
5417	Medicaments
54171	–containing antibiotics
55	Perfume, cleaning etc prd
551	Essential oils, perfume, etc
5514	Mixed perfume substances
553	Perfumery, cosmetics, etc
554	Soaps, cleansing etc preps
5541	Soaps
58	Plastic materials etc
59	Chemical materials nes
591	Pesticides, disinfectants
5911	Insecticides, for retail
6	Basic manufactures
61	Leather
6114	Leather bovine nes, equine
63	Wood, cork manufactures nes
64	Paper, paperboard and mfr
642	Paper, etc, precut, arts of
65	Textile yarn, fabrics, etc
66	Non metal mineral mfs nes
661	Cement etc building prod
6612	Cement
67	Iron and steel
674	Iron, steel univ, plate, sheet
69	Metal manufactures nes
691	Structures and parts nes
6911	Structures, parts iron, steel
698	Metal manufactures nes
7	Machines, transport equipment
72	Electrical machinery
729	Electrical machinery nes
7291	Batteries, accumulators
72991	Primary batteries, cells
8	Miscellaneous manufactured goods
89	Miscellaneous manufactured goods nes
892	Printed matter
893	Articles of plastic nes

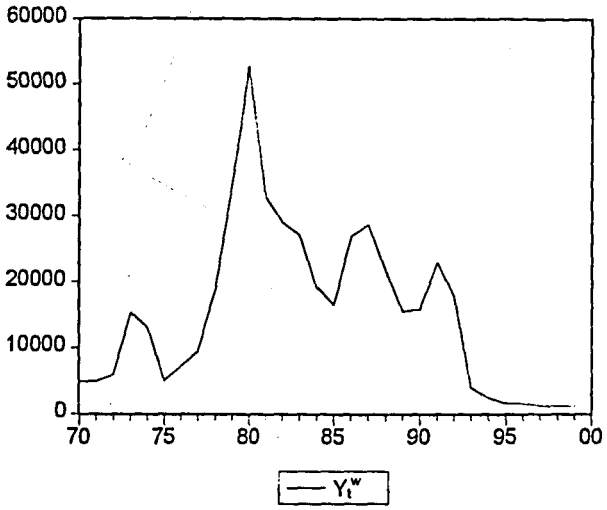
Source: International Trade Statistics Year Book 1990.

