Trade Liberalization and the Structure of Production in Tanzania

Khatibu Kazungu

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University of Glasgow
Faculty of Law, business and Social Science
Department of Economics

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ABSTRACT

This thesis explores the role of trade and trade liberalization policies on Tanzanian economy with special focus on the performance of agricultural sector. In terms of methodology, we first use parametric and non-parametric tests to evaluate the impact of liberalization policies on the growth rate of exports. Secondly, we use ordinary least square and instrumental variable to test the "inverse relationship hypothesis" and then we estimate the effect of liberalization on land productivity. We also extend this analysis to Uganda in order to ascertain whether similar findings could be replicated in other developing countries. Thirdly, we employ the co-integration technique to evaluate the effects of openness on economic growth.

The parametric and non-parametric tests shows that: despite the marked variation in the composition of traditional exports especially during the late 1990s; largely from coffee and cotton to cashewnuts and tobacco, the contribution of trade liberalization in fostering export growth is rather weak. Second, although the volume of food crops during the post reform period is much higher than before the reforms, there are no symptoms of increased growth overtime. The empirical evidence from econometric analysis shows the existence of diminishing returns to land in the agricultural sector. On the other hand, the impact of trade liberalization on land productivity is mixed; while in some traditional exports its impact is negative and significant, in others the impact is positive but not significant. Contrary to the conventional wisdom as documented in the traditional theories of comparative advantage, the problem with Tanzanian agriculture is not related to the land size but low productivity. Interestingly, these results are also replicated in the Ugandan case. The cointegration analysis shows that the share of trade to GDP is negatively correlated with economic growth.

In general, the contribution of this thesis has wider implications in the development policy, at least for the case of Tanzania and other developing countries. First, trade liberalization policies are counterproductive unless diminishing returns to land is squarely addressed. Secondly, the existence of diminishing returns to land is incompatible with the simple prediction of the theory of comparative advantage. The presumption behind trade liberalization is that specialization according to the "comparative advantage" doctrine would inevitably enhance increased productivity (i.e., efficiency). Our results do not conform to this presumption. Third, diminishing returns means that as production increases with international specialization, every additional unit of commodity produced would be more expensive to produce. Fourth, the persistence of diminishing returns to land is incompatible with poverty reduction.

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The final product of this work is a result of synergies of different people in various capacities. Since more than three years have elapsed since I started this work, it is obvious that the list of individuals who assisted me in different ways is likely to be longer than the one acknowledged here. Those who do not appear on the list, please rest assured that your contribution is highly acknowledged. Nevertheless, I would like to record my sincere appreciation to a few individuals on this page.

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Last but not least, I would like to mention that all the remaining errors and shortcomings contained in this thesis are solely mine. Under no circumstances should these errors and shortcomings be attributed to any individual or institutions acknowledge above.

DECLARATION

I declare that the thesis does not include work-forming part of a thesis presented successfully for another degree. I declare that the thesis represents my own work except where referenced to others.

CHAPTER ONE
BACKGROUND TO THE STUDY

"Trade liberalization implies any change which leads to a country's trade system towards neutrality in the sense of bringing its economy closer to the situation which would prevail if there were no government interference in the trade system. Put in other words, [trade liberalization] confers no discernible incentives to either the importable or the exportable activities of the economy." Papageorgiou, *et al.* (1991).

1.1 Introduction

Trade liberalization has been a key policy debate in the development literature since the early 1970s. The centrepiece of this debate has placed a particular emphasis on the role of openness on economic growth and productivity as part of development strategy. The evolution of this debate has also been reinforced by the accumulation of evidence that confirmed positive correlation between export growth and GDP growth in countries with more open trade regime as opposed to those countries which embraced import substitution and inward looking policies under the wall of tariffs and non-tariff barriers, Krueger (1997), Edwards (1998).

Over the last two decades or so, influenced partly by the prevailing wisdom in the academic and policy circles, the government of Tanzania like many other developing countries adopted a series of trade liberalization measures. Trade liberalization has among other things, entailed substantial reduction in the role of government in production and marketing, abolition of controlled prices, removal of export taxes, relaxation of foreign exchange and import controls; and bolstering the participation of the private sector in the economy. Unquestionably, these reforms also arose as a response to address the protracted economic crisis that hit hardest the country in the 1980s. The severity of crisis was pronounced in slow and negative growth, drastic fall in the share of Tanzanian export in the world trade, decline in manufacturing output and unfavourable balance of trade.

In Tanzania, trade liberalization has been implemented under the aegis of Breton woods institutions. According to these institutions, the rationale for these reforms is that Tanzania's dismal economic performance fundamentally reflects domestic policy inadequacies, and it is precisely these policy inadequacies that need to be re-examined and addressed. In order to realize economic recovery, liberalization of internal and external trade and greater reliance on market forces have been accorded high priority in the policy agenda. These policies have primarily been designed to restore equilibrium, especially in the balance of payments and boosting productivity and exports in both manufacturing and agricultural sectors.

However, the response of exports to the incentive structure built into the trade liberalization programme has been unsatisfactory in terms of the values of export earnings and absence of export diversifications. Indeed, the available evidence indicates that the economic performance has been rather disappointing (see Table 1.1). Between 1990 and 2003, the Tanzanian economy registered negative current account balance to GDP ratio. The GDP per capita in constant US$ dropped from $267 in 1990 to $262 in 1999 before rising to $308 in 2003. Trade to GDP ratio also declined consistently from 50% in 1990 to 39% in 1999 before rebounding to 45% in 2003. Although export to GDP ratio increased from the low level in the 1990, it started to decline in a roller coaster fashion after 1995. While manufactures to GDP ratio continues to remain at an average of 9% over the past three decades, the share of agricultural exports to total exports in the 2000s is half of the level recorded in the 1970s!

World Bank, (2005). The industrial value added has been falling and there are no symptoms of any quick recovery.

Thus, the role of trade and trade policy reforms in Tanzania not only remains questionable but it also poses serious questions on development strategy. To this extent, some researchers argue that trade liberalization has failed due to a combination of internal and external problems. Internally, trade liberalization has been plagued by policy interruptions and reversals. As a result, there is a growing divergence between the free market rhetoric documented in government policy statements and the market intervention by politicians in power (Cooksey, 2003). The removal of subsidies on agricultural inputs coupled with severe budget cuts have exposed the country into vulnerable position both in terms of reducing domestic production and maintaining competitiveness in the global economy. Externally, both volatility and decline in the price for agricultural commodities are common features in the global markets. Hence, this study seeks to draw out some implications of trade liberalization policies relevant to the structure of production in Tanzania.

Table 1.1 Selected Economic Performance Indicators

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
GDP per capita (constant 2000 US$)	267.03	264.19	257.63	252.90	249.29	250.76	254.95	256.92	259.71	262.40	269.45	280.00	294.03	308.70
Trade (% of GDP)	50.08	43.90	51.80	65.69	64.24	59.34	48.15	43.13	41.98	39.70	37.13	40.98	41.65	45.62
Current account balance (% of GDP)	-13.12	-14.88	-15.52	-21.02	-14.13	-11.22	-6.35	-6.16	-8.96	-9.67	-5.49	-5.08	-2.57	-9.43
Export to GDP ratio (%)	12.62	10.26	12.44	17.98	20.61	24.07	19.93	16.21	14.52	14.87	16.81	15.93	16.71	19.66
Import to GDP ratio (%)	37.45	33.63	39.35	47.70	43.62	41.50	31.94	25.68	29.29	25.94	24.22	24.18	24.11	26.28
Industry, value added (% of GDP)	17.65	16.89	16.20	15.57	15.14	14.50	14.22	14.28	15.42	15.52	15.74	15.94	16.17	16.36
Gross capital formation (% of GDP)	26.11	26.34	27.23	25.13	24.65	19.79	16.64	14.90	13.85	15.54	17.63	17.00	19.12	18.63
Manufacturing, value added (% of GDP)	9.27	8.97	8.20	7.49	7.41	7.17	7.37	6.90	7.43	7.27	7.45	7.41	7.33	7.25

Source: World Development Indicators (2007)

1.2 Motivation

This study is motivated by the on-going debate, which investigates the effectiveness of trade liberalization policies in developing countries under the umbrella of multilateral institutions, notably the IMF and the World Bank. This debate has produced large volumes of literature with fundamental degree of divergences. For example, while some authors argue that trade liberalization is a precondition for rapid and sustained growth, Krueger, (1990, 1998); Edwards, (1993, 1997, 1998); Berg and Krueger, (2003), Winter, *et al.*, (2004), other authors dispute this premise arguing that there is little evidence showing that trade liberalization in the sense of lower tariffs and non-tariff barriers are significantly associated with growth, Harrison and Hanson, (1999); Rodriguez and Rodrik, (2001). In a different study that examined the interrelationships among economic institutions, political institutions, openness, and income levels, Rigobon and Rodrik (2005) found that openness (trade/GDP) exerts a negative impact on income levels and democracy.

In the same debate, those who favor trade liberalization tend to cite spectacular increase in export and trade in East Asia as the source of economic growth, although at the same time there are those who are argue that it is economic growth that generated export growth. On the other hand, those who dispute trade liberalization measures argue that government intervention has been instrumental in shaping the growth trajectory of East Asian economies (Wade, 1990). South Korea, for example, has been very interventionist, pursuing export promotion while maintaining import substitution at the same time. Perhaps this observation is what made the World Bank (1993) to conclude that there is no single East Asian model.

Thus, we are facing at least two major dilemmas in the literature. First, in terms of policy emulation, it is hard to draw any definitive conclusion from these studies since they contradict each other. Secondly, no empirical generalization is possible from these studies. Resolving the dilemmas, among other things, requires a careful analysis that entails the use of specific case studies.

Moreover, the recurring theme in the literature is that not all countries would necessarily share equally in trade liberalization regime. The gain from liberalization depends on *the structure of production* and demand characteristics of the goods that a country produces and trades and complementary domestic economic policies it adopts. Thirwall (2000) shows that the volume of exports in developing countries as a whole has grown slower than for developed countries since 1950 by 5% per annum compared to 8% respectively. This pattern is largely ascribed to the fact that the developing countries continue to produce and export primary commodities and low value-added manufactured goods with a relatively low-income elasticity of demand in world markets.

1.3 Research Questions

In the face of background to the study and motivation, this study seeks to address the following questions: (i) Does the empirical evidence support from an efficiency perspective the case for liberalization in Tanzania? (ii) What is effect of trade liberalization on productivity of agricultural farms? (iii) What is the effect of increased openness on economic growth in Tanzania? These questions are worth examining in detail taking into account that: (a) over 50% of export earnings in Tanzania are derived from the sale of primary commodities whose prices have been deteriorating over the last decades, (b) the low income elasticities of demand associated with these products makes the prospects from traditional exports rather bleak.

1.4 Objectives of the Study

The main objective of this study is to carry out an in-depth examination on the role of trade and trade liberalization policies in Tanzania. The specific objectives of this study are four fold:

(i) We use descriptive analysis and inferential statistics (i.e., hypothesis testing) to evaluate the impact of trade liberalization on output change of the traditional exports. In particular, we employ both parametric and non-parametric test.

(ii) We use time series data spanning over the last thirty years to test the hypothesis that productivity of agricultural farms (i.e., land productivity) is positively correlated with trade policy reforms. Ideally, trade liberalization has been devised to re-allocate economic resources into the most efficient sector, *à la* comparative advantage doctrine. In developing countries, agricultural sector is generally taken to fit in this doctrine. We also test the hypothesis that productivity of agricultural farms is negatively correlated with the area under cultivation. This hypothesis seeks to address the question whether Tanzania is efficient in the production of primary commodities.

(iii) We extend the analysis carried out under objective (ii) to Uganda in order to ascertain whether the findings obtained in objective (ii) could also be found in other countries.

(iv) We estimate empirically the long run effects of openness on economic growth over the last three decades using the cointegration technique developed by Johansen (1988), and Johansen and Jusellius (1990) in the context of Vector Autoregressive (VAR) framework. As a check to the robustness of our results, we employ an alternative test (i.e., Autoregressive Distributed Lag—ARDL) approach to cointegration developed by Pesaran and Shin (1999) and Pesaran *et al.* (2001)

1.5 Methodologies

The methodologies adopted in this study are empirical and each chapter uses different research techniques. In chapter 3, we use simple descriptive statistics and inferential statistics (i.e., hypotheses testing). We use the paired-t test and Wilcoxon signed-rank test. In chapters 4 and 5, we use ordinary least square to address objective (ii). In addition, we employ fixed effects, and Instrumental variable within a context of panel data econometrics to address objective (ii). In chapter 6, we employ maximum likelihood in the context VAR cointegration to address objective (iv). This is complemented by ARDL approach to cointegration.

1.6 Organization of the Study

The remainder of this study is structured in seven chapters as follows. Chapter 2 reviews the literature on trade liberalization and economic performance (i.e., economic growth and productivity). Chapter 3 explores the behaviour of imports, agricultural exports and tradable food crops production under the alternative trade policy regimes in Tanzania over the last thirty years. The aim of chapter 3, among other things, is designed to give a general snapshot on the trend in production of primary exports before and after the adoption of trade liberalization. Since the primary reason for implementing policy reform is, of course, to influence the targeted economic variable, the corresponding change in this target variable would then serve as an indicator of policy impact.

Chapter 4 and 5 use both time series and panel data to estimate the productivity of agricultural crops (i.e., individual crops such as cotton, coffee, etc) under the alternative trade policy regimes over the last thirty years in Tanzania and Uganda respectively. It also tests the hypothesis that agricultural productivity is characterized by diminishing returns to land. The definition of agricultural productivity adopted in chapters 4 and 5 is synonymous with land productivity.

Chapter 6 investigates the long run effects of openness on economic growth in Tanzania over the last three decades. It adopts the cointegration analysis following Johansen (1988), and Johansen and Jusellius (1990) VAR framework. Chapter 7 concludes and summarizes the main findings emanating from this study. It also outlines the limitations and identifies gaps for further research.

CHAPTER TWO
LITERATURE REVIEW ON TRADE LIBERALIZATION ON ECONOMIC GROWTH AND PRODUCTIVITY

2.1 Introduction

The chapter begins by examining how the conventional trade theory is linked to growth/ productivity and proceeds to survey some critics and extensions of the theory within the conventional framework, and from the alternative perspective. It then reviews some empirical studies on the effect of trade on growth and productivity paying particular attention to their methodologies. The chapter ends with a synthesis of empirical literature and identify some thematic issues that are particularly relevant in developing countries; nonetheless, the current body of research seem to have ignored them. It is from those thematic issues that we build the foundation for this study.

2.2 Theoretical Literature

The connection between trade liberalization and economic performance is one of the oldest topics in the field of international trade and development and it has invariably been polarized into two major schools of thoughts: those who favour free trade (i.e., neo-classical) on the one hand, and those who favour state intervention on the other. Both theoretical and empirical grounds have been offered to defend the position of each school of thoughts.

The neo-classical trade theory is based on the principle of comparative advantage. This principle postulates that the expansion of trade is beneficial to all trading partners. The implication of neo-classical trade theory is that the overall economic growth would be maximized when a country rescind trade barriers against trading partners. The doctrine of comparative advantage, however, does not guarantee equitable distribution of the gains from trade. The gains from trade depend on exchange rate between trading nations, terms of trade, and on whether the full employment of resources is maintained as economic resources are reallocated as countries specialise. In extreme situation, one country may become absolutely worse off if the real resource gains from trade are offset by a decline in the terms of trade. This is situation is known as immisering growth, Bhagwati (1958).

Theoretically, static models of economic growth in neo-classical world shows that movement towards openness/trade liberalization can temporarily increase the rate of growth due to short run gains from re-allocation of resources; implying a positive relationship between trade and growth, Coe and Helpman, (1995). Essentially, the dynamic gains are expected to shift the production possibility frontier outward thereby augmenting the availability and increased productivity of resource necessary for production. Among the major dynamic gains of trade is that export markets helps to widen the total market for domestic producers. However, a caveat is necessary here. In particular, if production is subject to increasing returns, export growth becomes a source productivity growth. In general, economies that specialise in the production and export of primary products do not perform spectacularly when compared with countries that specialise in the production and export of manufactured goods. Other sources of growth include optimal exploitation of economies of scale, Krugman, (1981). However, it is also possible that trade liberalization/openness in the sense of lower tariffs and non-tariff barriers may reduce growth and welfare. In particular, lower tariffs may be translated into lower domestic price for labour intensive good resulting into unemployment and lower growth, Wälde, (2004).

The new literature on endogenous growth also identifies a number of avenues through which openness (i.e., trade liberalization) might affect growth. Edwards (1997) discusses two sources of productivity growth in an open economy. The first one is a domestic source, which is associated with innovation. The second one operates through absorption of foreign technology from the leading nations. The rate of domestic innovation is assumed to depend on human capital, whereas the imitation depends on the catch up term. Intuitively, countries, which are more backward and provide more opportunities to absorb new ideas, will converge faster to international standards. Nonetheless, if knowledge spillovers are imperfect, the growth rate of the poor country after trade liberalization may worsen. And from a welfare perspective, the poor country might even be worse-off under free trade. In particular, Tang and Wälde (2000) show that international trade can result into welfare losses and a reduction in the growth rate if trade liberalization generate fierce competition to domestic producers.

Moreover, in contrast to the theoretical predictions on the effect of trade on competition, trade can potentially generate growth-accelerating as well as growth-decelerating forces, Rodriguez and Rodrik (2001). Trade can spur innovation by enhancing industrial learning since it facilitates international exchange of technical information, can improve the efficiency of global research since it eliminates the replication of research undertakings in different countries, can adversely affect research by diverting resources away from Research and Development or can improve growth by bringing resources into Research and Development, depending upon the abundance of skilled labour or the efficiency in Research and Development of any country relative to the rest of the world, Grossman and Helpman, (1991). Also, trade via market size effects, can reduce the incentives faced by domestic producers to innovate.

Among the oldest views against trade liberalization in developing countries are those based on two pessimisms: export supply and word export demand from low-income countries. Exports supply pessimism holds that low income countries export are concentrated in a few products with a very low domestic supply response so that trade reforms in the sense of changing relative prices will not induce domestic producers to adjust output substantially. World export demand pessimism for primary commodities maintains that world demand is inelastic to both income and prices, for the product in which low income countries exports are concentrated, Hinkle and Montiel (1999). Consequently, a key feature of resource-based economies is that wage level and level of economic growth in general tends to mimic the volatility of the world market price of their commodity.

Besides, developing countries are generally not in favour of liberalization policies as a move to protect their nascent industries for at leas two reasons. The first one is the famous “infant” industry argument which maintains that during the temporary period when domestic costs in an industry are above the product’s import price, a tariff is a socially desirable method of financing the investment in human resources needed to compete successfully with foreign producers, Baldwin, (2002). In addition, tariffs are seen as policy instruments that could allow domestic firms to capture a larger market share, thereby encouraging domestic firms to invest in better technology. However, protection must be temporary and that the infant industry must then graduate and become viable without protection. Secondly, the mere presence of market failure in developing countries means that government intervention is a necessary therapy to stabilise the domestic market—hence there is little ground for trade liberalization. Therefore, the relationship between trade liberalization and growth/productivity becomes an empirical issue, and it is the empirical literature that we review next.