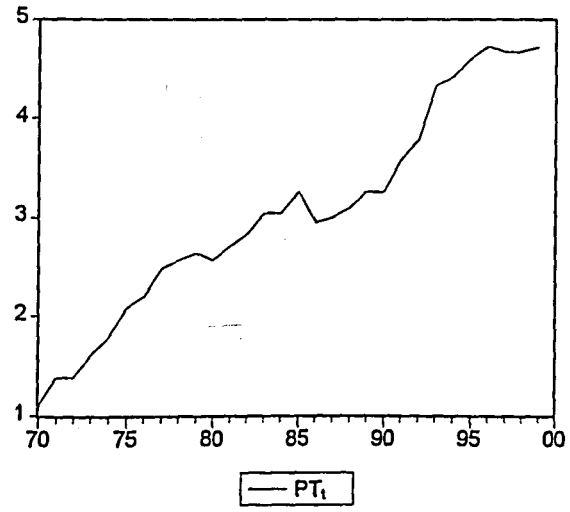
APPENDIX 2: Graphs of series in levels

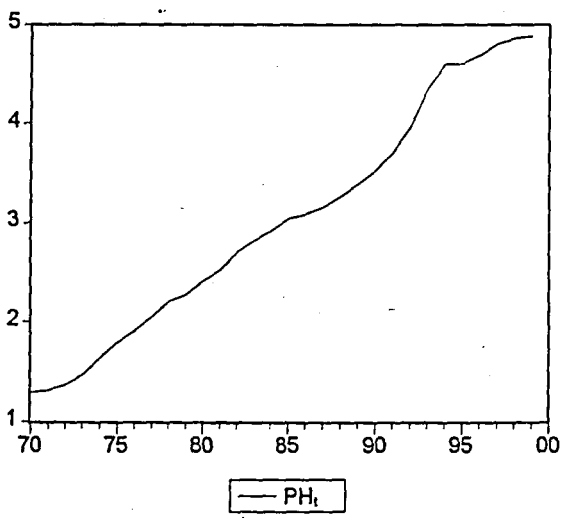


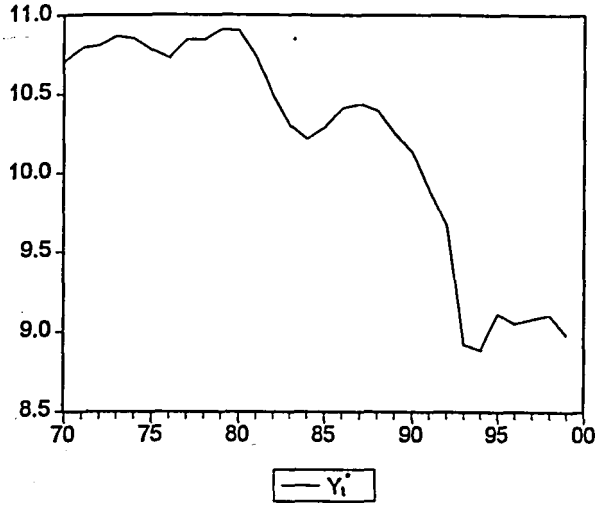


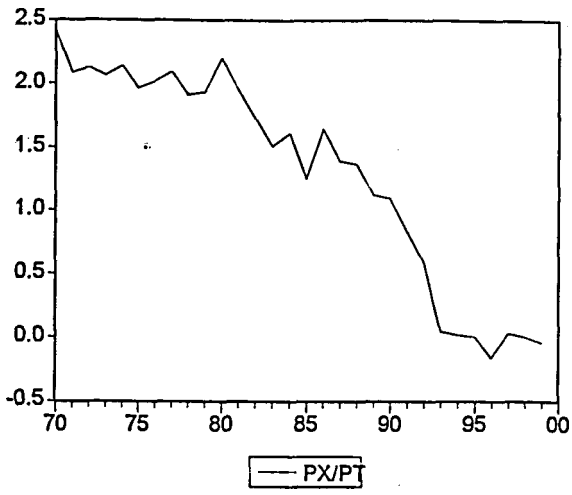


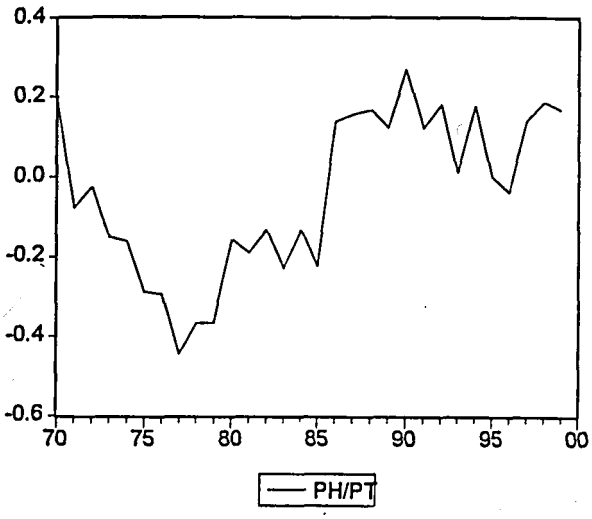







11.0
10.5
10.0
9.5
9.0
8.5
70
75
80
85
90
95
00
Yt*


2.5
2.0
1.5
1.0
0.5
0.0
-0.5
70
75
80
85
90
95
00
PX/PT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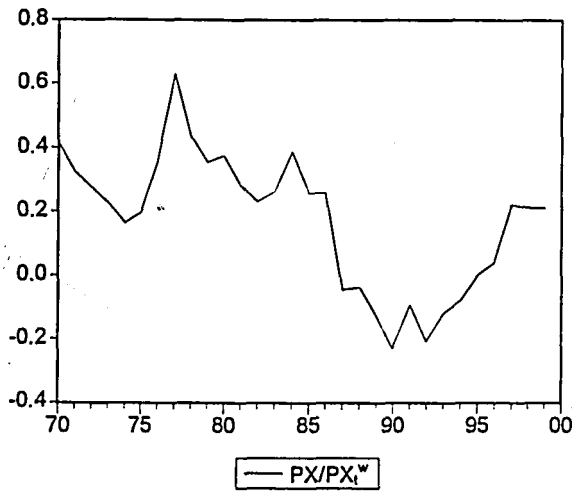
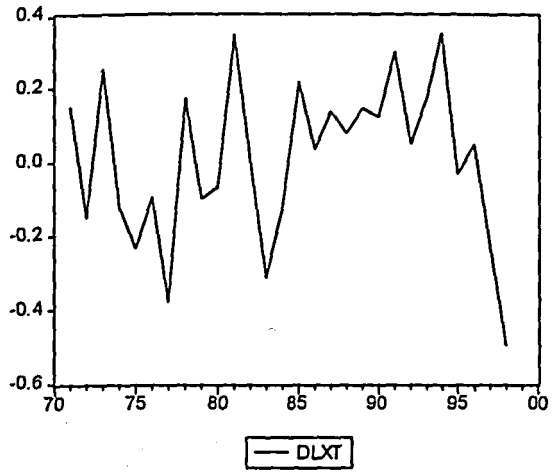
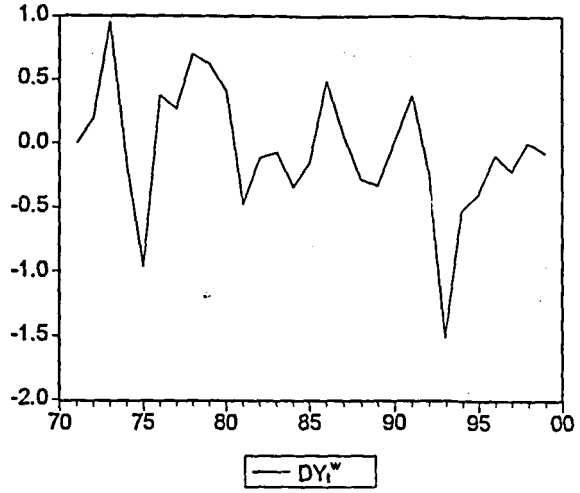
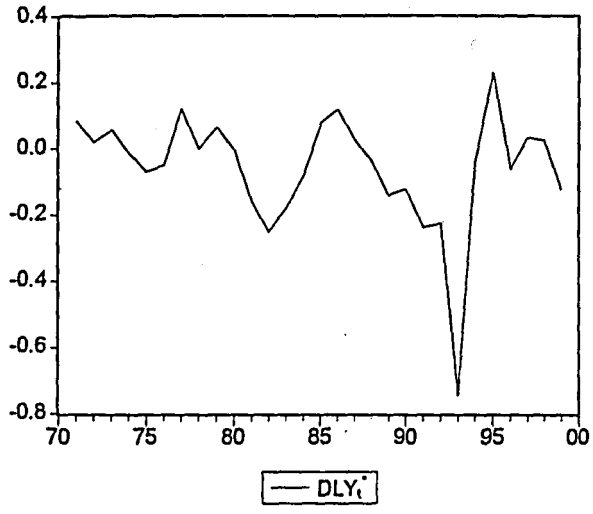
0.2
0.0
-0.2
-0.4
-0.6
70
75
80
85
90
95
00
PH/PT

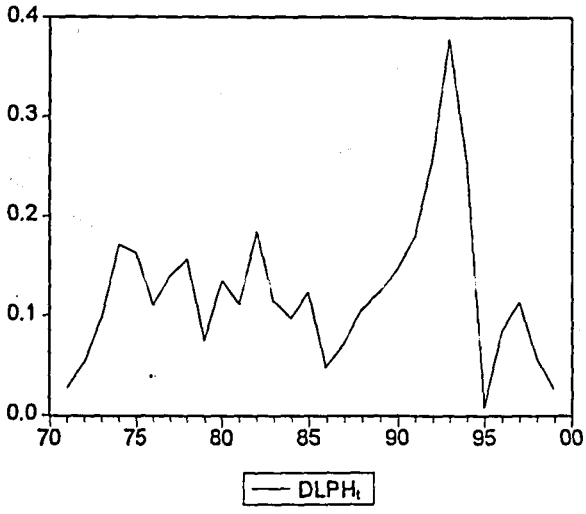

0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
70
75
80
85
90
95
00
PX/PXt*