2.3 Empirical Literature: Trade liberalization and Growth

The empirical literature on trade/trade liberalization and economic performance is so vast that we cannot claim by any means to have done enough justice in reviewing them exhaustively. However, this chapter will attempt inasmuch as possible to pinpoint those studies that in our opinions we think that they have had remarkable impact in the policy and academic debates.

The earliest empirical literature on the relationship between trade/trade policy reforms and economic performance in the 1970s and 1980s used trade dependency ratios and the rate of export growth as proxies for openness, Balassa, (1978, 1982, 1985). The problem with these indicators, nonetheless, is that they are not necessarily linked to trade policies since a country can distort trade and yet maintain the highest trade dependency ratio. Others authors employed tariff and non- tariff barriers as potential candidates for openness/trade liberalization (Litle *et al*, 1970; Balassa, (1971).[1] Pritchett and Sethi, (1994); Krugman, (1994); Rodrik, (1995), however, argue that average tariff does not represent a good proxy for openness since it underestimates the exact level of protection.[2] Indeed, tariff is argued to be relatively weak measure of trade policy especially when tariff and non-tariff barriers are used simultaneously, Edwards, (1997). Non-tariff barriers also do not distinguish between goods with either the highest or the lowest levels of restrictions. Moreover, theoretical framework in earlier studies failed to articulate the exact transmission mechanism through which the export expansion spurs economic growth. And failure to deal with issues related to endogeneity and other measurement errors has rendered these studies unpersuasive.

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[1] Litle, et al (1970) used the concept of effective rate of protection

[2] Using a sample of over 3,000 observations for Jamaica, Kenya and Pakistan., Pritchett and Sethi (1994) found that the collected tariff rates underestimated the true protection. Anderson (1994) calculated the Anderson-Nearly indicator for a group of 23 countries and found that the weighted average tariff tended to underestimate the true degree of trade restriction. The extent of underestimation is directly proportional to the degree of dispersion in the protective structure.

Krueger (1978) and Bhagwati (1978) are among the foremost pioneers to classify trade regimes by looking at the degree of *anti-export bias.* To do that, they developed an index of *biasness*, defined as the ratio of import's effective exchange (EER_M) to the export's effective exchange (EER_E). The effective exchange for imports is defined as the nominal exchange rate applied to imports (NER_M) corrected by the average (effective) import tariff (TAR_M), other import surcharges (IMP_S) and the premium associated with the existence of quantitative restrictions, such as import license (PR). Thus, the effective exchange rate equation for imports can be written as:

$$EER_M = NER_M\,(1 + TAR_M + IMP_S + PR) \qquad (2.1)$$

The effective exchange rate for exports is calculated as the nominal exchange rate applied to exports (NER_X) corrected by export subsidies (E_S) and other incentives to exports (E_{IN}); such as export encouragement schemes. It is written as:

$$EER_X = NER_X\,(1 + E_S + E_{IN}) \qquad (2.2)$$

When the nominal exchange rates are unified for commercial transactions, then $NER_X = NER_M = NER$. It follows therefore that the degree of bias of trade is given by the following index:

$$\text{Anti-export Bias} = \frac{EER_M}{EER_X} = \frac{NER_M(1 + TAR_M + IMP_S + PR)}{NER_X(1 + E_S + E_{IN})} \qquad (2.3)$$

There are three cases here. First, when the ratio in equation 2.3 is greater than one, the trade regime is biased against exports. Second, when this ratio is less than one, the country is said to be pursuing import substitution policies. Third, a value of one indicates *neutral* trade regime. Based on equation (2.3), Krueger and Bhagwati went on to define trade liberalization as any policy that reduces the degree of *anti-export bias*. This could be achieved through removal of all trade distortion including import tariff and export subsidies. Nonetheless, one of the pitfalls of this index is that it is based on average incentives. It is entirely possible to have a country pursuing ISI, but based on this average index, capturing that country may prove elusive.

In another development, a study by the World Bank (1987) classified a group of 41 developing countries according to their trade orientation in order to evaluate the performance of countries with different degrees of outward/inward orientation. Four categories of countries were classified. The first group consisted of strongly outward oriented countries in which there are very little trade or foreign exchange controls and trade and industrial policies do not discriminate between production for the home market and exports, and between purchases of domestic goods and foreign goods. The second group consisted of moderately outward oriented countries, in which the overall incentive structure is moderately biased towards the production of goods for the home market rather than for export, and favours the purchase of domestic goods. The third group consisted of moderately inward oriented countries in which there is a more definite bias against exports and in favour of import substitution. The fourth group consisted of strongly inward oriented countries where trade controls and the incentive structures strongly favour production for the domestic market and discriminate strongly against imports. The conclusion from that study is that economic performance of the outward-oriented economies (i.e., real gross domestic product, real GNP per capita, gross domestic savings, incremental capital output ratio, inflation, manufactured exports) has been broadly superior to that of inward-oriented economies. A serious limitation of this indicator is that it is subjective in the sense that the researchers that constructed it used their own judgement to classify different countries in the alternative openness regime, Edwards (1992). Notably, majority of African countries fall in the moderately and strongly inward oriented categories whose performance is generally not impressive in all respects. However, African countries are not a homogeneous group since some countries outperform others. Thus, a detailed case study would be essential.

In the 1990s, the interest to ascertain the connection between trade/trade policy and economic performance re-opened enthusiastically following the advent of endogenous growth theories, Lucas, (1988), Romer, (1989); and Grossman and Helpman (1991). In tandem with the new growth theories, most researchers, tried to construct alternative openness indicators, which were entered with other control variables on growth equation as regressors. Many of these studies confirmed significant positive correlation across countries between growth and trade volumes or trade policies. These studies have been very influential in reinforcing the consensus among many economists that trade is good for growth. In the next few paragraphs, we review some of them.

The study by Papageorgiou, *et al* (1991) report growth-enhancing effects for 36 liberalization episodes in 19 developing countries.[3] In each country of study, the degree of liberalization is defined by assigning to each year a mark for performance on a scale ranging from 1 to 20. While a mark of 20 would indicate virtually free trade, or perfect neutrality; a mark of 1 would indicate the highest possible degree of intervention. The indices provide a rough measure of liberalization as perceived by the authors in each country reflecting, for instance, assessment of nominal and effective rates of protection, the restrictiveness of quota and the gap between the formal exchange rate and equilibrium exchange rate. More importantly, these indices are subjective and idiosyncratic to each country studied and are incomparable between countries. The conclusion from this study, however, has been criticized by Greenaway (1993) on the

[3] The list of countries covered in this study are: Argentina, Brazil, Chile, Colombia, Peru, Uruguay, Indonesia, Korea, New Zealand, Pakistan, Philippines, Singapore, Sri-Lanka, Greece, Israel, Portugal, Spain, Turkey and Yugoslavia.

grounds that the underlying measure of liberalization is flawed. In addition, the timing of liberalization is difficult to establish across countries and overtime. In particular, Greenway (1997) looks specifically at the timing of Papageorgiou, *et al* (1991) episodes and fails to find systematic evidence between trade reforms and growth. These results, according to Greenaway *et al* (1997) are supported by the fact that the study by Papageorgiou, *et al* (1991) did not take into consideration the dynamic issues in econometric modelling.

The study by Dollar (1992) explores whether outward oriented developing countries grow more rapidly or not using a sample of 95 countries over the period 1976-1985. Trade orientation is measured by the degree of the real exchange rate distortion and exchange rate variability. In this study, Dollar estimated a simple model in which per capita GDP growth over 1976-85 as a function of investment rate, real exchange rate variability, and the index of the real exchange rate distortion. The regression results showed that growth is positively associated investment rate but negatively correlated with distortion and variability of the real exchange rate. His results, however, has been strongly criticised by Rodriguez and Rodrik (2001), who argue that Dollar's conclusions rest on very weak theoretical foundations coupled with flawed econometric issues. According to Rodrik and Rodriguez (2001) real exchange distortion used by Dollar is theoretically appropriate as a measure of trade restriction only when (i) there are no export taxes or subsidies, (ii) the law of one price holds continuously; and (iii) there are no systematic differences in national price level due to transport costs and other geographical factors. In the real world, these conditions are hardly satisfied. Thus, the credibility of his results remains suspicious.

Edwards (1992) uses a cross-country data set to analyze the relationship between trade orientation, trade distortions and growth in developing countries. A simple endogenous growth model that emphasizes the process of technological absorption in small developing countries is constructed. According to this model, countries that liberalize their international trade and become more open will tend to grow faster. Using nine alternative indicators of trade orientation (i.e., average black market premium, coefficient of variation of black market premium, index of relative price distortions, average import tariffs, average non-tariff barriers, world development report index of distortion, index of effective rates of protection, world bank index on outward orientation) Edwards find out that more open economies tend to grow faster than economies with trade distortions.[4] The results are robust to the method of estimation, to correction for errors in variables and for the deletion of outliers. According to Edwards, the major channel through which trade liberalisation enhances growth is the absorption of foreign technology. However, the absorption of technology might not be as simple as suggested by Edwards. First, technology is not a free commodity—there are some costs associated with its adoption, e.g., property right, patents, etc. Second, absorption of technology requires skills in order to nurture it—this is seriously lacking in developing countries.

In addition, policies correlated with growth (trade openness, government consumption,) used by Edwards (1992) to check for the robustness of his results are all highly correlated among themselves—it is not easy to disentangle the individual effects of different policies, and yet it is very simple to misjudge the effects of omitted policy and institutional variables to trade. As a check to the robustness growth's determinants reported by Edwards (1992) amongst many other researchers, Levine and Renelt (1992) employed an extreme-bound test proposed by Leamer (1985). Using extreme bound test, Levine and Renelt did not find consistent

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[4] For detailed definition of these indices, see Edwards (1992)

relationship among long run growth and different measures of trade policies.[5] However, the correlation between investment and trade shares lead Levine and Renelt (1992) to conclude that the beneficial effects of trade reforms may operate through enhanced resources accumulation instead of an efficient allocation of resources. An alternative test for robustness of growth determinants was performed by Sala-i-Martin (1997) on the ground that the proposed test by Levine and Renelt was not powerful enough. In doing so, Sala-i-Martin (1997) constructed confidence levels for the entire distribution of coefficients for different determinants of growth. Using this alternative approach, the only openness indicator, which is robust, is a measure of openness constructed by Sachs and Warner (1995).

The study by Dean *et al* (1994) investigates the extent and character of trade reform in 32 countries in South Asia, East Asia, Africa, and Latin America. Changes in tariffs, non-tariff barriers, foreign exchange controls, and export impediments between the mid-1980s and 1992/93 are discussed. Data are presented on changes in the level, range, and dispersion of tariffs, and coverage of quantitative restraints. Similarities and differences both within and between regions are evaluated. Trade liberalization was most rapid in both Latin America and East Asia. In Africa, however, little progress towards a liberalized regime was realised. In some African countries, reduction in import barriers was substituted for increase in other impediments. Although it is highly cited in policy and academic dialogues, this study did not evaluate the impact of liberalization on economic performance.

In an influential paper, Sachs and Warner (1995) developed a “composite indicator” based on five individual indicators for specific trade policies to besiege measurement problems hitherto encountered. According to Sachs and Warner, an economy is defined as closed if satisfies at

[5] Their measures of trade include the black market premium, real exchange rate index of distortion of Dollar (1992), trade volumes and two indices compiled by Leamer.

least one of the following conditions: tariffs in the mid-1970s were 40 percent or more, quotas in the mid-1980s were 40 percent or more, the black market premium (computed separately for the 1970s and 1980s) was 20 percent or higher in either the 1970s or 1980s, the country had a state monopoly on major exports, the country had a socialist system. When such an indicator (henceforth SW dummy) is entered in the growth regression, its coefficient is significant—more open economies grow faster. However, Rodrik and Rodgriguez (2001) argue that the robustness of SW index derives from black market premium (BMP) and state monopoly of major export (MON) indicators. That is, very little of the dummy statistical power would be lost if SW was constructed by using these two indicators—BMP and MON. Harrison and Hanson, (1999) criticise SW indicator arguing that it captures many other aspects of openness than pure trade policy. For example, quotas and tariffs provide a good measure of commercial policy, while the black market premium measures the importance of exchange rate distortions. To measure the impact of these policies separately, Harrison and Hanson (1999) estimated a cross-country growth regression, which corresponds exactly to the specification presented by Sachs and Warner, except that they decomposed SW openness indicator into its five separate components. Empirical results show that only two indicators not related to trade policy are statistically significant—socialism and exchange rate distortion.

Rodrik (1998) carried out both cross section and pooled cross section studies that examined the role of trade and trade policy in explaining variation in economic performance in Sub-Saharan Africa over 1964-1994. In his specification, the share of trade to GDP as a dependent variable averaged over 1964-1994 was regressed against the following explanatory variables: log of initial income per capita, ad-valorem equivalent of international trade taxes, geographical variable proxied by *tropics* taken from Sachs and Warner (1997). Empirical results show that the share of ad-valorem tax on total revenue correlates strongly with trade performance.[6] Reduction of trade tax by 10 percentage points increases the share of trade in GDP by 17 percentage points. The estimated coefficient of *tropic* indicated that the tropical climate has a significant depressing effect on trade. Other things held constant, a county that has only 50% of its area in the tropical zone has a share of trade in GDP, which is 26-percentage point larger than a country covered 100% by tropical zone. [7]

One of the major arguments advanced by most researchers is that trade/trade policy is not an exogenous variable, as most of the empirical literature would tend to treat it. Following this argument, the subsequent literature has tried to address this issue using instrumental variable and Generalized Methods of Moment (GMM) techniques. Frankel and Romer (1999) constructed measures of the geographic component of countries' trade, and use those measures to obtain instrumental variables estimates of the effect of trade on income. The results provided no evidence that ordinary least-squares estimates overstate the effects of trade. Further, they suggest that trade has a quantitatively large and robust, though only moderately statistically significant, positive effect on income. Rodriguez and Rodrik (2001), however, argue that the geographical indicator constructed by Frankel and Romer (1999) may not be a valid instrumental variable because geography is likely to be a determinant of income through more channel than simply a trade. For example, distance from equator affects public health and thus productivity through exposure to various diseases. When Rodrik and Rodriguez include distance from the equator or percentage of land in the tropics, or a set of dummies in the frankel-Romer instrumental variable income regressions, their constructed trade share is no longer statistically significant. This contrast sharply with Romer and Frankel who argued that

[6] The shortcoming of this indicator is that it underestimates the effects of extremely high taxes, which results in little revenue. Further, it ignores non-tariff barriers; the role of implicit taxation through commodity boards and overlooks smuggling.

[7] Human resource, macroeconomic/fiscal policies, demography and "catch up" factor were proxied by life expectancy, public savings dependency ratio and initial level of income respectively.

when they include distance from the equator as a control variable there is still no evidence that ordinary least square regression overstate the influence of trade on income.

Greenaway *et al*, (2002) use a data set from 73 countries to evaluate the short run impact and transitory effects of liberalization in a dynamic panel model of growth. Indicators of liberalization from Sachs and Warner (1995), Dean *et al* (1994) and World Bank were used as explanatory variable, in addition to investment, population growth, initial per capita GDP, terms of trade and initial human capital. To provide consistent estimates, an instrumental variable following Arellano and Bond (1991) technique was used, with lagged dependent variable as an instrument. The empirical results suggested that liberalisation exert positive impact on growth of real GDP per capita. More recently, however, Arellano and Bover (1995), Blundel and Bond (1998) and Bond and Windmeijer (2000) have shown that in the presence of weak instruments the standard GMM (i.e., Arellano and Bond, 1991) produces large biases and low asymptotic precisions. To overcome these problems, the SYS-GMM approach developed by these authors combines the regressions in levels with regressions in differences. Specifically, recent applications of the standard GMM and the SYS-GMM by Blundell, Bond and Windmeijer (2000), Bond and Hoeffler and Temple (2001) and Hoeffler (2002) demonstrate that SYS-GMM is more superior to the standard GMM.

A study by Dollar and Kraay (2004) focused on within-country rather than cross country decadal changes in the growth rates and changes in the volume of trade, which is regarded as an imperfect measure of trade policy. Using this approach, Dollar and Kraay argue that their results are not driven by geography or other unobserved country characteristics that influence growth but vary very little over time such as institutional qualities. In addition, period dummies were introduced to control for shocks that are common to all countries such as global demand shocks or reductions in transport cost. The data set consisted of 187 observations on growth in the 1990s. The empirical findings reported by the Dollar and Kraay (2004) found strong and positive relationship between the effect of changes in trade and changes in growth. Moreover, introducing a measure of individuals' willingness to hold liquid assets (interpreted as a measure of the quality of country's institutions) does not change the high level statistical significance of changes in the volume of trade.

Wacziag and Welch (2003) revisited the empirical evidence between openness and economic growth. In doing so, they first present an updated data set of openness indicators and trade liberalization dates for a wide cross section countries in the 1990s. Second, they extend the Sachs and Warner (1995) study of the relationship between trade openness and economic growth to the 1990s. The empirical finding suggested that the cross sectional findings of SW are sensitive to the period under consideration. In particular, an updated version of the SW indicator does not enter significantly in growth regressions for the 1990s. Third, they present evidence on the time paths of economic growth, physical capital investments and openness around trade liberalization. Over the period 1950-1998, countries that have liberalized their trade regimes have experienced on average, increases in their annual rates of growth on the order of the 1.5 percentage point compared to pre-liberalization times. The post liberalization increase in investment rates was between 1.5 and 2.0 percentage points. Finally, liberalization raised the trade to GDP ratio on average by roughly 5 percentage points. Despite these results, it is important to note that Wacziarg and Welch (2003) apply the same criteria used by Sachs and Warner (1995) to determine the date in which countries are liberalized. A closer examination on this updated version of the Sachs and Warner Indicator by Rodriguez (2006) found that inconsistencies continue to abound.[8]

Paulino and Thirwall (2004) use panel data and time series/cross section analysis to estimate the effects of trade liberalization on export growth, import growth, the balance of trade and balance of payments for a sample of 22 developing countries that have adopted trade liberalization policies since the mid 1970s. The authors find that export growth has risen by about two percentage points, but that the effect on import growth has been greater (about six percentage points), leading to a deterioration in of the trade balance of at least 2% of GDP, on average. The impact on the balance of payments has been less, however, which suggest that while liberalization may have, on balance, improved growth performance, nonetheless countries have been forced to adjust in order to reduce the size of payment deficits to a sustainable level which has reduced growth below what it might otherwise have been if balanced trade had been maintained.

2.4 Empirical Literature: Trade liberalization and Productivity

The empirical literature on the impact of trade liberalization on productivity growth is divided into two major categories: cross countries and sectoral levels. To begin with cross-countries, Edwards (1997) uses a comparative data set for 93 countries and nine alternative indices of trade policy to investigate whether the evidence supports the view that, other things given, TFP growth is faster in more open economies.[9] The regressions results reported by Edwards

[8] "For example, Gabon is rated as closed because of state ownership of the petroleum industry, but Mexico and Indonesia are not. Ukraine and Venezuela are rated as closed in periods in which they adopt exchange controls despite having maintained relatively liberal trade regimes; Malaysia which did the same thing at the end of nineties, is not.