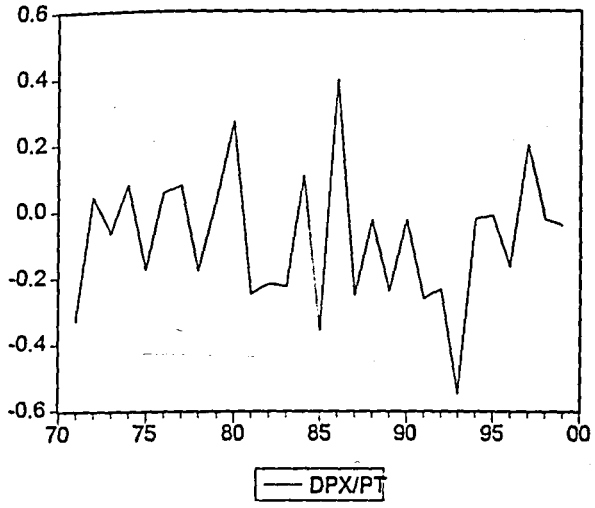
APPENDIX 3: Graphs of series in their first differences

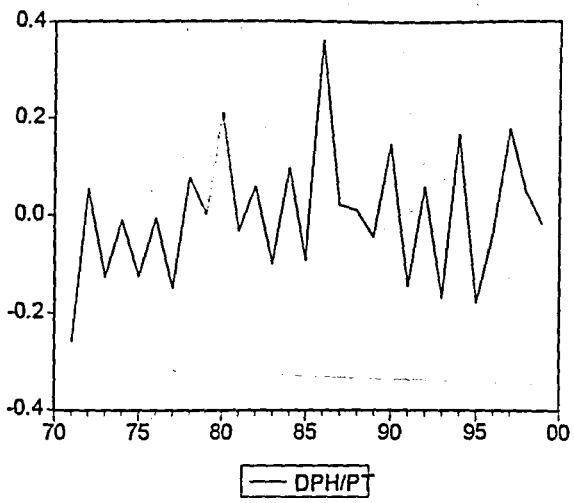









0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
70
75
80
85
90
95
00
DPX/PT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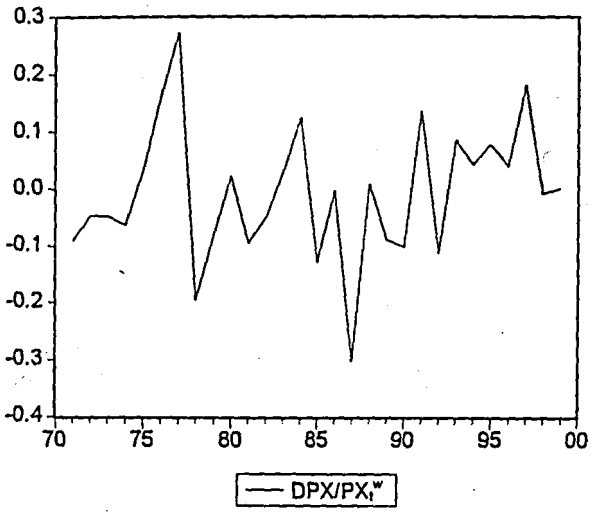
0.2
0.0
-0.2
-0.4
70
75
80
85
90
95
00
DPH/PT


0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
70
75
80
85
90
95
00
DPX/PX$_t^w$

APPENDIX 4: Over parameterized model results

Table 1: General model estimates on LPX_t [Modelling LPX_t by ordinary least squares (OLS)]

Variable	Coefficient	Std.Error	t-value	t-prob	PartR^2
Constant	0.31465	0.52178	0.603	0.5569	0.0272
$DL\,PX_t^w$	-0.16472	0.55162	-0.299	0.7700	0.0068
$DL\,PX_{t-1}^w$	0.36783	0.37570	0.979	0.3454	0.0687
DLy_t^w	0.014017	0.063156	0.222	0.8278	0.0038
DLy^w_{t-1}	0.061407	0.087270	0.704	0.4941	0.0367
$DLPT_t$	0.19025	0.25667	0.741	0.4717	0.0405
$DLPT_{t-1}$	0.21194	0.23383	0.906	0.3812	0.0594
$DLPH_t$	0.69334	0.75616	0.917	0.3759	0.0607
$DLPH_{t-1}$	0.52360	0.62492	0.838	0.4172	0.0512
DLy_t	0.57055	0.31443	1.815	0.0927	0.2021
DLy_{t-1}	0.10013	0.31395	0.319	0.7548	0.0078
DLx_t	-0.22359	0.11737	-1.905	0.0791	0.2182
DLx_{t-1}	-0.16643	0.14111	-1.179	0.2593	0.0967
LPX_{t-1}	0.37858	0.30006	1.262	0.2292	0.1091
LPX_{t-2}	0.52633	0.29663	1.774	0.0994	0.1950