[9] The following indicators were used: Sachs and Warner indicator, World Development Report Outward Orientation (WDR), Leamer's Openness Index, Average Black market premium, Average Import tariff on

are robust to the use of openness indicators, estimation technique, time period, and functional form suggesting that more open countries have indeed experienced faster productivity growth. In addition, Edwards constructed a “grand” composite index comprising: Sachs and Warner index, black market premium, tariff, quantitative restriction and Wolf’s openness indicator which measures import distortions. Although Edwards admits that his “grand” composite index carries no economic meaning[10], the findings supported the earlier conclusion.

A study by Coe, Helpman, and Hoffmaister (1997) scrutinize the extent to which developing countries benefit from research and development (i.e., R&D) that is performed in the industrial countries. By trading with an industrial country that has a large stock of R&D activities, a developing country can enhance its productivity by importing a larger variety of intermediate products and capital equipment embodying foreign knowledge, and by acquiring valuable information that would otherwise be expensive to acquire. The authors' results, based on data for seventy-seven developing countries, suggest that R&D spillovers from twenty-two industrial countries over 1971-90 are substantial. However, these authors do not consider competing explanations of access to knowledge capital.

At micro/sectoral level, Harrison (1994) uses a panel of firms from the Cote d’Ivoire to measure the relationship between productivity, market power, and trade reform. The time-series approach, which compares behavior of various sectors before and after liberalization of 1985, shows that productivity growth tripled after the reform. Using tariffs as a trade policy measure shows that productivity growth was four times higher in the less protected sectors. If import penetration is used to capture changes in trade policy, however, the relationship

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manufacturing, Average Coverage of Non-Tariff Barriers, Heritage Foundation Index of Distortions in International Trade, Collected Trade Tax ratio, and Wolf’s Index of Import Distortions.

[10] Footnote 12, page 13 in Edwards (1997)

between trade policy and productivity gains is more ambiguous. Assessing the productivity effects of a trade reform, in contrast to relying on cross-section comparisons, is particularly useful if protection tends to be applied to inefficient sectors.

The study by Tybout and Westbrook (1995) provides a detailed analysis of Mexican manufacturing firms over the liberalization of 1984–90. In particular, the industry-wide productivity changes were decomposed into the plant-level scale economy exploitation, reallocation of output shares among plants with different average costs, and a residual term that captures movements of individual plants toward the production frontier, and shifts of that frontier due to innovation, externalities, and other forces. Among its major findings are: elimination of inefficient firms are an important contributor to sectoral productivity gains, cheaper intermediates provide significant productivity and profitability, and that competition from imports seems to encourage increases in technical efficiency on industries that are already most open. To a large extent these results are similar to those reported by Feenstra *et al*. (1997) in South Korea and Taiwan, Hay (2001) in Brazil, Johnson and Subramanian (2001) in South Africa, Lee (1996) and Kim (2000) for the case of Korea, Ferreira and José (2001) in Brazil. While Tybout and Westbrook (1995) cast some doubt on simulation models that have stressed scale effects as a major source of welfare gain with trade liberalization, Kim (2000) suggests that most of the apparent TFP advance is actually due to the compression of margins and to economies of scale

Krishna and Mitra (1998) use data on a panel of firms to investigate the effects of the 1991 trade liberalization in India. In particular, they test the relationship between trade liberalization, market discipline and productivity growth. Their methodology differs from other studies in that they allow the returns to scale to change after the liberalization, a relaxation of estimation restrictions that significantly improves regression estimates. Their results strongly suggest that there was an increase in competition, as reflected in the drops in markups. They also find evidence of a reduction in returns to scale and some weaker evidence of an increase in the rate of growth of productivity in the years following the reforms.

One of the major limitations of the earlier literature on trade liberalization and productivity is that firms are treated alike. Recently, however, the direction of research has tended to focus on firm heterogeneity as articulated elegantly in Melitz, (2003). Gustafsson and Segerstrom (2006) present a trade model with firm-level productivity differences and R&D-driven growth. Trade liberalization causes the least productive firms to exit but also slows the development of new products. The overall effect on productivity growth depends on the size of inter-temporal knowledge spillovers in R&D. When these spillovers are relatively weak, then trade liberalization promotes productivity growth in the short run and makes consumers better off in the long run. However, when these spillovers are relatively strong, then trade liberalization retards productivity growth in the short run and makes consumers worse off in the long run.

Ederington and Mccalman (2007) develop a theoretical model that accounts for the existence of firm level heterogeneity within industries and predicts that the equilibrium response to changes in trade policy will also be heterogeneous in terms of both sign and size. The variation in firm level reaction is shown to be determined by both firm and industry characteristics and therefore the equilibrium response to trade policy is predicted to vary not only within industries but also across industries. To investigate these predictions Ederington and Mccalman (2007) examine the Colombian experience with trade liberalization since the mid 1980's. The results show that trade liberalization tended to raise the productivity of the typical firm in industries with low barriers to entry, small technology gaps, large markets and also large initial levels of protection. However, Ederington and Mccalman (2007) also found evidence that firms within industries also had a differential response to tariff changes, not just in terms of magnitude of response but in terms of whether it improved or undermined a firm’s productivity performance. Specifically it is found that larger firms, younger firms and exporting firms (i.e., firms with high rankings in the productivity distribution) tend to grow faster as tariffs are raised. Finally, it is shown that such variation across firms and across industries is consistent with their model of endogenous technology adoption.

Fernandes (2007) examine whether increased exposure to foreign competition generates productivity gains for manufacturing plants in Colombia during the 1977–1991. Using an estimation methodology that addresses the shortcomings of previous studies, she finds a strong positive impact of tariff liberalization on plant productivity, even after controlling for plant and industry heterogeneity, real exchange rates, and cyclical effects. The impact of liberalization is stronger for larger plants and plants in less competitive industries. Her findings are not driven by the endogeneity of protection. Similar results are obtained when using effective rates of protection and import penetration ratios as measures of protection. Productivity gains under trade liberalization are linked to increases in intermediate inputs' imports, skill intensity, and machinery investments, and to output reallocations from less to more productive plants.

2.5 Concluding Remarks: Synthesis of Empirical Literature

The emerging theme in the literature is that there is no agreement pertaining to the gains from trade/trade policy and the mechanism through which these gains are accomplished. The intricacy of establishing an empirical link between trade liberalization/openness and growth arises from at least three major sources.

The first problem is how to define openness/trade liberalization. There are several different measures of trade liberalisation or trade orientation. The most common measures used are: the average import tariff; an average index of non-tariff barriers; an index of effective protection; an index of relative price distortions or exchange rate misalignment, and the average black market exchange rate premium. For example, Dollar's (1992) results rely on the volatility of the real exchange rate, while Sachs and Warner (1995) combine high tariff and non-tariff measures with high black market exchange rate premia, socialism and the monopolization of exports to identify non-open economies. The measure of openness proposed by Sachs and Warner (SW) has been criticized on several grounds. The variables that make up SW index are highly correlated with each other; they potentially measure a number of macroeconomic policies (Hanson and Harrison, 1999; Rodrik and Rodriguez, 2000).[11] In addition, the measures developed tend not to relate to the mechanism through which endogenous growth theory suggests are important. Although Anderson and Neary's (1996) Trade Restrictiveness Index provides useful approach of aggregating tariffs, it can nevertheless handle non-tariff barriers only once their tariff equivalents are known. Pritchett (1996) shows the trade indicators are only poorly correlated with other indicators of openness, while Harrison (1996), Hanson and Harrison (1999) and Rodriguez and Rodrik (2001) show that most of Sachs and Warner's explanatory power comes from the non-trade components of their measure. All in all, existing aggregate measures of trade restrictiveness fail to capture some critical aspects of trade reforms, or require data, which are unavailable, and perhaps the most difficult problem, is the lack of a comprehensive data set on official trade barriers.

[11] The key difference between Harrison and Hanson (1999) and Rodriguez and Rodrik (2001) studies is that while the former introduces the subcomponents of SW index separately in their regression the later construct sub index (for example, Tariff, Non-Tariff Barriers and Socialist regime are combined to make SQT dummy)

Second, causality is difficult to establish. Rodriguez and Rodrik (2001) argue that openness, as measured by imports plus exports relative to GDP, is likely to be endogenous, and this problem is also prevalent in policy based measures such as the average tariffs. Frankel and Romer (1999) and Irwin and Tervio (2002) have tried to address this problem by instrumenting openness in the income equation, with populations, land areas, borders and distances between trading partners. Although this appears to have addressed econometrics issues, Rodriguez and Rodrik (2001) point out that the instruments used by Frankel and Romer (1999) are correlated with factors that boost growth independently of trade—for example, health and institutions—and that adding geographical variables directly to the growth equation undermines the result. Although recent studies employ System Generalized Method of Moments (SYS-GMM) to overcome the endogeneity problem, they are nevertheless trapped in the first problem.

The third difficulty is that if trade liberalization is to have a permanent effect on growth, it must be implemented concurrently with other complementary policies. Baldwin (2002) argues that since trade liberalization is never implemented in isolation, trying to separate its effects from other policies does not make sense. The policies advocated here, among others are: sound macroeconomic fundamentals, rule of laws, anti-corruption, good institutions, accountability, political stability, transparency, and investment in human capital. Unfortunately, however, the current econometric strategies are not well capable in handling those crucial determinants of long run growth.

Fourth, most of the studies have focused on a large number of countries. While it is true that cross-country studies do provide a good empirical generality, its problem is that they suffer from heterogeneity problems prevailing in the countries under investigation. Indeed, initial conditions between reforming countries vary considerably. There are huge cross-country differences in the measurement of many of the variables used in econometric. Obviously important idiosyncratic factors are ignored, and there is no indication of how long it takes for the cross-sectional relationship to be achieved. Recently, Srinivasan and Bhagwati (2001) have attributed the ambiguous results to the shift of the profession from nuanced case studies that were carried out by World Bank and OECD in the 1970s and 1990s. In chapter six, we examine the effect of openness on economic growth in Tanzania.

Fifth, what is less clear is how agricultural productivity is related to trade liberalization (we shall return to this issue in detail in chapter 4). Indeed, one complication in the literature is how TFP is measured. The current empirical strategy presupposes perfect competition and then equates marginal products with factor shares as is implied by Cobb- Douglas technology, Bernard and Jones (1996). Attempts to relax these assumptions by estimating production or cost functions econometrically remain disappointing with implausible estimates very common especially for developing countries, Griliches and Mairesse (1998). In addition, measuring factor inputs is difficult especially in terms of obtaining reliable data on agricultural inputs.

CHAPTER THREE
TRADE POLICY REFORMS, EXPORT GROWTH AND IMPORT BEHAVIOUR

3.1 Introduction

The major objectives of this chapter are three fold. First, we review and analyse the trend in production of agricultural output, primary export and import behaviour under the alternative trade policy regimes over the last forty years. Second, we explore the nexus between trade policy and return to the peasants in terms of producer prices. Third, we perform both parametric and non-parametric tests in order to evaluate the impact of reforms on growth rate of export crops.

In an attempt to address the objectives of this chapter, we categorize three major phases of trade policy regimes based on policy episodes that the Tanzanian economy went through. The initial phase covers the period from the post independence era up to the early 1980—the time when Tanzanian government practiced an active policy of socialism and state intervention. The second phase, which combines both unilateral policy reforms and IMF/World Bank policy prescriptions, goes from the early 1980s up to 1992. This period is characterized by a mix government intervention and free market doctrine. The last phase, which runs from 1992 up to the 2000s involves full-fledged liberalization of the external sector.

There are two key observations, which are emerging from this chapter. First, despite the marked variation in the composition of traditional exports especially during the late 1990s; largely from coffee and cotton to cashewnuts and tobacco, the contribution trade and trade policy in fostering export growth is rather tenuous. Second, although the volume of food crops during the post reform period is much higher than before the reforms, there are no symptoms of increased growth overtime. These observations are supported with both parametric and non-parametric tests.

3.2 Agriculture and the National Economy

Agriculture is the most dominant sector in Tanzania in terms of employment (over 80%), contribution to the GDP (over 50%, see figure 3.1) and Foreign exchange earnings (over 60%). It employs more than 80% of the work force. Figure 3.1 aggregates various sectors into four major economic categories (1) primary activities (2) basic transformation or infrastructure (construction); and (3) intermediate or industrial sector, and (4) services (home rentals, public administration, electricity and water, trades, hotels and restaurant. Clearly, the primary sector dominates the economy for the entire period of our study. The contribution of service sector has averaged 30%. On the other hand, construction never increased its share above 6%. The industrial sector’s contribution to GDP has fallen gradually to 7 % in 2001-04 from 9% during the 1980-85. In general, the growth rate of GDP is to a large extent shaped by the growth rate in agricultural produces because other sectors, such as manufacturing and construction have remained almost stagnant over the last forty years (see figure 3.1).

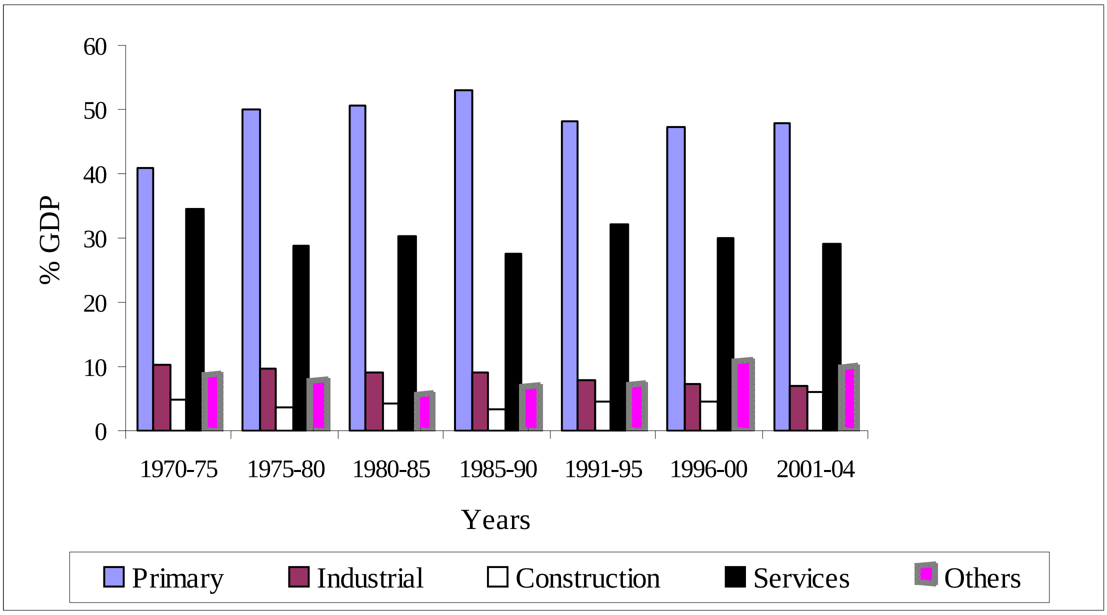

Figure 3.1 Sectoral Contributions to the GDP

Thus, any meaningful examination on the efficacy of IMF/WB programmes in Tanzania must therefore explore the performance of the agricultural sector. Indeed, since agriculture occupies the largest segment of the national economy, the IMF/WB have focused much of their policies intervention in this sector. Hence, both the IMF/WB have not only been instrumental in shaping macroeconomic policies in Tanzania, but they have also played a major role in restructuring agricultural policy.

3.3 IMF and World Bank Policies on Tanzanian Economy: An Overview

Tanzanian economy has undergone through dramatic trade policy reforms since the mid 1980s and throughout the 1990s. These policy reforms have generally pointed toward decreasing anti-export bias and reducing macroeconomic disequilibria. As already mentioned in the introductory chapter, the most important policies involved removal of protection to the import substitution sector, elimination of export taxes and subsidies, and exchange rate devaluation.

These policies have been implemented under the conjecture that the fall in output in the non-tradable sector would be more than compensated by the expansion of agricultural sector, in particular the agricultural exports. Moreover, removal of protection in the Import Substitution Industries (ISI), reforms in the exchange rate regime and abandonment of export taxes are all targeted towards increasing the relative profitability of agricultural exports vis-à-vis the rest of the economy. Intuitively, the agricultural sector would be better placed to attract scarce resources and therefore trigger rapid economic growth.

In conjunction with the IMF, Structural Adjustment Lending (SAL) and Sectoral Adjustment Loans (SECALs) were introduced by the World Bank in the 1980 to address balance of payments problems in developing countries, Noorbakhsh and Paloni (1998). While the SECAL was aimed at strengthening the export production, SALs were targeted at encouraging specific social and economic policies. Nonetheless, the goals of the World Bank's lending policies are similar to those of the IMF: e.g., removal of trade and exchange controls, etc.

However, the effect of these policies on the performance of the agricultural sector has not been impressive. Figure 3.2 plots the share of primary export to Agricultural GDP of five major export crops in Tanzania over the 34 years.[12] While the dataset for primary exports is taken form FAOSTAT (2005), the dataset for Agricultural GDP is taken from Economic Surveys in Tanzania. One can notice from figure 3.1 that, although, there is mild recovery of the share of primary exports in agricultural GDP in the 1990s, this increase is below the level recorded in the early1970s.

[12] These crops are: Cotton, cashewnuts, coffee, tea and tobacco.

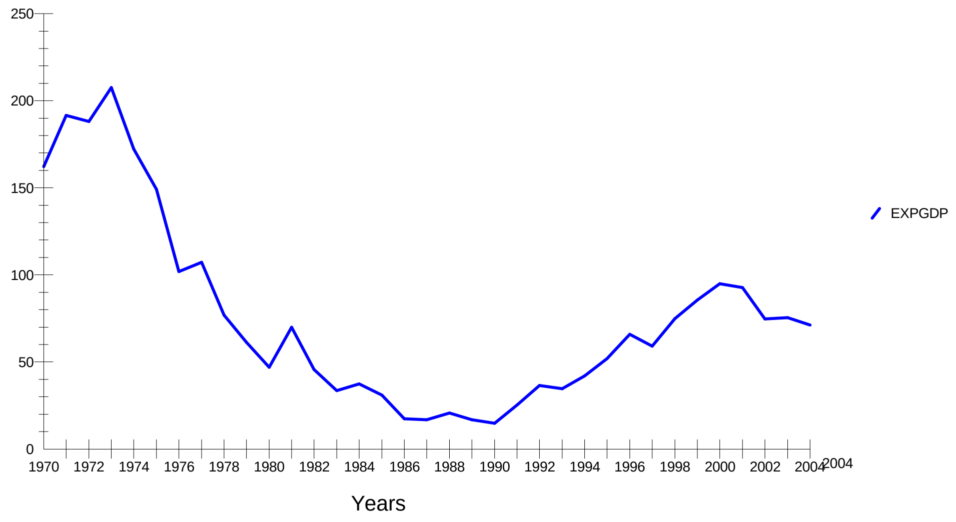

Figure 3.2 Primary Exports to Agricultural GDP Ratio

The natural question that arises is why despite all these years of liberalization, the performance of the agriculture has not been spectacular? To answer that question, among other things, a review of various trade policy regimes that the country pursued from post independence to the present time is warranted. Such a narrative analysis is what follows in the next sections.