R^2 = 0.937584 F (14, 13) = 13.949 [0.0000] σ = 0.108069 RSS = 0.1518270329 for 15 variables and 28 observations

Diagnostic tests
AR F (2, 11) = 1.4246 [0.2817] and Chi^2 (2) = 5.7603 [0.0561]
ARCH F (1, 11) = 0.067896 [0.7992]
Normality Chi^2 (2)= 2.8919 [0.2355]
RESET F (1, 12) = 1.1728 [0.3001]

Table 2: General model estimates on DLx_t (Modelling DLx_t by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	PartR^2
Constant	0.25975	1.0856	0.239	0.8163	0.0063
DLPXtw	0.51009	0.93963	0.543	0.6004	0.0317
DLPXtw_1	-0.19703	0.59193	-0.333	0.7469	0.0122
DLytw	0.17974	0.085822	2.094	0.0657	0.3277
DLytw_1	-0.10202	0.16067	-0.635	0.5412	0.0429
DLPTt	0.13375	0.36919	0.362	0.7255	0.0144
DLPTt_1	-0.19585	0.38043	-0.515	0.6191	0.0286
DLPHt	0.014383	1.1541	0.012	0.9903	0.0000
DLPHt_1	0.44735	0.91775	0.487	0.6376	0.0257
DLxt_1	-0.016613	0.16404	-0.101	0.9216	0.0011
DLxt_2	0.23882	0.20582	1.160	0.2758	0.1301

DLyt	-0.23841	0.37047	-0.644	0.5359	0.04
DLyt_1	-0.21376	0.46026	-0.464	0.6534	0.0234
LPXt	-0.87076	0.37020	-2.352	0.0432	0.3807
LPXt_1	0.80701	0.30770	2.623	0.0277	0.4332
i1983	-0.54718	0.21250	-2.575	0.0299	0.4242
i1981	0.35285	0.20374	1.732	0.1173	0.2500
i1998	-0.56944	0.18165	-3.135	0.0120	0.5220

$R^2 = 0.83855$ F (17, 9) = 2.7497 [0.0628] $\sigma = 0.148326$
RSS = 0.1980063807 for 18 variables and 27 observations

Other tests
AR F (1, 8) = 0.52327 [0.4901] and Chi2 (1) = 1.6576 [0.1979]
ARCH F (1, 7) = 0.00013335 [0.9911]
Normality Chi^2 (2)= 0.30109 [0.8602]
RESET F (1, 8) = 0.39475 [0.5473]

Table 3: The quantity equation general model (Modelling DL x_t by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
Constant	-0.073001	0.043433	-1.681	0.1150	0.1679
$DL(PX/PT)_t$	-1.0183	0.30308	-3.360	0.0047	0.4464
$DL(PX/PT)_{t\_1}$	-0.67815	0.41880	-1.619	0.1277	0.1577
$DL(PH/PT)_t$	0.69385	0.32861	2.111	0.0532	0.2415
$DL(PH/PT)_{t\_1}$	0.53312	0.38042	1.401	0.1829	0.1230
DLy_t	0.56678	0.29896	1.896	0.0788	0.2043
DLy_{t_1}	0.060447	0.26937	0.224	0.8257	0.0036
$DL\ x_{t-1}$	-0.21284	0.20796	-1.023	0.3234	0.0696
$DL\ x_{t-2}$	0.27075	0.19178	1.412	0.1799	0.1246
i1981	0.36509	0.18770	1.945	0.0721	0.2127
i1983	-0.55807	0.17742	-3.145	0.0072	0.4141
i1998	-0.52288	0.17290	-3.024	0.0091	0.3951

R^2= 0.745955 F (11, 14) = 3.7371 [0.0116] σ = 0.149173 RSS = 0.3115382488 for 12 variables and 26 observations

Other tests
AR F (2, 12) = 0.42724 and Chi^2 (2) = 1.7283 [0.4214]]
ARCH F (1, 12) = 0.021181 [0.8867]
Normality Chi^2 (2)= 2.2193 [0.3297]
RESET F (1, 13) = 0.63366 [0.4403]