3.4 Post Independence Trade Policy Regime: 1967-1980

The year 1967 is usually taken as an initial milestone in exploring the effects of trade and other socio-economic policies in Tanzania as it was marked by a radical shift in policy transformation from the colonial setting to the home grown policy under the umbrella of socialism and self-reliance. One of the major hallmarks of Tanzanian socialism was the introduction villagization policy in which rural peasants were collectivized in "Ujamaa" villages. The underlying doctrine of Ujamaa villages was largely meant to enhance collective ownership in the production process, modernization of peasant agriculture and elimination of any sort of exploitation amongst the people in the country. The policy of socialism and self-reliance had a remarkable impact in shaping trade and other economic policies.

The post independence trade policy regime was characterized by an active and expanded role of government intervention in production and marketing of agricultural exports supported by the marketing boards. Specifically, markets for agricultural produce and inputs were controlled by public corporations, which were given legal monopoly power. The government also introduced pan-territorial pricing for both food and cash crops. Within this particular time frame, there was also a strong drive toward industrialization based on the philosophy of import substitution, and large investments were made in state owned manufacturing industries, Skarstein and Wangwe (1986). In addition, the fixed exchange rate policy and foreign exchange controls were adopted in 1966 as the instruments of trade policy to cushion the country from imported inflation and managing the balance of payments, Kaufmann and O'Connell, (1997). However, the effect of these policies on agricultural sector was mixed as explained in the following sections.

3.5 Export Performance: 1967-1980

The word "export performance" as used in this chapter means the relative success or failure to produce and sell domestically produced goods to the rest of the world. Four indicators are used to capture export perfomance: the share of primary export to Agricultural, the share of primary export to total exports, the volume of production, and finally the the export earnings generated by a particular export crop.[13]

Our discussion on the export crops throughout this section shall focus on six major crops (coffee, cotton, cashewnuts, tea, sisal and tobacco), which constituted a significant proportion

[13] The statistics reported in this chapter are: "means and standard deviation".

in the total agricultural exports in the 1990s. Coffee remains the largest export crop and is cultivated by both smallholders (95%) and estates (5%) (See table 3.1). The share of coffee in traditional export crops is around 17%. Cotton is the second largest export crop and is grown by smallholders with a contribution to total traditional exports of about 15% in the 1990s. Tea is both an estate and smallholder crop. Its contribution to the total traditional exports is about 5%. Both tobacco and cashewnuts are mainly smallholder crops, with a contribution of around 5% and 10% in the total export respectively. Sisal is typically an estate crop; its share to the traditional agricultural export is less than 2%.

Up until the early 1970, the volume of primary export crops was generally impressive, although there is a marked variation across individual crops. Table 3.2 shows that, although the volume of cotton and sisal were lower in the early 1970s compared to the late 1960s, the export earnings for these two crops were generally higher in the 1971-75 compared to 1967-70. The volume of coffee rose from 47 thousands metric tons to 49 thousands between 1967-70 and 1971-75 sub-periods respectively (see table 3.2). The export earnings generated by coffee expressed in 2000 prices (US$) rose by 45% over the same period. The expansion of coffee took place when prices were generally favourable. The largest expansion took place in the southern part of the country under the European Economic Community projects. We also note from table 3.2 that there is a rapid growth in cashewnuts production during the 1970-75, following the plating of new trees in the Tanga region (Jaffee, 1994).

Beginning the mid 1970s, the volume of cotton, cashewnuts, and sisal started to plummet, however. Among the individual crops, sisal production deteriorated significantly. Between 1971-75 and 1976-80, the share of sisal crop to the total agricultural exports declined by almost 30% (see Table 3.2). The decline in volume of sisal was also accompanied by considerable reduction in the export earnings, from 501 in 1971-75 to about 416 in 1976-80

(Table 3.2). Besides the common factors for all crops to be discussed later, the decline in the sisal is attributed to the introduction of synthetic fibres and poor management in the nationalized estates, which constituted 60% of the area under cultivation in the 1970s.

While the production of cotton dropped consistently from 53.93 metric tons in 1971-75 to 41.52 metric tons in 1976-80, export earnings rose by more than 20%. The decline in cashewnuts in the later part of 1970s in addition to the incidence of diseases was partly ascribed to the effect of villagization programme from the mid 1970s; in which farmers were relocated further away from their perennial crops. This relocation coupled with the new chores with regard to the development of “new” villages and communal farms, prevented farmers not only from harvesting but also in executing proper management of their former farms, Jaffee (1994).

Unlike cash crops, the increase in the output of tradable food crops is largely ascribed to the effect of villagization programme, which effectively assigned the dual roles to the peasants—in addition to individual farms; peasants were required to work in the village farms. There was also an enforcement of minimum acreage laws that required each household to cultivate a minimum of one acre. Concomitantly, coercive measures were enforced and fines were levied to farmers who went against the minimum acreage law. Table 3.3 reveals that the performance of food crop over the 1967-1980 was much higher at the end of the decade than it was in the beginning. As part of state intervention in agricultural sector, a national maize production programme was launched alongside the villagization in 1973/74 in which farmers were given free agricultural inputs such as tractors, ploughs and fertilizers. Although the national maize project was confronted with problems related to input delivery and inadequate extension services, its contribution to the increased production of maize in the late 1970s was substantial (see table 3.3). The study by Lofchie (1978) and Kikula (1997), however, dispute the contribution of villagization policy as an important factor in increasing the volume of crops because peasants were separated from their original farms, which were believed to be much more productive.

3.6 Producer Prices: 1970-1980

In table 3.4 we compute real producer price index by taking the producer prices expressed in the 1970 dividing by the Consumer Price Index. With exception of coffee, which registered increased producer prices in the mid 1970s, real producer prices for other crops declined considerably. Such a fall in real producer prices arises from the fact that nominal prices were pre-determined by the government agencies. In addition, overvaluation of the exchange rate contributed to a fall in producer prices. Since producer price for export crops is a function of exchange rate, when the exchange rate is overvalued, the exporting firms realize fewer units of local currency per unit of output sold. This explains partly the reasons why marketing boards were experiencing financial difficulties which were passed on to farmers in terms of lower domestic producer prices.

On the other hand, a fall in real producer prices for tradable food crops in the 1970s is partly ascribed to food pricing policy that existed at that particular time. The food pricing policy that prevailed between the late 1960s and 1980s was intended to eliminate wide marketing margins by removing the involvement of inefficient agencies, which characterized postcolonial food trade, Bryceson (1993). It was thought that the marketing chain would be simplified if the National Milling Corporation (NMC) could buy crops straight from farmers, and thus bypassing inefficient cooperative unions.[14] But the operation of the NMC was not without shortcomings. Since the NMC was instructed by the government to make advance payments to the villages, some of which had little competence of handling bookkeeping, it is not baffling to note that financial mismanagement and other inefficiencies in crop procurement arose in the process. Because of operational problems that the NMC faced, unsold stocks were artificially created in the farming communities. This in turn pushed prices downward since the NMC was the only monopoly buyer of food crops.

3.7 Import Structure

The structure of imports during the 1970s and the early 1980s indicates the predominance of manufacture as compared to imports of food and agricultural raw materials (Table 3.5). This trend is not surprising bearing in mind that the import of manufacture remained vital for the survival of import substitution industries.[15] In the average, the share of fertilizers in total merchandize imports was the less than 1% in 1980-85.

The dis-aggregation of food imports into maize, rice, wheat, sugarcane and pulses using US$ 2000 as a base reveals that imports value of major staples increased drastically in the mid 1970s following severe drought (see table 3.6). More precisely, the import of maize rose considerably from $9.19 during 1967-70 to $173 in 1971-75 before dropping to $116 in the late 1970s following adjustments in food pricing system.[16] Imports of major grains (maize and pulses) rose again during the 1981-85 partly because of adverse weather conditions but also because of the inefficiencies surrounding the National Milling Corporation in its role both as a

[14] Local cooperative were abolished in 1976 with the passage of 1975 village Act. The NMC staple food procurement had to be pursued directly with village government. That is, villages were designated to act as multipurpose cooperatives, purchasing cooperatives and selling to the NMC.
[15] Major components of manufactures imports are: machines, transport and communications and industrial raw materials.
[16] Ellis (1992) argues that the initial response of the government following the drought in the 1973 and1974 was to rise producer prices.

buyer and supplier of food grains. Because the NMC was inundated with problems related to procurement and delivery of food crops to the urban population, the government had to import food to remedy the deficit, MDB (1986a). All in all, the import of food between 1980-86 was paramount because the official domestic purchases of maize, rice and wheat were not adequate to meet the demand from the official channels, MDB (1986a).

At this juncture, perhaps it is reasonably fair to argue that unfavourable performance of export sector following trade policies of the 1970s had disastrous consequences on production of food crops. For example, overvaluation of the exchange rate made the domestic price of imported food to be less expensive than the same item or equivalent foodstuff produced by local farmers. On the other hand, the subsidies policy had a devastating consequence on the national budget as the government grappled to maintain the price of grains artificially below the market clearing level. With meagre financial resources, the government was unable to buy crops, resulting into acute shortage of food in the official channels, which in turn fuelled food price inflation in the parallel markets. The combinations of staple food producer prices rise, transport subsidy and the overvalued exchange rate led the costs of NMC produced maize, rice and wheat to supersede import parity, MDB (1983). Because of import restrictions, the country was thrown into food crisis in the early 1980s, whose severity forced the government to seek external assistance from the IMF.

3.8 Unilateral Policy Regime Change and Reforms by the IMF/World Bank

This phase was characterized by both internal policy strategies as documented in the National Economic Survival Program (NESP), the Structural Adjustment Programme (SAP) and policy prescriptions following the Washington consensus. The NESP (1981-82) was formulated by Tanzanian government in order to reinvigorate agriculture and other traditional exports. The

NESP was further expected to increase manufacturing output and productivity while downsizing public expenditures. The SAP (1982-85) was much more comprehensive in that it encompassed a wider part of the economy. The policies adopted in the SAP included the liberalization of food crops, removal of export taxes on traditional export crops, partial liberalization of imports of agricultural inputs and other spare parts, Ndulu *et al.* (1999). In 1984, the government devalued the shillings, raised producer prices and reduced the number of goods subject to price control from around 2000 to 75, Amani et *al.* (1992), World Bank, (2000).

Nevertheless, the impact of these reforms were short-lived, as they could not translate themselves into sustained export recovery because of the acute shortage of foreign exchange needed to buy intermediate inputs for both industrial and agricultural production. The recourse to the international finance from multilateral institutions was neither forthcoming nor was it feasible because of the country's resistance to the IMF policy recommendations, Singh (1986); Bigsten *et a.*,(1999). By the mid-1980s, it became increasingly apparent that the prospects for primary exports remained bleak (see figure 3.2) While initial devaluations in the early 1980s provided some stimulus to exports, its pass-through effect in rural areas was not pronounced because farm gate prices continued to be fixed by the government. As such, the gains from devaluation were absorbed by the export processing and marketing authorities which remained monopolies in the 1980s. To redress the economy, further trade policy reforms in tandem with other macroeconomic policy adjustments was prepared in close collaboration with the World Bank and led to the conclusion of negotiations with the IMF in 1986.

The reforms in trade policy under the support of World Bank and IMF commenced earnestly in 1986 as part of the overall Economic Recovery Programmes (ERP). This was followed by the second Economic Recovery Programme (ERP II) also known as Economic and Social Action Plan (ESAP), implemented over 1989-1992.[17] The focus of the ERP, among other things, was targeted at shifting resources from non-tradable to tradable.[18] In the agricultural sector, domestic food markets were liberalized first. Between 1986 and 1989 private trade in food crops was deregulated. Roadblocks that were used to control the movement of food crops were lifted in 1987; and by 1989 pan territorial pricing policy was abandoned. Moreover, exchange rate was further devalued and tariffs were rationalized, Ndulu (1993); Ndulu *et al*., (1999). The sharpest devaluation of the exchange rate went concomitantly with dismantling of quantitative restrictions.

The cut in tariff went together with two liberalization measures. The first one was the introduction of an open general license (OGL) system under which import licenses were provided automatically for eligible imports. The second measure involved the creation of the Own Funds Facility, under which import licenses were provided freely to importers that used their own foreign exchange holdings to pay for specified imports, Kaufman and O'Connell (1997). The scope of these facilities remained limited, however, until a major intensification of liberalization efforts in 1991-93 eliminated all administrative allocations of foreign exchange and abolished import licensing, IMF (2003).

3.8.1 Export Performance: 1980-1992

Table 3.2 gives a summary of descriptive analysis for export performance during the 1980-1990 and beyond. In general, the export performance for 1981-85 is not impressive as

[17] In essence, the ESAP carried over the objective of the SAP and ERP in addition to the new target, which focused on rehabilitation of social services by identifying and designing appropriate strategies, and programmes that would enhance people's participation in the operation and management of these services.
[18] Other objectives were to raise GDP growth rate to at least 5% per annum, reduce the rate of inflation below 10%. The programme also introduced liberalization of financial sector reforms, which effectively allowed private banks, and liberalization of the foreign exchange market.

compared to 1976-80—the average production (in thousand metric tons) in the former was greater than the latter. Indeed, the foreign exchange generated by export crops also dropped sharply. Despite the adoption of Washington Consensus in the mid 1980s, production and export values of cash crops continued to worsen in the late 1980s. This trend is also confirmed by the precipitous drop in the share of primary export over agricultural GDP shown in figure 3.1.

3.8.2 Producer prices: 1980-1992

Table 3.4 shows that producer prices for almost all cash crops were generally higher after 1986. Currency devaluation is frequently cited as one of the major factors that contributed to the increase in producer prices. In particular, between 1986 and 1991 the real exchange rate depreciated precipitously following devaluation of the currency by more than 90%. To some extent, such devaluation increased the average producer price for export crops, Cooksey (2003), Baffes (2004), Mitchell (2004), Winter-Nelson and Temu (2001).

But the increase in producer had a limited impact on the production of export crops for at least two reasons. The first reason is that removal of fertilizer subsidies combined with inflation and subsequent currency devaluation caused rapid increases in price for local inputs. In 1991/92, for example, the domestic market prices for fertilizer (in nominal terms) rose at an average of 85 percent, Wobst (2001). The price of improved seeds also went up under the adjustment program to an extent that between 1986 and 1991 there was a 60% decline in the number of household using improved varieties, Mashindano and Limbu (2001). Second, depreciation of the real exchange rate could not be sustained over the long run as it has appreciated in the mid 1990s largely due to inflation differentials between Tanzania and her major trading partners.

3.8.3 Import structure: 1980-1992

The import structure during 1980-85 was not different from the 1970s decade—manufactures still taking a huge chunk of the overall merchandize imports. While the imports of fertilizers continued to remain at 1% (Table 3.6), the combined share of machines, industrial raw materials, transport &communications and building and construction remained above 50%. In general, the import of other consumer goods peaked up drastically in the 1990s. This trend is ascribed to the relaxation of import controls.

3.9 Trade Policy Reform under the IMF/World Bank: Post 1990s

The third phase, which begun around 1992 witnessed the liberalization of agricultural trade for traditional export. The liberalization of export crops started with the amendments of coffee, cotton, tobacco and cashewnuts Acts by the Parliament—the Acts which permitted private sector to compete with cooperative unions in buying farmers' crops, supplying inputs and to participate in the export market for agricultural produce. Within this period, the government replaced the monopoly of marketing boards with crop boards.[19] The reason for introducing such a change is that the government was pulling out of production and marketing of agricultural crops. Such a move, it is argued, would enable the government to focus on provision of public goods—research, extension services and quality control, World Bank (1994, 2000).

In 1992 the fixed exchange rate regime was replaced by the market-determined exchange rate. Such a policy shift had three goals. The first goal was aimed at the compensation for the past erosion of external competitiveness. The second goal was to achieve the unification of the

[19] Marketing boards were created in the mid-1970s as public agencies to cater for a range of marketing activities, such as crop purchasing, input supply, allocation of consumer goods, and credit provision. Unlike marketing boards, crops boards (coffee, cotton, cashewnuts, tea, tobacco) are no longer playing an active role in direct marketing or production but are expected to continue with regulatory, reporting, and service activities, including quality control and input supply of the former marketing boards.

segmented foreign exchange market. The steep depreciation of the official exchange rate was the most significant policy option in closing the gap with the parallel market rate. The government also introduced the foreign exchange bureaus in 1992, allowing these entities to transact in foreign exchange at freely market-determined exchange rate for current account transactions. The spread between the official exchange rate and bureau rate gradually fell, reaching roughly 10% in mid 1993 and disappearing by the end of that year, Kaufman and O'Connell (1997). The third goal was to restore the convertibility of the Tanzania's shilling (T.Shs) mainly via the dismantling of the exchange controls. The enactment of the Foreign Exchange Act of 1992, allowed individuals to hold foreign currency and maintain foreign exchange accounts at commercial banks within Tanzania.

While the exchange rate policy was moving toward being market determined beginning 1992, the tariff reforms that were introduced in the late 1980s were reversed in 1993 to besiege the bloated fiscal deficit, which arose from tax exemptions granted by National Investment Promotion and Protection Act (NIPPA) of 1990, and income tax on treasury bills' interest rate, Budget Speech (1994).[20] Currently, agricultural machinery, fertilizers and pesticides are exempted from valued added tax. Also, imports of all capital goods in agriculture, mineral sector, road, railway, air and sea transport, port facilities; telecommunication, banking and insurance are duty free, Tanzania Investment Centre (2005)

[20] In an effort to improve the investment climate in Tanzania, fiscal incentives have been put in place which provides soft landing platform for all investors during the initial period of project establishment in recognition of the fact that investors need to recover their investment costs first before paying taxes. In this regard investors pay very little or no taxes at all to established their projects in Tanzania.

3.9.1 Export Performance: 1994-2004

Despite further reforms undertaken during the 1990s, the general trend in the production of traditional export during the 1990s has been mixed (see table 3.1). With an exception of tea, cashewnuts and tobacco crops, which maintained relatively increasing paths, coffee and cotton recorded an increase in production in the early 1990s, falling production thereafter. Production in traditional coffee growing areas has declined due to reduced production in public estates, low input use, increased incidence of diseases and low returns to producers in the face of escalating cost of production. Figure 3.2 shows a slight recovery of the share of primary export in Agricultural GDP. A quick glance at table 3.1 shows that there is no significant change in the share of primary export to total export before and after the reforms of 1990s. However, we also note that the export earnings generated by primary exports are higher in the 1990s compared to 1970s, see figures 3.5-3.9 in the appendix 3.0

As argued elsewhere, possible reasons for drop in production in the early 1990s (see table 3.3) especially for major staple such as maize has been connected to the end of pan-territorial pricing and higher cost of fertilizers following removal of input subsidies and adverse climatic conditions. In particular, pan-territorial pricing was subsidizing the movement of maize from the southern highland (Iringa, Mbeya, Rukwa and Ruvuma regions) to Dar es salaam region, thus boosting production in the former regions. According to World Bank (2000) between 1987-89 and 1996-98 maize output declined by 13-19 percent in the southern highlands, while expanding in other regions closer to the Dar es Salaam. Before removal of subsidies, Southern Highlands consumed more than 50% of all fertilizers in Tanzania, Skarstein (2005). However, abolition of subsidies witnessed the sharpest fall in the fertilizer consumption. The entry of private traders in input markets remained quite insignificant and when it occurs fertilizers prices are too prohibitive.

3.9.2 The Ratio of Producer's Price to the Export Price

One of the core arguments in favour of liberalization of agricultural sector was to reduce the gap between farm gate and export prices. The producer prices of Tanzania's major export crops have generally tracked the export prices, although the magnitude varies by individual crop. Table 3.7 shows that the share of producer price to export price differs across individual crops, with coffee and cashew responding better than other crops. Smallholders in tea production have not benefited much from liberalization, as the ratio of producer to export price is lower than 10%. Cotton farmers also appear to have been marginally affected as the ratio between farm gate price and export is floating between 10 and 20 percent over the 1990s. The ratio of producer to export price to tobacco rose from 25% in 1992 to 43% in 1997 and it gradually started to fall thereafter.

On the other hand, the trend in the real producer prices food crops indicates that real producer prices increased gradually up to 1993/94. The gradual increase in producer prices before 1995 is attributed to at least two factors. First, the year 1993/94 witnessed the harvest failure due to adverse weather conditions. Second, the effect of market reforms in food grain also seemed to have contributed because large number of buyers had entered the market thus pushing prices upward. Beginning 1995 however, prices started to fall suggesting that some speculative traders started to exit, Ministry of Agriculture (2000).

One of the most adverse impacts of phasing out the NMC has been an increase in price volatility in different seasons and across different regions. This has resulted into increased farmers' vulnerability. Before liberalization, producer prices were not fluctuating within a particular crop season. In contrast, producer prices have exhibited seasonal volatility, being lower in the period following harvest and highest before the next harvest. This tendency pushes farmers with low income and no storage facilities into a disadvantageous bargaining position, which in turn forces them to sell their products when the price is very low. The irony is that the same poor farmers would buy the same food when the price is rising. So, in the end poor farmers loose more than would have been with regulated prices.

Econometric evidence on the effect of producer prices on production of food crops is not unambiguous. The most controversial study that is frequently cited by many researchers was carried out by Bilame (1996). The empirical results by Bilame as cited by Skarstein, (2005) shows that there is a negative relationship between producer prices for maize and the maize output during the liberalization period. Bilame (1996) argues that since the government no longer determines producer prices, uncertainties created by free markets tend to have a negative relationship with the production of maize in Tanzania. High prices reflect maize deficits while low prices reflect a bumper harvest. Such volatility in price distorts production decisions of smallholders because when prices are lower in the current harvest season, smallholder tends to reduce marketed output in the next season. This situation contrast sharply with pan-territorial pricing in which farmers were given a guaranteed a price floor; implying that the absence of price fluctuation served to rule out variability of maize production as caused by the price factor.

3.9.3 Import Structure 1992-2004

As far as the merchandize import is concerned, we note a slight rise in the early 1990 presumably due to further liberalization and removal of import controls. The liberalization of imports slowed markedly in 1993/94 as emerging fiscal imbalances led the authorities to increase customs duty rates (in both fiscal years 1993/94 and 1994/95) to compensate for shortfalls in domestic tax revenues. But the structure of import has been more or less the same over the last thirty years. That is, while the import of manufactures continues to take the lead; food import has hovered around 10-20%. Fertilizer import as a percentage of merchandize imports remains the lowest (see Table 3.15). In terms of food security, the volume of food imports declined quite dramatically in the late 1980s due to the diversion of food from black markets and increased cost of imports resulting from devaluation.

All in all, the expenditure on import tends to suggest that the country imported more food in the late 1990s than had been the case during the 1986-90 (see table 3.5). Several reasons might possibly account for this behaviour. First, liberalization has been accompanied by removal of restrictions in food imports. This implies that more food is now imported than before the reforms. Second, while devaluation of the currency in the mid 1980s increased remarkably the import bills, which in turn was translated into low levels of import for the 1986-1990 period, the appreciation of the real exchange in the 1993 made the import of food relatively inexpensive. Third, adverse weather conditions in 1997/98 made the country to import more food. Fourth, the fact that population growth rate is above the growth of major staples such as maize has brought with it more demand for food.

3.10 Substitution between Cash Crops and Food Crops

A cursory inspection of agricultural data shows that while the production of some export crops has declined especially beginning the late 1990s, food crops has generally increased over time; although for some food crops, production at the end of 1990s does not differ considerably with the level of production in the 1980s. It could be argued that change in the composition of crop production overtime would provide a crude picture of how farmers substitute production of food crops for cash crops. However, variation in crop composition is not an adequate factor that could explain a switch of production from cash to food crops; for even within the cash crops, the composition of output has changed quite dramatically especially in the 1990s. For example, while the production of coffee, cotton and sisal declined gradually during the 1990s, tobacco, tea and cashewnuts have maintained an upward trend.

But as discussed earlier, export crops appear to have been unfavourably exposed to policy shocks compared to food crops and therefore it is hard to tell whether the declined level of production is simply a matter shifting production from export to food crops. Indeed, since most cash crops are perennial in nature, it takes long gestation period before potential yields are realized. In other words, it is relatively easy to switch production from cash crops such as coffee and cashewnuts to food crops. The reverse is difficult in the short run. This suggests that substitution between cash and food crops is largely a long run matter and therefore it remains an empirical issue.

As a matter of an empirical investigation, the World Bank (1994) estimated a Cobb-Douglas function in order to establish whether substitution between crops does exist in small holding agriculture in Tanzania. That relationship was estimated by the Seemingly Unrelated Regression (SURE). The Cobb-Douglas function consisted of individual equations for food production and official purchase of export crops covering the period from 1969 to 1991. Export crops were divided into perennial (coffee, cashew and tea); annual crops (cotton, pyrethrum and tobacco). On the other hand, food crops comprised of maize, sorghum, paddy, cassava, millet and beans. For each of the three categories (i.e. food, perennial and annual crops), a Tornqvist price index and Tornqvist quantity indices were constructed, using values share at official producer prices as weights. It is assumed that export crops compete with food crops for inelastically supply of labour. This assumption permitted the inclusion of the price of competing food crops in the export equation. Analogously, the price of annual export crops was included in the food crop equation. In addition to other dummy variables such as drought and entry of cooperative unions in 1985, lagged prices were used as proxies for the prices expected to prevail in the market. The empirical results for food crop equation showed that the price of annual export crops (cotton, pyrethrum and tobacco) lagged one year significantly affect the supply of food. However, the food price lagged one year bore the correct sign but was not significant in the annual export crop equation. This implied that market condition in the annual export crops exert a noticeable impact in production of food crops but not vice versa.

Although the above study suggests the substitution effect from annual export crop to food crop, it nevertheless remains unclear as to which crops drive this kind of the relationship. It is similarly unclear whether substitution between crops within a specific sector could be empirically estimated. Perhaps, this is one of the reasons why the World Bank (1999) re-examined the relationship across individual crops covering the period between 1986-1997. The regression equation of maize supply included among other variables, the lagged price of cotton to estimate the substitution effects. The regression results indicate that both lagged price and production (one year) for maize are statistically significant. The coefficient of fertilizer price is insignificant implying that removal of subsidies prices had no impact on maize production. But the most interesting result is that of cotton. It is striking to note that the cross price elasticity of cotton was -0.43 indicating that a 10% increase in cotton price reduces maize output by 4.3%. However, the substitution between food crop (such as maize versus paddy) within the food crop sectors was found to be insignificant. For example, the substitution from maize to paddy was not significant. It could be argued that lack of substitution between maize and paddy is a matter of agro-ecological zone rather than a question of an empirical investigation. In other words, paddy’s cultivation depends on the permanent use of water sources in river valleys and alluvial plains—an agro-ecological zone which is not fit for maize production. On the contrary, cotton and maize can be grown interchangeably on the same piece of land.

In spite of the fact that the empirical literature supports existence of substitution between crops, little diversification between crop productions has occurred over the last forty years. This is not startling given the fact that most of the problems that besiege export (cash) crops are also confronting the food crop sector. As a mater of fact, it is difficult to unravel the performance of the food sector from cash crop because the two are inextricably linked up.

3.11 The Preliminary Evaluation of the Impact of Reforms

In this section, we perform hypothesis testing using both parametric and non-parametric test to make a preliminary evaluation of the impact of reforms on output change for the following crops: cashewnuts, coffee, cotton, tobacco and tea. In addition, we perform hypothesis testing for three tradable food crops: maize, paddy and wheat.[21] The null hypothesis is that there is no difference in the growth rate of these crops before and after the adoption of trade reforms.

For the sake of comparison, we split our dataset for each individual crop into three sub-samples. The first sub sample covers the period between 1974-1983. This sub sample is meant to capture the period of strong government intervention. The second sub sample covers the period between 1984 and 1993. This period is characterized by a mix of government intervention and early reforms. The third sub sample covers 1994-2003—the period of full-

[21] In principle, the main target in the production of food crops is to meet the domestic demand since the country is not self-sufficient in terms of food security. In practice, however, it is increasingly recognized that a considerable volume of recorded and unrecorded cross border trade for food and other crops is actually taking place between Tanzania and neighbouring countries, Bryceson, (1993); Ackello-Ogutu, (1998); Ministry of Agriculture, (2000). Besides cross border trade, Tanzanian economy imports a sizeable quantity of food crops from other countries (see for example FAOSTAT, 2005).

fledged trade reforms. The idea here is to make a comparison between 1974-83 and 1994-2003 (government intervention versus full-fledged reforms), and 1984-93 and 1994-2003 (mixture of government intervention and free market versus full-fledged reforms)

As part of parametric tests, we use the paired sample t-test since our aim is to test the growth rate of individual crop in two different occasions. Table 3.8 reports the results. The variable cashewnuts9403-7483 describes the null hypothesis of no significant difference in the growth rate of cashewnuts production between 1994-2003 and 1974-1983. Similarly, the variable cashewnuts9403-8493 describes the null hypothesis of no difference in the growth rate of cashewnuts between 1994-2003 and 1984-1993. The same interpretation applies for other variables. It is clear that the confidence interval for each crop does include the value of zero, and therefore we cannot reject the null hypothesis that the difference in the growth rate before and after reforms is zero. Equivalently, since our observed significance level (p-value) is more than 5%, we are confident that the 95% confidence interval does contain the value of zero.

Another important feature worth noting in table 3.8 is the mean difference between different periods. In short, the mean difference in two periods gives an indication of the direction of change. When the mean difference is positive after the reforms, this tells us that the mean growth rate of a specific crop is generally higher during the reforms period compared with pre-reform era. On the other hand, when the mean difference is negative, this tells us that the mean growth rate of a specific crop is generally lower during the reforms period compared with before the reforms. Table 3.8 shows that, with the exception of cashewnuts, cotton and wheat, other crops show negative sign in the mean difference in the period between 1984-1993 and 1994-2003 indicating that reforms are associated with lower growth rate of these crops, although the difference in growth rate is not significant as shown by the level of significance (i.e., p-value).

We next perform non-parametric tests since they are useful in small samples especially when there are serious departures from normality assumption. In addition, non-parametric tests are useful in the presence of outliers since the outlying cases will barely influence the results. The *Wilcoxon signed-rank test* is a non-parametric alternative to the paired t-test for the case of two related samples or repeated measurements. Table 3.9 reports the Wilcoxon results. It can be seen from the two-tailed signifcance level that the difference in mean level is large enough for us not to reject the null hypothesis that the growth rate in the mean difference before and after reforms is zero.

The preliminary evaluation in this chapter using both parametric and non-parametric tests does not support the impact of reforms in enhancing the growth rate of individual crops over time. The reasons for the dismal performance in the agricultural sector are many and varied. We can group them into two categories: internal and external.

3.12 Internal Factors

Internally, we show that the state of agricultural technology, exchange rate overvaluation, terms of trade and anti-export bias are some of the factors that have inhibited agricultural sector from realizing its full potential.

3.12.1 Agricultural Technology

The current state of agricultural production technology is still underdeveloped. About 80% of cultivation is still done using hand tools, 15% using ploughs, and only about 5% use tractors—

advanced technology is beyond the reach of the majority of small farmers.[22] Tractors were promoted during the villagization period when efforts to induce communal, mechanized farming were made to increase labour productivity. The difficulties and cost of operating tractors were too large for small holders, and utilization rate of this vital machines has dropped significantly. Most farmers use seeds from their previous harvest and apply little fertilizers and other chemicals. According to Mashindano and Limbu (2001), less than an average of 10 kilograms of fertilizer is used per cultivated hectare; which is far below the 49 kg average for Latin America and 98 kgs average for the world as whole.

3.12.2 Overvaluation of the Exchange Rate

The practice of setting official exchange rates at levels below the market clearing level appeared to have sparked off a number of disincentives to agriculture in developing countries during the 1970s and 1980s, Krueger, Schiff and Valdes (1988). In the context of Tanzania, Balassa (1990) among many other authors stressed this point. When the exchange rate is measured in Purchasing Power Parity (PPP) terms, available evidence shows that the real exchange rate appreciated by approximately 150% between 1973 and 1985, Ndulu and Kimei (1997).

Since the overvaluation of exchange rate reduces the prices of exports, it suppresses return to domestic producers. Overvaluation of the exchange rate also tends to lower the cost of living of urban consumers by lowering the price of imported goods including consumer goods. And because the foreign exchange used to finance these imported consumer goods is typically generated by agricultural exports, overvaluation penalized the rural producers at the expenses urban sector. Although currency overvaluation is envisaged to lower the cost of imported

[22] The predominant feature of agricultural production in Tanzania is the individual peasants smallholding.

goods, this is not what happened in Tanzania during the 1980s; for it precipitated acute shortage of foreign exchange. As a result, foreign exchange was rationed and supply of imported inputs and other essential commodities was adversely affected.

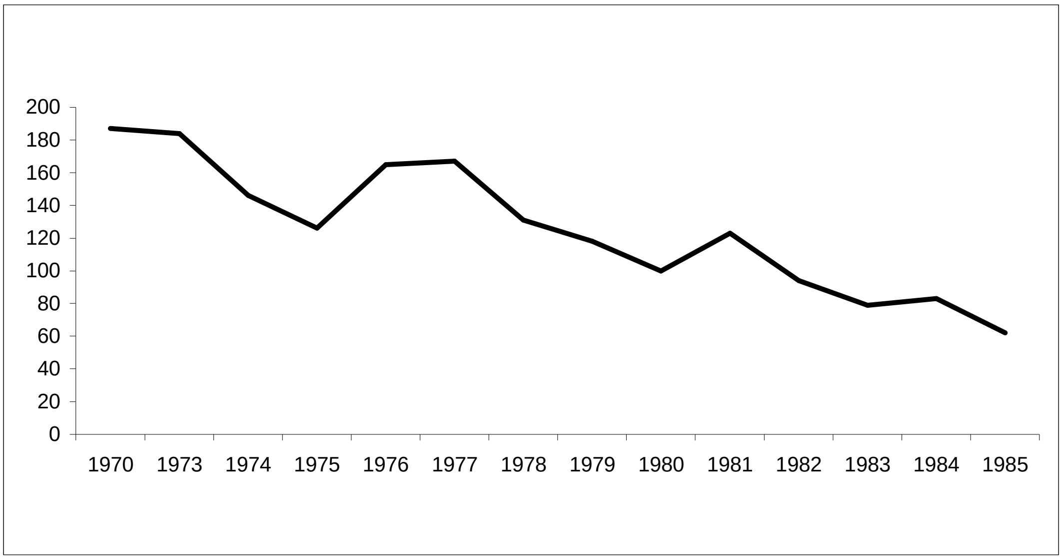

Figure 3.3 Income Terms of Trade: 1970 –1985 (1980=100)

Source of Data: UNCTAD, Handbook of International Trade and Development statistics, (1987), pp.545.

According to Ellis (1982) the net barter terms of trade of smallholder producers dropped by more than 35% between 1970 and 1980, and the income terms of trade declined by 33% during the same period. An additional problem is that the terms of trade exhibited fluctuation, often within short period of time (see figure 3.3). This unpredictability in the terms of trade is as damaging as the tendency towards long term decline because it both obscure the entire planning horizon in as far as the long term investment in agriculture is concerned.

3.12.3 Agricultural Terms of trade

Terms of trade are estimated as a ratio of GDP deflator for the agricultural sector on the one side and the deflator on the industrial and non-agric on the other side. The GDP deflator for the agricultural sector is an average measure of the price that farmers receive for their agricultural products. The GDP deflator of the industrial and non-agricultural goods is intended to represent the price that farmers pay for the goods and services they purchase. Alternatively, the GDP deflator for the industrial and non-agricultural goods would show the attractiveness of other productive sectors compared to the agricultural sector. Using 1992 as a base year, we see from figure 3.4 that the terms of trade has exhibited overall decline since the onset of reforms in 1986, though it has maintained a relatively steady path after 1998.

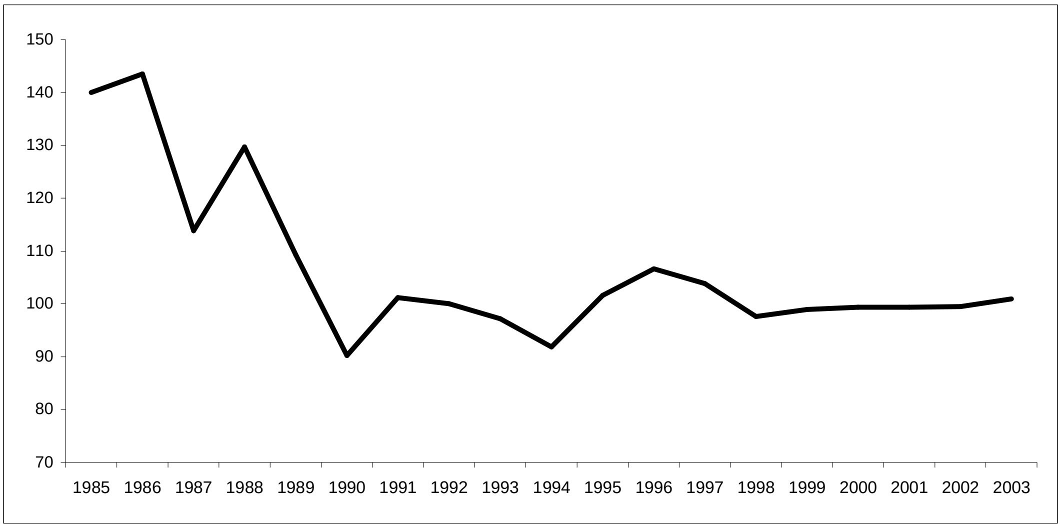

Figure 3.4 Agricultural Terms of trade Index: 1992=100

Source of Data: Economic Survey (2005)

3.12.4 Anti Export Bias

The effect of anti export bias cannot be overemphasized. The available evidence shows that the effective export tax rate increased from 2.4 % in 1972 to 12.3% in 1977, Ndulu, *et al*, (1999). In essence, export taxes were designed to give a bounty to the import substitution industries. However, weak performance of industrial sector meant that the connection between agriculture and industrial sector in terms of forward and backward linkage was somehow fragile. Industrial sector continued to be import dependent with a serious repercussion in draining the foreign exchange that would be required to support the agricultural sector, Bevan, et, *al.*,(1989). This implies that agricultural sector was penalized by inefficiency of the industrial sector. But it is equally plausible to argue that the gloomy performance of industrial sector was also partly attributed to the falling in the terms of trade of agricultural exports. Since Tanzanian import includes spare parts and raw materials for industrial sector, the falling rate of capacity utilization in manufacturing industries may be attributed directly to the foreign exchange scarcity brought about by the falling terms of trade.