Table 4: Long run equilibrium relationship general model (Modelling DL $\hat{x}_t$ by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
Constant	0.13826	0.23466	0.589	0.5635	0.0200
$L(PX/PX^W)_t$	-0.83776	0.18454	-4.540	0.0003	0.5480
$L(PX/PX^W)_{t\_1}$	0.58699	0.20509	2.862	0.0108	0.3252
Ly_t^W	-0.024199	0.054096	-0.447	0.6603	0.0116
$Ly^W_{t\_1}$	0.015873	0.057785	0.275	0.7869	0.0044
i1981	0.30407	0.11355	2.678	0.0159	0.2967
i1983	-0.28239	0.10506	-2.688	0.0156	0.2982
i1993	0.13209	0.12598	1.049	0.3091	0.0607
i1998	-0.52696	0.11766	-4.479	0.0003	0.5413

$R^2 = 0.824019$ F (8, 17) = 9.9502 [0.0000] $\sigma = 0.0989077$ DW = 2.30 RSS = 0.166306533 for 9 variables and 26 observations.
Information Criteria: SC = -3.92422; HQ = -4.2343; FPE = 0.0131691

Other tests
AR 1- 1F(1, 16) = 0.64063 [0.4352] and Chi^2 (1) = 1.0009 [0.3171]]
ARCH 1 F (1, 15) = 0.03449 [0.8552]
Normality Chi^2 (2)= 11.695 [0.0029] **
RESET F (1, 16) = 0.91741 [0.3524]

Table 5: Quantity equation general model (Modelling DL $\hat{x}_t$ by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
Constant	-0.091939	0.025494	-3.606	0.0036	0.5201
$DL(PX/PT)_t$	-1.0582	0.16621	-6.367	0.0000	0.7716
$DL(PX/PT)_{t\_1}$	-0.53449	0.22891	-2.335	0.0377	0.3124
$DL(PH/PT)_t$	0.55308	0.18846	2.935	0.0125	0.4179
$DL(PH/PT)_{t\_1}$	-0.087868	0.23010	-0.382	0.7092	0.0120
DLy_t	0.23840	0.20544	1.160	0.2684	0.1009
DLy_{t_1}	0.20641	0.14910	1.384	0.1914	0.1377
$DL\hat{x}_{t-1}$	0.14788	0.13343	1.108	0.2895	0.0929
$DL\hat{x}_{t-2}$	0.16198	0.10888	1.488	0.1626	0.1557
i1981	0.42885	0.096482	4.445	0.0008	0.6221
i1983	-0.50378	0.097122	-5.187	0.0002	0.6916
i1993	-0.28181	0.14295	-1.971	0.0722	0.2446

$R^2 = 0.90445$ F (11, 12) = 10.326 [0.0002] $\sigma = 0.0787862$ DW = 1.89 RSS = 0.07448711847 for 12 variables and 24 observations

Other tests
AR F (2, 10) = 0.0074507 [0.9926]
ARCH F (1, 10) = 0.26992 [0.6147]

Table 6: The ECM overparameterized model (Modelling DL $\hat{x}_t$ by OLS)

Variable	Coefficient	Std.Error	t-value	t-prob	Part R^2
Constant	0.0080871	0.017129	0.472	0.6436	0.0146
$DL(PX/PX^W)_t$	-0.87406	0.13275	-6.584	0.0000	0.7430
$DL(PX/PX^W)_{t\_1}$	-0.11451	0.13509	-0.848	0.4099	0.0457
DLy_t^W	-0.044829	0.046192	-0.970	0.3472	0.0591
$DLy^W_{t\_1}$	-0.14699	0.035382	-4.154	0.0008	0.5350
ECM_{t_1}	-0.11749	0.20169	-0.583	0.5688	0.0221
i1981	0.29019	0.085489	3.394	0.0040	0.4344
i1983	-0.31456	0.079868	-3.939	0.0013	0.5084
i1993	0.14970	0.10339	1.448	0.1682	0.1226
i1998	-0.53591	0.087177	-6.147	0.0000	0.7159

R^2 = 0.903819 F (9, 15) = 15.662 [0.0000] σ = 0.0773805 DW = 1.33
RSS = 0.0898162176 for 10 variables and 25 observations.
Information Criteria: SC = -4.34132; HQ = -4.69364; FPE = 0.00838285
Other tests
AR 1- 1F(1, 14) = 2.3429 [0.1481] and F-Form (1, 14) = 2.3429 [0.1481]
ARCH 1 F (1, 13) = 0.32236 [0.5799]
Normality Chi^2 (2)= 0.14347 [0.9308]
RESET F (1, 14) = 0.033823 [0.8567]