3.13 Exogenous Factors

Since the early 1970s, Tanzania has been negatively affected by exogenous shocks. Among the shocks that are commonly cited in the literature are: oil price hikes of 1973 and 1979, falling international price for agricultural exports, drastic cuts in foreign Aid in the early 1980s, and protectionist policies pursued by western countries.[23] But there are some factors, which are worth mentioning because they vehemently dispute the discourse on trade liberalization measures in low-income countries. Although these factors are older in economics literature, they remain valid until today especially in the context of north-south trade theories.

[23] Tanzania’s war with Uganda in 1978 and break up of east African community in 1977 are also cited in the literatures as shocks that aggravated the downturn of the economy.

3.13.1 Low Elasticity of Demand for Primary Commodities.

This factor is shared by almost all agricultural raw material exporters. The issue here is that world demand for primary commodities does seem to be price inelastic. This factor cast a serious doubt on the feasibility of agricultural led export growth as a development strategy. What this factor suggests is that countries that are ambitious to increase their foreign exchange earning by boosting export volumes may simply confront glutted markets, in which falling prices cause their foreign exchange to fall. Figures 3.10-3.13 in the appendix 3.0 show volatility in world prices for agricultural commodities in developing countries. This situation is unlikely to improve in the foreseeable future because of the external policy factors that cause a downward pressure on the price level of agricultural exports continue to prevail. For example, cotton, sisal and sugar compete with polyester, synthetic fibres and sweeteners respectively. It is not an easy task for agricultural raw material exporting economies to alter this type of trade pattern overnight, nor does the trade liberalization package offer any opportunity to change this type of consumption pattern.

3.13.2 Fall in the World Demand for Primary Commodities

In an effort to contain unemployment effects of the productivity slowdown, which were caused by global economic shocks and other macroeconomic disequilibria in the 1970s, industrial countries accommodated those shocks by, among other things, strengthened a number of protectionist measures which include price supports and non-tariff barriers. These policies are one of the reasons for glut in the world market affecting economic fortunes of agricultural dependent economies in at least two ways. First, surplus for agricultural commodities make it difficult for agricultural exporters to enter into the western markets. Second, as argued before, surpluses have resulted into a downward movement in the world price. In particular, Badiane *et al* (2002) estimates that overproduction in developed economies caused by farmers' subsidies, costs African economies $ 250 million a year as a loss in revenue from export.

3.14 Concluding Remarks

In this chapter we have reviewed the performance of the agricultural output, export and import under the alternative trade policy regimes during the last four decades. We have seen that: despite the impressive picture of export performance in the 1990s compared to the 1980s, the prospect is not impressive enough. At the beginning of the third millennium it disappoints to note that the production of coffee, cotton, and sisal are considerably below the volumes recorded in the late 1960s. Even between the 1980s and 1990s, the volumes of coffee and cotton production have not changed much and there are no clear trends for improving agricultural growth over the last thirty years.

Both domestic and world factors are part of the problems and therefore should be part of the solution. Such factors include falling producer prices, agricultural credit crunch, inadequate extension services and local taxation regimes, infrastructure, appreciation of the exchange rate and secular deterioration in the world price. Some of the solutions to these problems (such as producer prices, credit markets, taxation) are within the domain of domestic policy makers, but others such as falling in the world prices are beyond the reach of government policy intervention in Tanzania. The continued discussion on removal of subsidies for farmers in the rich countries currently ongoing at WTO would perhaps provide such a solution.

3.15 APPENDIX 3.0

Table 3.1 Composition of Exports as a Percentage of Total Export

	1967-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-99	2000-02[24]
Traditional Exports	**52**	**53**	**62**	**57.7**	**60.0**	**58.6**	**57.3**	**32.23**
Coffee	15	16	32	26.7	32.0	20.3	16.7	7.96
Cotton	15	14	11	13.5	15.5	19.6	11.8	4.4
Sisal	10	10	7	4.1	1.3	0.7	1.1	0.8
Tobacco	3	4	4	5.4	4.6	6.3	4.3	3.96
Tea	3	3	4	3.7	3.4	4.7	7.8	5.53
Cashewnuts	6	6	4	4.3	3.1	7.0	15.6	8.4
Other merchandize exports	**48**	**47**	**62**	**42.3**	**40.0**	**41.4**	**42.7**	**67.77**

Source: Own computation using World Bank (1994), Bureau of Statistics in Tanzania

[24] Data for 2000-02 are taken from Tanzania statistical abstract published by the IMF

Table 3.2 Export Volume (000'metric tons) and value in 1000 US Dollar at 2000 prices

		Coffee		Cotton		Cashewnuts		Tobacco		Tea		Sisal	
		Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value
1967-70	Mean	47.34	35.88	60.28	100.48	85.60	16.80	5.74	12.17	7.02	15.72	196.12	348.49
	Std.Dev	24.94	4.17	2.55	8.14	5.01	2.44	1.20	2.64	5.91	0.97	19.55	39.72
1971-75	Mean	49.20	52.25	53.93	134.54	121.62	26.34	8.42	24.35	9.431	20.48	123.95	501.15
	Std.Dev	10.39	14.20	9.70	34.23	8.80	5.15	2.25	9.45	7.12	4.93	29.67	269.96
1976-80	Mean	49.87	160.90	41.52	165.37	47.02	16.64	11.33	47.66	13.44	46.57	72.81	416.95
	Std.Dev	5.45	30.68	11.06	33.73	25.95	5.91	3.00	13.44	1.49	8.38	15.90	22.21
1981-85	Mean	51.57	129.71	35.16	150.46	22.11	16.40	8.28	32.52	12.98	48.99	35.04	243.03
	Std.Dev	6.36	15.22	7.99	56.13	9.18	12.01	2.84	8.01	2.38	7.93	17.16	156.89
1986-90	Mean	48.61	117.69	45.51	174.89	25.34	10.94	7.89	30.55	12.26	40.77	11.25	63.84
	Std.Dev	8.34	43.20	8.58	52.78	23.36	7.35	4.60	3.62	1.51	7.57	3.99	11.68
1991-95	Mean	49.40	93.64	60.70	262.33	44.21	35.23	13.15	48.82	20.20	71.08	6.43	53.34
	Std.Dev	7943	30.92	13.56	63.13	24.58	20.35	3.64	10.04	1.68	21.93	2.99	27.42
1996-00	Mean	48.02	115.22	46.68	198.95	110.88	111.40	26.10	129.38	21.53	83.24	12.10	113.43
	Std.Dev	9.66	18.93	26.88	117.16	28.38	35.58	6.82	29.63	1.33	19.76	1.99	30.13
2001-04	Mean	42.42	47.19	37.03	102.55	81.39	53.77	25.27	105.03	23.12	71.82	12.97	99.47
	Std.Dev	5.77	11.22	8.36	32.15	11.01	11.91	5.69	17.88	1.62	8.17	7.96	7.00

Source: Own Computation using FAOSTAT (2005)

Table 3.3 Production of Tradable Food Crops in ('000 Metric tons)

		Maize	Rice	Wheat	Sugar cane	Pulses (total)
1967-1970	Mean	606.75	117.92	44.28	1048.54	171.49
	Standard Deviation	113.59	13.23	92.55	89.16	88.86
1971-1975	Mean	871.00	229.40	76.80	1157.32	191.55
	Standard Deviation	293.25	539.51	11.86	31.94	188.96
1976-1980	Mean	1604.80	320.00	73.20	1441.40	287.51
	Standard Deviation	137.18	484.92	14.98	194.35	51.19
1981-1985	Mean	1835.20	330.46	76.40	1348.00	377.82
	Standard Deviation	1897.45	83.00	13.72	78.86	54.59
1986-1990	Mean	2496.40	653.23	84.52	1282.00	405.60
	Standard Deviation	362.85	78.14	15.91	47.12	63.93
1991-1995	Mean	2374.72	578.94	68.26	1390.40	350.60
	Standard Deviation	286.66	104.83	11.03	68.60	50.43
1996-2000	Mean	2433.37	753.26	89.20	1254.96	424.80
	Standard Deviation	348.59	117.22	13.13	156.95	36.22
2001-2004	Mean	2795.00	621.04	77.88	1812.50	460.12
	Standard Deviation	298.20	73.346	7.76	239.35	13.02
2001-2004	Mean	2795.00	621.04	77.88	1812.50	460.12
	Standard Deviation	298.20	73.346	7.76	239.35	13.02

Source: Own computation and FAO STAT (2005)

Table 3.4A Trends in Real Producer Prices Indices 1970-1980

	Coffee	Cotton	Cashewnuts	Tobacco flu cured	Tobacco fire cured	Tea
1970	100.00	100.00	100.00	100.00	100.00	100.00
1971	89.13	95.27	99.01	97.32	97.32	99.01
1972	92.60	96.15	96.15	114.96	114.96	100.33
1973	84.65	86.41	84.03	107.66	107.66	87.69
1974	71.95	69.65	67.11	86.64	86.64	80.25
1975	51.64	68.27	56.88	68.80	68.80	60.08
1976	125.46	81.11	52.21	77.44	33.19	63.94
1977	112.25	76.39	48.94	73.25	44.54	79.21
1978	68.24	73.55	42.84	61.33	43.10	110.54
1979	48.18	65.06	53.68	51.99	36.53	93.70
1980	51.11	68.53	47.89	52.10	37.00	78.96

Source: Author computation Using Data from Tanzania Economic Surveys (various years)

Table 3.4B Producer Prices at 1992 prices

	Coffee	Cotton	Tea	Cashewnuts	Tobacco
1984	10.80	8.50	7.00	5.30	6.90
1985	13.30	11.80	10.30	7.50	9.60
1986	20.20	17.90	12.30	7.80	15.30
1987	22.30	23.90	19.00	13.70	19.50
1988	29.70	27.60	24.80	22.70	24.60
1989	41.20	31.50	33.50	30.40	29.80
1990	65.60	39.90	42.50	64.30	36.30
1991	69.20	58.30	70.00	83.10	44.30
1992	100.00	100.00	100.00	100.00	100.00
1993	134.30	82.40	100.00	114.60	94.10
1994	449.40	114.30	112.50	153.70	135.40
1995	945.70	171.40	125.00	253.60	214.90
1996	626.00	285.70	137.50	292.00	224.60
1997	679.20	240.00	137.50	230.50	268.60
1998	850.00	185.00	137.50	330.00	454.00
1999	900.00	200.00	137.50	460.00	566.00
2000	840.00	123.00	137.50	600.00	550.00
2001	600.00	180.00	165.00	250.00	428.00
2002	450.00	165.00	165.00	300.00	547.00
2003	500.00	180.00	170.00	360.00	680.00
2004	500.00	280.00	180.00	462.00	670.00

Source: World Bank (2002), Economic Surveys in Tanzania

Table 3.5 Imports as % of Merchandize Imports

	1970-1975	1976-80	1980-85	1986-90	1991-95	1996-00	2001-02
Fertilizers	0.99	1.23	0.80	0.79	1.26	1.20	1.05
Food Imports	11.72	9.68	9.84	6.68	4.65	9.82	9.38
Manufacture Imports	74.00	71.59	81.51	83.34	73.75	66.77	67.92
Others	15.11	17.5	7.85	11.22	20.34	22.21	21.65
Total	100	100	100	100	100	100	100

Source: Author's computation, World Bank (2005), Tanzania at the turn of the Century (2001), IMF statistical Abstract, 2004

Table 3.6 The Imports of Food Crops Index ($1000) at 2000 prices.

		Maize	Rice	Wheat	Sugar cane	Pulses (total)
1967-1970	Mean	9.19	3.91	3.65	0.85	12.69
	Standard Deviation	8.50	1.97	1.54	0.18	2.27
1971-1975	Mean	173.02	26.15	13.42	16.46	22.16
	Standard Deviation	192.24	32.88	17.02	11.98	10.93
1976-1980	Mean	115.64	33.05	10.13	13.10	7.46
	Standard Deviation	190.57	30.98	7.04	6.65	1.45
1981-1985	Mean	235.95	54.65	13.78	9.16	15.78
	Standard Deviation	44.28	20.98	3.15	9.09	26.18
1986-1990	Mean	15.20	32.07	2.09	9.21	0.00
	Standard Deviation	16.41	18.88	2.66	3.98	0.00
1991-1995	Mean	84.93	36.57	10.21	17.80	93.88
	Standard Deviation	80.70	10.40	12.00	18.49	129.42
1996-2000	Mean	244.32	73.15	67.99	72.20	159.70
	Standard Deviation	311.59	41.49	28.85	29.89	42.99
2000-2004	Mean	134.96	54.58	145.25	48.09	162.72
	Standard Deviation	62.91	25.76	53.46	8.37	78.84

Source: Own computation and FAO STAT (2005)

Table 3.7 Producer Price to Export Price Ratio

	Coffee	Cotton	Cashew	Tobacco	Tea
1970	0.78	0.26	0.61	0.53	0.08
1971	0.76	0.23	0.73	0.44	0.08
1972	0.74	0.20	0.68	0.54	0.08
1973	0.66	0.20	0.71	0.56	0.08
1974	0.63	0.11	0.53	0.48	0.08
1975	0.63	0.18	0.57	0.41	0.07
1976	0.68	0.17	0.53	0.18	0.06
1977	0.36	0.15	0.44	0.25	0.06
1978	0.43	0.26	0.32	0.26	0.13
1979	0.32	0.19	0.34	0.24	0.14
1980	0.42	0.24	0.27	0.52	0.11
1981	0.64	0.22	0.27	0.47	0.14
1982	0.71	0.28	0.97	0.44	0.10
1983	0.53	0.27	0.72	0.48	0.10
1984	0.54	0.23	0.70	0.39	0.09
1985	0.63	0.36	1.15	0.52	0.11
1986	0.38	0.41	0.43	0.40	0.09
1987	0.35	0.25	0.25	0.32	0.06
1988	0.27	0.13	0.31	0.25	0.05
1989	0.29	0.12	0.34	0.22	0.05
1990	0.56	0.09	0.48	0.20	0.05
1991	0.59	0.13	0.57	0.19	0.06
1992	0.60	0.17	0.60	0.25	0.08
1993	0.48	0.12	0.40	0.33	0.06
1994	0.58	0.09	0.50	0.37	0.05
1995	0.64	0.12	0.68	0.39	0.08
1996	0.60	0.22	0.85	0.40	0.09
1997	0.52	0.18	0.67	0.43	0.06
1998	0.35	0.17	0.60	0.27	0.05
1999	0.50	0.19	0.83	0.27	0.04
2000	0.58	0.16	0.79	0.28	0.07

2001	0.57	0.17	0.63	0.34	0.05
2002	0.58	0.19	0.56	0.32	0.07
2003	0.60	0.19	0.63	0.38	0.06
2004	0.57	0.28	0.77	0.45	0.06

Source: Author's Computation, using Data from Economic Surveys in Tanzania

Table 3.8 Parametric Test: Paired Sample t-Test

	Mean	Std.Deviation	Std.Error Mean	95 Confidence Interval		t-statistic	Sig. (2-tailed)
				Upper	Lower		
Cashewnuts9403-7483	.22602	.38111	.12052	-.49864	.04661	-1.875	.093
Cashewnuts9403-8493	.05633	.44750	.14151	-.37646	.26379	-.398	.700
Coffee9403-7483	.00578	.30993	.09801	-.22749	.21593	-.059	.954
Coffee9403-8493	-.00764	.29655	.09378	-.20451	.21978	.081	.937
Cotton9403-7483	.10279	.67851	.21456	-.58817	.38259	-.479	.643
Cotton9403-8493	.00648	.63141	.19967	-.44520	.45817	.032	.975
Tea9403-7483	-.00763	.16818	.05318	-.11268	.12794	.143	.889
Tea9403-8493	-.03098	.08470	.02678	-.02961	.09157	1.157	.277
Tobacco9403-7483	.02081	.27050	.08554	-.21431	.17269	-.243	.813
Tobacco9403-8493	-.07849	.37404	.11828	-.18908	.34607	.664	.524
Maize9403-7483	-.05707	.30648	.09692	-.16217	.27632	.589	.570
Maize9403-8493	-.01083	.29167	.09224	-.19782	.21948	.117	.909
Paddy9403-7483	-.02079	.21686	.06858	-.13435	.17592	.303	.769
Paddy9403-8493	-.06037	.40279	.12737	-.22776	.34851	.474	.647
Wheat9403-7483	.02685	.27680	.08753	-.22487	.17116	-.307	.766
Wheat9403-8493	.04636	.26834	.08486	-.23832	.14560	-.546	.598

Table 3.9 Wilcoxon signed-rank test

	Test statistic	Asymp. Sig. (2-tailed)
Cashewnuts9403 - 7483	-1.580	.114
Cashewnuts9403 -8493	-.663	.508
Coffee9403 - 7483	-.153	.878
Coffee9403 - 8493	-.051	.959
Cotton9403 - 7483	-.255	.799
Cotton9403 - 8493	-.255	.799
Tea9403 -7483	-.051	.959
Tea9403 -8493	-.866	.386
Tobacco9403 -7483	-.153	.878
Tobacco9403 - 8493	-1.274	.203
Maize9403 - 7483	-.663	.508
Maize9403 - 8493	-.051	.959
Paddy9403 - 7483	-.459	.646
Paddy9403 - 8493	-.968	.333
Wheat9403 -7483	-.663	.508
Wheat9403 -8493	-.764	.445

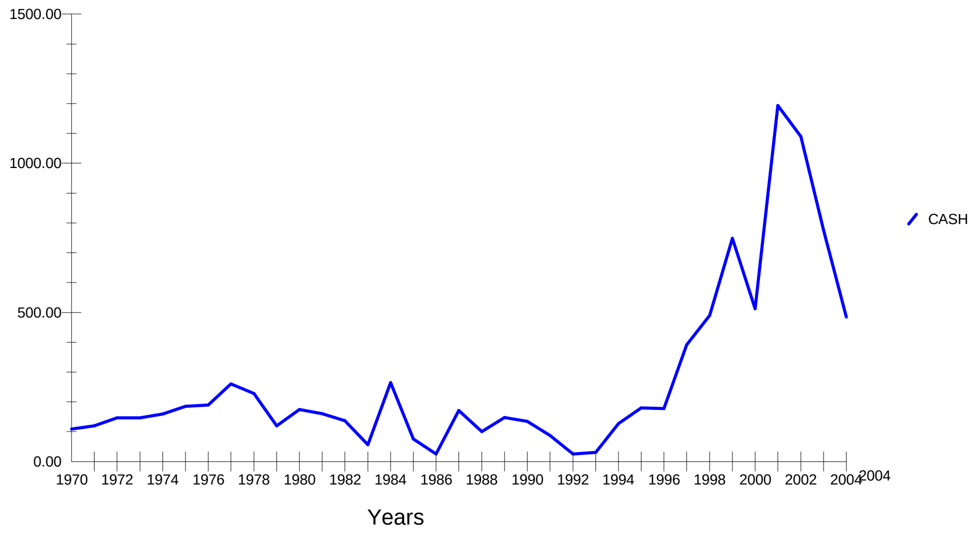

Figure 3.5 Cashewnuts Export Earnings in US$: (2000=100)

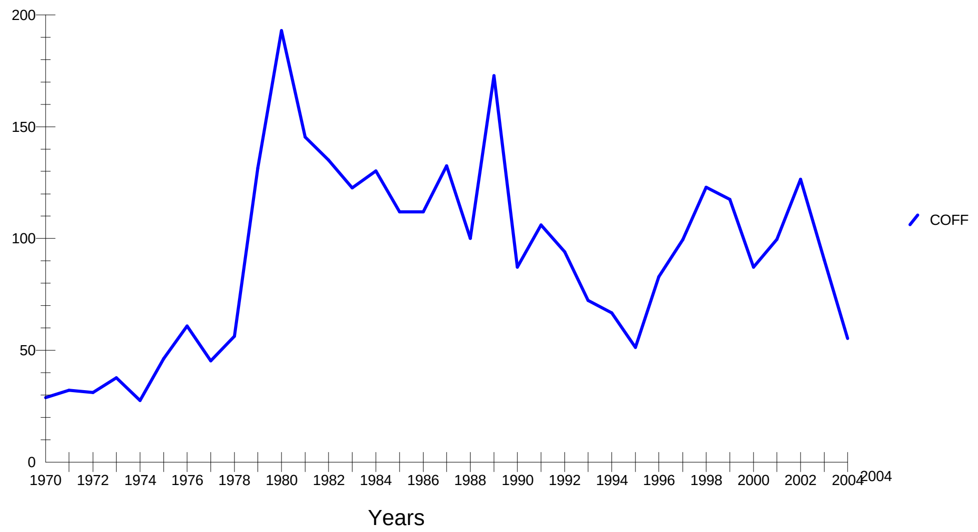

Figure 3.6 Coffee Export Earnings in US$: (2000=100)

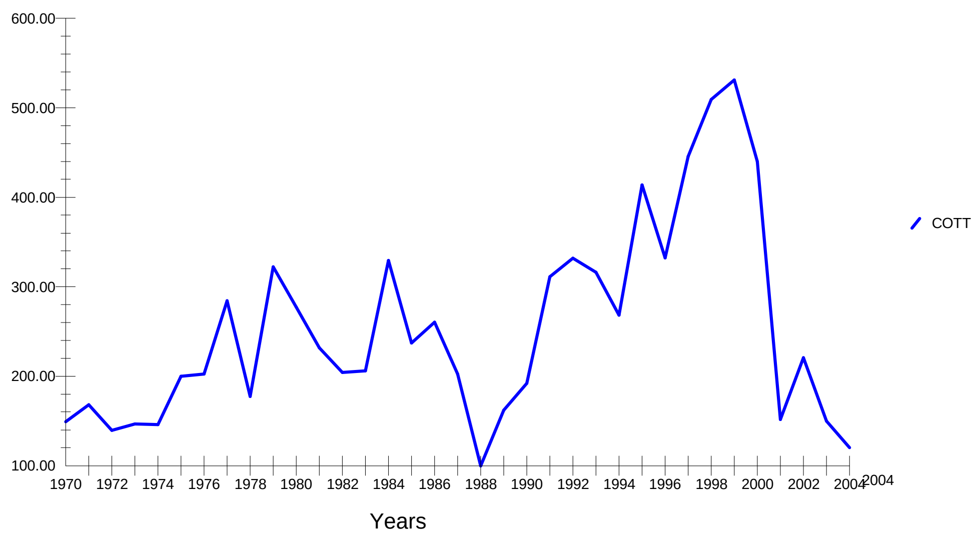

Figure 3.7 Cotton Export Earnings in US$: (2000=100)

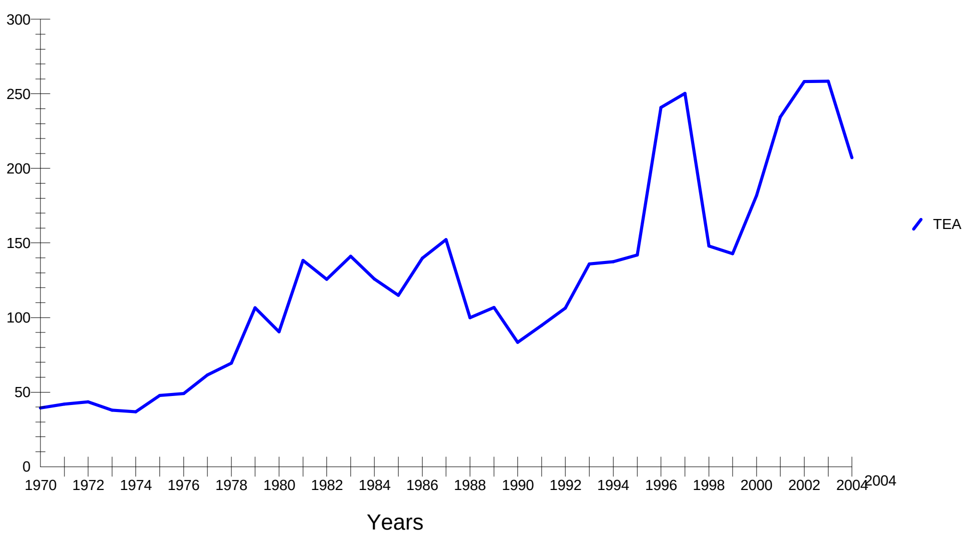

Figure 3.8 Tea Export Earnings in US$: (2000=100)

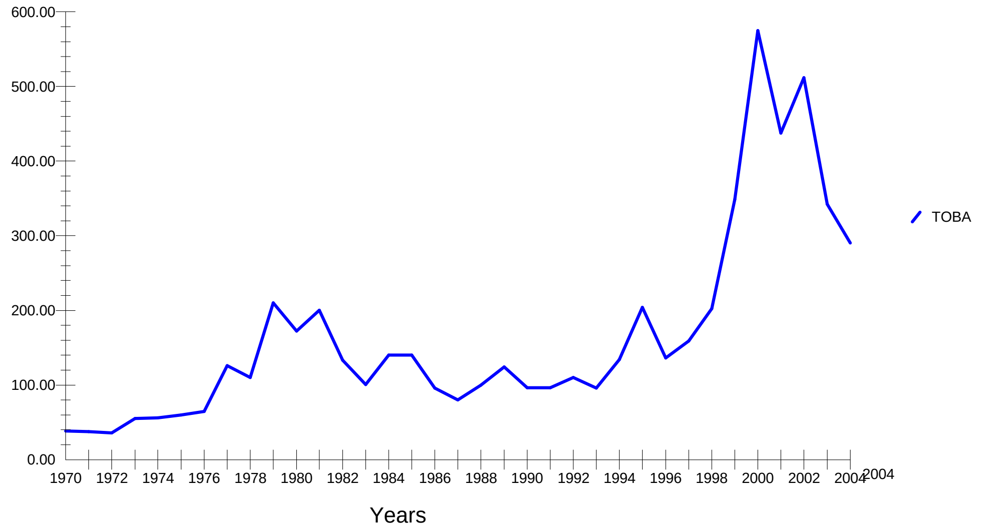

Figure 3.9 Tobacco Export Earnings in US$: (2000=100)

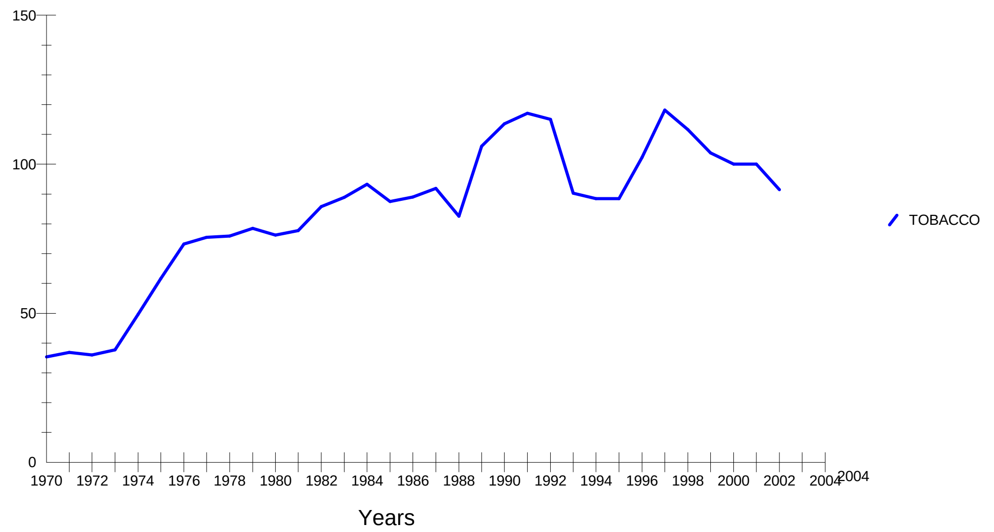

Figure 3.10: World Price for Tobacco in 2000US$

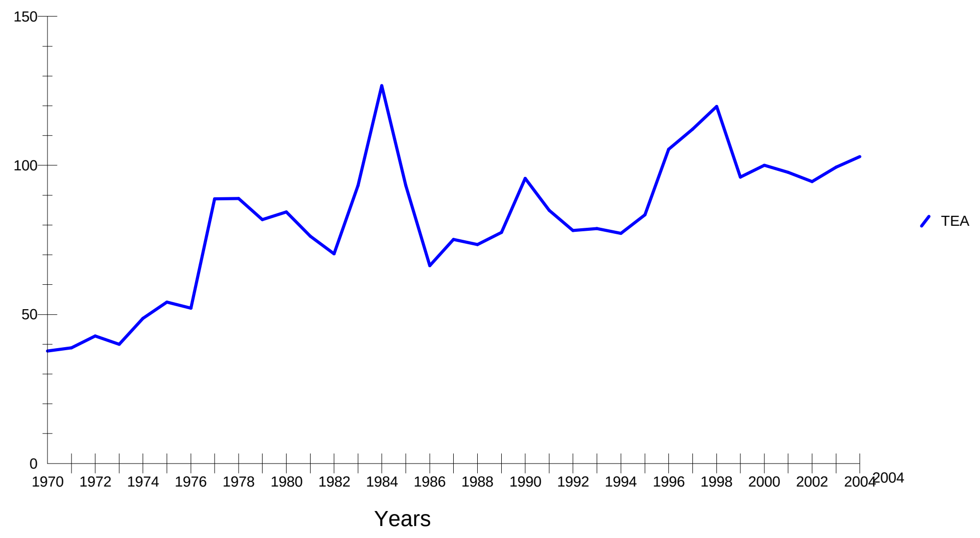

Figure 3.11: World Price for Tea in 2000US$

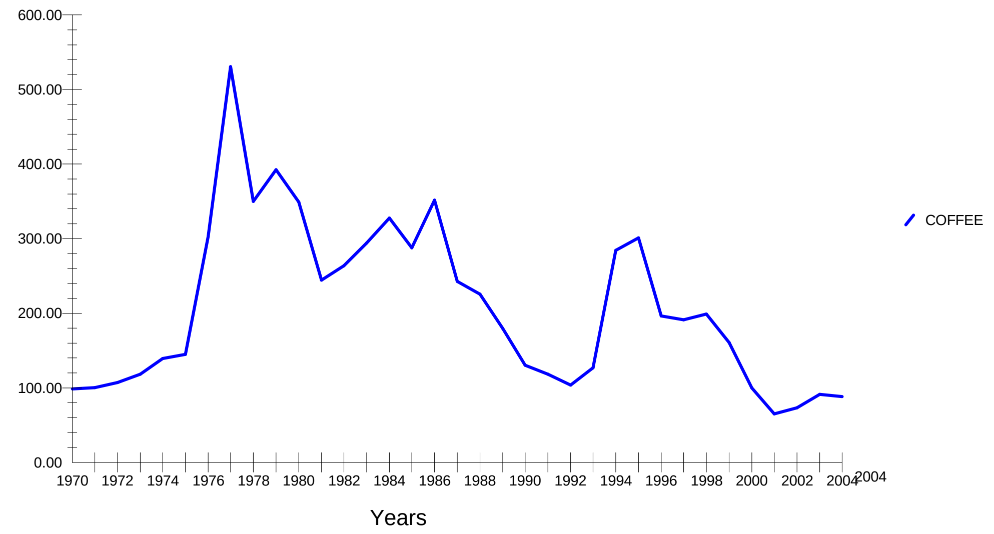

Figure 3.12: World Price for Coffee in 2000US$

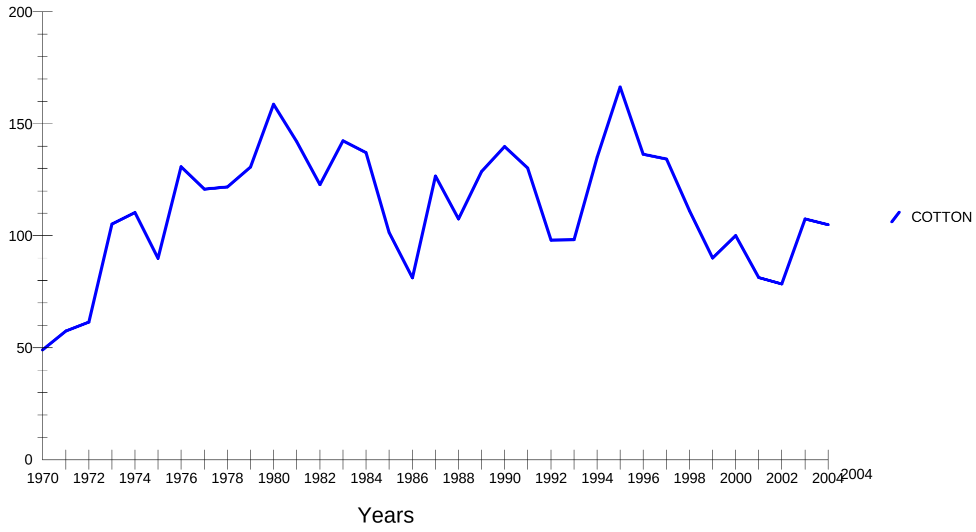

Figure 3.13: World Price for Cotton in 2000US$

CHAPTER FOUR
TRADE LIBERALIZATION AND DIMINISHING RETURNS

4.1 Introduction

This chapter examines the impact of trade liberalization on returns to land (i.e., land productivity) over the last thirty years. It is motivated by the broader research question on the effectiveness of "economic liberalization" on agricultural productivity, which has thus far, produced inconsistency statements in Tanzania. In particular, while a study by the World Bank (2001) for example contends that the economic reforms initiated in the 1990s have reversed the declining trend of agricultural productivity[25], Skarstein (2005) criticizes strongly the World Bank study arguing that economic liberalization has failed to generate productivity growth. Specifically, while the growth rate of labour productivity in maize production measured in kilograms per economically active person in agriculture during the 1976-86 was positive (0.66%), it registered negative (-1.94%) during the 1986-98, Skarstein (2005).

More recently, Baffes (2005, 2004a, 2004b), Danielson (2002), Cooksey (2003), Mitchell and Baffes (2002) and Sen (2005) have failed to establish the positive evidence on the efficacy of structural adjustment policies on agriculture.[26] Yet, it is also even more perplexing to note that some of the earlier studies in Tanzania by Ellis (1982, 1983) and Lofchie (1978) argued that government intervention in the agriculture during the 1970s was plagued by colossal failures, resulting into substantial deterioration in productivity. These observations raise two important questions. First, what has been the trend in productivity of arable land used for the cultivation of traditional export crops over the last thirty years? Second, has trade liberalization altered the trend in the productivity of arable land? The second question is especially important as it fits in reasonably well with the theoretical foundation behind trade

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[25] According to World Bank (2001, p.23), during the 1970s, Tanzania experienced a decline in productivity to 0.3 from 1.2 percent recorded in the 1960s. This was followed by a further decline in productivity in the 1980s in which negative rates of growth were registered. Among many other reasons, poor macroeconomic policies remain key.

[26] Trade liberalization is a subset of structural adjustment policies.

policy reforms under the aegis of IMF/World Bank policies. The presumption behind trade liberalization is that specialization according to comparative advantage would inevitably enhance increased productivity. In the light of the second question, is there any evidence, which support the above-mentioned theoretical presumption in the case of Tanzania?

The specific objectives of this chapter are two fold. First, we use both time series and panel data spanning over the last thirty years to test the hypothesis that land productivity is positively correlated with trade policy reforms. Second, we test the hypothesis that land productivity is negatively correlated with the area under cultivation. The definition of land productivity adopted in this chapter is identical with output per hectare. Aside from being a satisfactory measure of relative economic efficiency, there are at least two reasons why this chapter focuses on land productivity rather than other types of agricultural productivity such as labour and total factor. First, data limitation (e.g., distribution of labour force in the production of individual crops) has prevented us to pursue empirical analysis beyond land productivity. Second, the theoretical justification on which trade liberalization policies originate would tend to suggest that low-income countries are efficient in land-based activities. Hence, besides data considerations, the theoretical underpinning provides adequate rationale for carrying out this analysis. Third, since more than 80% of Tanzanians are predominantly small farmers whose livelihood hinges on land based activities, the question of trade liberalization versus land productivity becomes paramount.

The empirical analysis emerging from this chapter strongly support the presence of diminishing returns to land. On the other hand, the impact of trade liberalization on land productivity is mixed—in some crops its impact is negative and significant, in other crops the impact is positive though not significant. These results, *inter alia*, are supported by the fact that Tanzanian agricultural sector is characterized by backward technology, low use of modern inputs and poor linkages with other domestic sectors. Clearly, failure to achieve productivity growth stems from the fact that expansion of agricultural production has been ushered in by the extension of the land under cultivation using the primitive techniques of production.

On the policy front, the contribution of this chapter has wider implications in the development discourse. First, trade liberalization policies are counterproductive unless diminishing returns to land is squarely addressed. This calls for renewed intervention in the agricultural sector in order to ameliorate the accessibility of farming inputs, credit market, production technology and reliable output market. Secondly, the existence of diminishing returns to land contradicts a simple prediction of the theory of comparative advantage. Third, diminishing returns means that as production increases with international specialization, every additional unit of commodity produced would be more expensive to produce. Fourth, the persistence of diminishing returns to land is incompatible with poverty reduction. Arguably, without addressing diminishing returns in Tanzanian agriculture, poverty is likely to remain unabated.

The remainder of this chapter is structured as follows. In section 4.2, we review both theoretical and empirical literature on agricultural productivity and identify the existing gaps. In section 4.3, we specify an econometric model and types of variables that are used in the empirical analysis. In section 4.4, we report the estimated results. The discussion of econometric results is presented in section 4.5. The last section concludes.

4.2 Literature Review

The conventional theories of trade as documented in Ricardo and Heckscher-Ohlin frameworks posit that specialization according to countries' comparative advantages would result into the gains from trade—gains from efficient allocation of resources (i.e, comparative cost) and productivity. In the comparative cost theory, specialization implies a movement along a static production possibility frontier constructed on the given levels of resources and technology. In a country like Tanzania endowed with a vast piece of unutilized land and plenty of unskilled labour, specialization in primary commodities would appear to be plausibly consistent with the prediction of the theories of comparative advantages since the opportunity cost of labour working in agriculture is very small.

In contrast, productivity gains view international trade as a dynamic force, which, by widening the division of labour raises the skills and dexterity of the workforce, encourage innovations, overcome technical indivisibilities and generally enables the trading country to enjoy increasing returns (Young, 1928). It is argued that increasing productivity following specialization and removal of trade barriers are essential for capital investment in agriculture and for the steady release of surplus capital and labour to other sectors of the economy. The gains in terms of comparative cost is known as direct gains while the gains in terms of productivity increase is usually referred to as an indirect gain (Mint, 1958). Adam smith as cited by (Mint, 1958) also referred to the benefits of expanded markets and the vent for surplus production capacity, which would have been underutilized in the absence of international trade.

In the context of trade liberalization, an economic theory illustrates that trade distortion depresses the domestic price of tradables (traditional export crops), which cause inefficient allocation of resources as labour and capital are pulled into non-tradable sector. It follows therefore that removal of trade barriers and other forms of distortions are expected to create double gains. The first one is the efficiency gain largely arising from the reversal of the adverse resource pull mentioned above. The second one is a distributional gain, ensuing from the rise in farm gate prices.

However, one of the gravest shortcomings embedded in these conventional trade theories is that their predictions are driven by the assumptions of constant returns to scale and perfect competition. In the real world however, productions of goods are characterized by imperfect competition and non-constant returns to scale, (Helpman and Krugman, 1985). And it is precisely because of the flaws documented in these traditional trade theories that new trade theories based on increasing returns to scale were formulated beginning the 1970s. Even though, it is argued that in the case of land-based economies, whose productions are subjected to decreasing return to scales, new trade theories based on increasing returns are inappropriate (Reinert, 1996, 2004). In short, the expansion of production in underdeveloped countries involves a simpler process based on decreasing returns to scale and rigid combination of factors. Consequently, as more land is devoted to agricultural production less and less output per hectare is obtained. This phenomenon is dubbed in the literature as "inverse relationship" hypothesis.

On the empirical front, the concept of inverse relationship between land productivity and farm size has been explored extensively (Srinivasan, 1972; Bardhan, 1973; Bhalla, 1974; Carter, 1984; Bhalla and Roy, 1988; Benjamini, 1995; Heltberg, 1996; Byringiro, and Readon, 1996; Doward, 1999; Kimhi, 2006). However, what is missing is that none of the previous empirical literature has tried to link it with liberalization policies. Besides, most studies are cross section in nature—comparing the efficiency between small versus large farms. Yet, another problem with most of the previous studies is that the interpretation of the nexus between land productivity and the area under cultivation is not always straightforward. In particular, aside from the existence of diminishing returns to land, the negative relationship between land productivity and the area under cultivation could be linked to labour dualism and imperfection in credit markets (Sen, 1966). The presumption behind labour dualism is that farmers may choose to offer their labour in either large capitalist farms in return for wage or remain in non-wage family employment. The labour cost that arises from the wage gap between the family and wage employment causes lower level of output per acre in capitalist farms compared to peasant farms (Bhalla and Roy, 1988; Sen, 1966).

Certainly, while the theory of labour dualism provides an appealing intuition in explaining productivity differential between small and large farms, it nevertheless, remains silent in elucidating the productivity path from small farms to large farms; the natural tendency behind the law of diminishing returns. Indeed, since the vast majority of farmers in Tanzania are predominantly small holders who account for more than 80% of total agricultural production, we suspect that labour dualism may not be an important driving force behind the inverse relationship hypothesis. Based on Tanzania household budget survey conducted in 2000/01, smallholders who afford to hire casual workers in rural sector declined from 2.0% in 1991/92 to 1.0% in 2000/01. On the contrary, the statistics for unpaid family workers rose from 1.1% to 7.5% over the same period (NBS, 2002).

Imperfection in credit markets, on the other hand, means that small farmers without access to credits cannot purchase modern inputs and adopt new technologies, which constitute crucial ingredients in land productivity (Carter, 1984; Bhalla, 1974). Indeed, one can reasonably argue that imperfection in credit markets has been exacerbated by deregulations of the financial sector whereby the private sector plays a marginal role in terms of supporting the agricultural sector in general, and small farmers in particular. It is, however, not implausible to argue that imperfection in credit markets would serve to reinforce diminishing returns, *pari passu,* rather than being a separate channel as in the case of labour dualism discussed before.

Srinivasan (1972) offered an alternative explanation that attributes the inverse relationship to the optimal response (in terms of input used) of a farmer to a situation of uncertainty relating to yield per hectare due to the vagaries of weather. Even in the absence of imperfections in input markets and of differences in quality of land due to differing irrigation facilities, it may still be optimal for a small farmer to use more inputs per hectare (and hence obtain higher expected yield) than a large farmer, provided all farmers have the same utility function for income that exhibits non-increasing absolute and non-decreasing relative risk aversion as income increases.

A study by Bhalla (1974) in the India's district of Haryana argues that the inverse relationship is likely to diminish once the level of technology, which was lower among the smaller farm size, is taken into account. This observation suggests that the results reported in the previous studies carried out in India were not unbiased. Despite the criticism raised by Bhalla *op cit*, against the previous studies in India, the estimated coefficients reported in his study were large compared to those reported in the previous authors during the pre-green revolution (Saini, 1971, Rani, 1971, Bhattacharya and Saini, 1972).[27] However, Bhalla's study has been criticized on the ground that it was based on non-randomly selected data—the sample selection criteria based on farmer's literacy, which censored 22% of the observations may also lead to biased results.

Using a pooled farm-level data set taken in the Indian state of Haryana during the 1969/70-1971/72, Carter (1984) re-affirmed the negative relationship between per hectare production and hectare under cultivation. Although Intra-village soil quality differences and other farms assets explain part of productivity relationship, per hectare production is still estimated to decline by 20% as farm size doubles, controlling for these factors. The strength of the inverse relationship is intriguing given that the data used were collected during the India's green revolution. In short, a study by Carter (1984) in the state of Haryana in India shows that the inverse relationship between farm size and productivity is neither a reflection of bias resulting from sample selection based on farmer's literacy nor misidentification of village effects (such as soil quality) correlated with farm size.

[27] In another development, Bhalla and Roy (1988) argue that past research may have suffered from a mis-specification problem. More precisely, exclusion of land quality, a variable negatively correlated with farm size results in the coefficient of land being biased downward (see, also Bhalla, 1988).

Eswaran and Kotwal (1986) examine the economies in which labour is subject to supervision problems and land provides better access to credit. They show that because of the increasing marginal cost of *supervision*, the labour to land ratio is smaller for richer farmers, which leads to decreasing output per hectare with respect to farm size. Binswanger and Rosenzweig (1986) posit that imperfect information in labour search results in a positive probability of misallocation of labour. Labour selling household that fail to find casual labour re-allocate the time they had planed for wage labour to work on their own farms up to the point where marginal utility of home production equals marginal utility of leisure. But because household wanted to work, the marginal utility of the wage (and thus production) exceeds that of leisure so some windfall labour goes to home farming. The opposite happens when labour-hiring households who fail to hire casual labour; they fall short of planned labour applications. Just like in the case of labour dualism models, these models (Eswaran and Kotwal (1986) and Binswanger and Rosenzweig (1986)) do not explain the productivity trend from small farms to large farms. In fact, these explanations suggest reducing the size of the farms as a means to boost productivity growth.

Byiringiro and Readorn (1996) examine the effects of farm size, soil erosion, and soil conservation investments on land and labor productivity and allocative efficiency in Rwanda. A number of key results emerged from this study. First, there is a strong inverse relationship between farm size and land productivity, and the opposite for labor productivity. For smaller farms, there is evidence of allocative inefficiency in use of land and labor, probably due to factor market access constraints. Second, farms with greater investment in soil conservation have much better land productivity than average. Third, land productivity benefits substantially from perennial cash crops, and the gains to shifting to cash crops are highest for those with low erosion and high use of fertilizer and organic matter. Consequently, program and policy effort to encourage and enable farmers to make soil conservation investments, to use fertilizer and organic matter, and to participate in cash cropping of perennials will have big payoffs in productivity.

Although a huge part of the empirical literature tends to support the inverse relationship hypothesis, a positive relationship has been observed in other studies. These mixed results are supported by Doward, (1999) who reviewed a number of studies from Africa. According to Doward, *op cit*, a study by Carter and Wiebe (1994) found very high levels of productivity on very smallholdings in Njoro in Kenya, and then a positive relationship between productivity and the size of larger holdings. Indeed, the regression results by Doward (1999) in Malawi found positive relationship between farm size and productivity. According to Doward, the absence of inverse relationship is due to the to fact that larger smallholders are more efficient than those with smaller holdings, because the former are better placed to overcome the credit constraint and hence combine labour with capital.

Kimhi, (2006) examines the relationship between Maize productivity and plot size in Zambia. Among other things, Kimhi accounts for the endogenous determination of plot size devoted to Maize and controls for differences in land quality and weather conditions across districts. Farm decisions are modeled in two recursive stages, where land is first allocated to the different crops based on the information set of the farmers at the time of planting, and the yield is affected by subsequent application of inputs, the quantities of which may depend on additional information that is revealed after planting. When considering plot size as an explanatory variable, his study found a monotonic positive relationship between the yield of Maize and plot size, indicating that economies of scale are dominant throughout the plot size distribution. However, when the endogeneity of plot size is corrected, the study found the inverse relationship to dominate the economies of scale in all plots up to 3 hectares, which constitute 86% of the sample.

In brevity, the literature on the inverse relationship between crop productivity and the area under cultivation is both rich and diverse. Basically, there are two major strands of literature, which support the inverse relationship hypothesis: labour dualism and diminishing returns. However, for the reasons explained earlier, this chapter test the second hypothesis (i.e., diminishing returns). While there have been numerous studies that have explored this kind of relationship in other developing countries, similar studies are scant in Tanzania. This chapter bridges that gap. The novelty of our approach is that we employ time series and panel regressions to explore the question of productivity by looking at individual crops in Tanzanian agricultural sector. Unlike the previous studies, we also add a dummy variable that capture the effect of trade liberalization in our empirical analysis. As a check on the robustness of our results, in addition to the change in producer price index, we employ the ratio of producer price to export price as alternative indicators of liberalization. Moreover, in panel data regressions, we use globalization index (Dreher, 2006), and freedom in international trade (Gwartney, *et al*, 2008) as additional indicators of liberalization.

4.3 Econometric Model

The econometric specification employed under this section is based on a basic regression that has been used by many researchers in different countries, Berry and Cline, (1979); Carter, (1984); Bhalla and Roy, (1988); Benjamin, (1995). It is specified as follows:

$$y_t = \beta_0 + \beta_1 H_t + \beta_2 Libdummy + u_t \quad u_t \sim N(0, \sigma^2) \tag{4.1}$$

Where y_t is the value of output deflated by price index at time t divided by the area under cultivation, H_t is the area under cultivation in the farming season, $Libdummy$ is the liberalization dummy, and u_t is the usual stochastic term.[28] Equation (4.1) assumes that farmers have adjusted to their environment by making the relevant choice and that the exogenous non-choice determinants such as weather are uncorrelated with the area under

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[28] Note that $y_t = \frac{Y_t}{H_t}$, where Y_t is the output and H_t is the area under cultivation in the farming season.

cultivation. The coefficient β_1 is expected to have a negative sign to support the existence of diminishing returns. The effect of trade liberalization will be captured by β_2 .

Before running the regressions, a few comments on the econometric specification are worth emphasizing here. In particular, change in output per hectare (i.e, y_t) can arise from at least three factors. First, difference in cropping pattern; second, differences in crop intensity; and third, differences in yield of various crops. The concern of this study is with the estimation of a reduced form like (3.1) and, hence the composition of y_t, and differences in H due to cropping intensity are ignored. What we are interested in this chapter is the relationship between land productivity and cultivated land. One last, but important comment is that the relationship between y_t and H can never be negative by construction, unless a researcher is using cross section data. In time series/ panel regression, the relationship between y_t and H can take any sign depending on whether both the numerator and denominator in the y_t term are either moving in the same or opposite directions.

4.4 Data and Regression Results

Our main source of data used in this section is FAOSTAT (2005). These data include crop production and the area under cultivation. Crop production data refer to the actual harvested production from the field, excluding harvesting and threshing losses and that part of crop not harvested for any reason. Production therefore includes the quantities of the commodity sold in the market and the quantities consumed or used by the producers. Area under cultivation refers to the area from which a crop is gathered. Area under cultivation, therefore, excludes the area from which, although sown or planted, there was no harvest due to damage, failure, etc (see FAOSTAT, 2005).

Before we proceed, it is worth mentioning a caveat on the timing of trade liberalization. In particular, trade liberalization has been a gradual process in Tanzania. It started in the mid 1980s with the removal of export taxes, import liberalization and currency devaluation. This implies that our regressions must take into account the pace of liberalization. Specifically, our regressions are divided into two categories. The first category looks at the effect of early liberalization of 1986 on the food crop sector. The liberalization dummy takes the value of zero before 1987, and the value of one from that year onward. The second category of regressions explores cash crops. Liberalization of cash crops started in 1993, with the amendment of coffee, cashewnuts, tobacco and cotton "Acts" by parliament, which effectively permitted the participation of private sector in buying, processing and exporting export crops from 1994.[29] Thus, liberalization dummy for cash crops takes the value of zero before 1994 and the value of one from that year onward.

Our observations span from 1970 to 2004. The choice of time frame has been dictated by the availability of data especially producer prices for individual crops which were used to deflate the market value of crop yields in 1986 prices. In addition to the hectares under cultivation and liberalization dummy as our main explanatory variables, we introduce weather dummy and the lagged ratio of export to agricultural GDP (for the case of cash crops) and output of that particular crop to agricultural GDP (for the case of food crops) as additional control variables. Weather dummy takes the value of one for bad weather. Note that export to GDP ratio captures the lagged effect of trade on land productivity. We expect this variable to carry a positive sign. This implies that our empirical specification takes the following form:

$$y_t = \beta_0 + \beta_1 H_t + \beta_2 Libdummy + \beta_3 \left(\frac{Export}{GDP} \right)_{t-1} + \beta_4 Weather + u_t \qquad (4.2)$$

All data were tested for unit root test in order to verify whether they could be represented appropriately as difference process, using the standard Augmented Dickey-Fuller test with and

[29] The timing of this dummy coincides with updated Sachs and Warner openness indicator, Wacziarg and Welch (2008).

without a trend. Majority of variables were found to be non-stationary in levels (see tables 4.2-4.7) and results presented hereafter are based on the first difference.

Our estimation strategy involves first running the regression of productivity (i.e., output per hectare) on the area under cultivation and weather (i.e. column 1), and then we introduce a lagged ratio of export to the agricultural GDP, and liberalization dummies in separate regressions (i.e. columns 2) just to examine the behaviour of β_1 following the addition of those variables. Both log and non-log specifications were estimated. However, non-log specification results performed reasonably better than log specification.[30]

Table 4.8 reports the estimated results for cotton, coffee and tobacco' productivity regressions. Clearly, the null hypotheses of zero coefficients for the area under cultivation in all three crops are rejected. The estimated coefficients of the area under cultivation for individual regressions bear the right signs and are statistically significant at 1% confidence level. As one would expect, the effect of adverse weather conditions carry negative signs, which are not statistically insignificant. The next important coefficient in our regressions is the liberalization dummy, which appears to be negative and statistically significant for coffee productivity regression. In the case of cotton and tobacco, the liberalization dummies are positive but not statistically significant. The estimated coefficients of export to agricultural GDP ratio for cotton and tobacco are both positive and significant. An "F" statistic in table 4.8 indicates that all the coefficients in each of the productivity regressions are jointly significant.

It is also clear from table 4.8 that the predictive power in each regression suggests that column 2 performed better than column 1. The adjusted R^2 for cotton, coffee and tobacco jumped considerably from 42%, 42% and 35% to 52%, 54% and 54% respectively. Moreover, all regressions pass comfortably the Serial correlation and Heteroscedasticity diagnostic tests.

[30] The empirical results based on Log specifications are reported in table 4A, 5A and 6A

The Jacque-Bera Normality statistic based on a test of skewness and kurtosis shows that the residuals are normally distributed. The Ramsey's RESET (i.e., functional form) test that uses the squares of fitted values supports the assumption that the relationship between the dependent and independent variables is linear, and therefore we are using the linear functional forms.

Table 4.9 reports the regression results for tea and cashewnuts. Once again, the null hypotheses of zero coefficients of the area under cultivation are strongly rejected. The estimated coefficients of the area under cultivation strongly support the maintained hypothesis. The coefficient of the liberalization dummy for tea as reported in Table 4.9 is negative and not statistically indistinguishable from zero. The coefficient of the lagged export to GDP ratio is positive for the cases of cashewnuts and tea; it is also not insignificant for the cashewnuts but statistically insignificant for the case of tea. In the case of cashewnuts, a liberalization dummy is positive but not significant. An "F" statistic shows that individual coefficients are jointly significant. Moreover, the regressions are not plagued by serial correlation, Normality, linearity and Heteroscedasticity problems. In the overall, the adjusted R^2 in column 2 for each individual crop (Table 4.9) performs better than column 1.

Tables 4.8 and 4.9 reveal interesting results for one thing. When liberalization dummy is negative and significant, the lagged export /GDP ratio is either positive or negative but not significant. On the other hand, when the lagged export/GDP ratio is both positive and statistically significant, liberalization dummy is either positive or negative but not significant in both cases. What can we infer from this pattern? In the case of coffee, the significant negative sign of the liberalization dummy, among other things, could be linked to the fall in producer prices especially from the late 1990s.[31]In the case of tea, although the share of smallholders in the sector is well above 50%, their contribution to total tea production over the

[31] Note that productivity index is computed as a ratio of farm output deflated by using 1986 prices per hectare.

years has not been significant. Contributing to the decline of tea were low prices, inadequate use of inputs, and declining yields because of a failure to switch to high-yielding clonally varieties. In the case of cashewnuts, an insignificant positive sign of liberalization dummy could be ascribed to increased use of agrochemical provided by cashew input development fund to cashewnuts farmers (Poulton, 1998). As a matter of fact, cashew trees are well suited to grow on poor soils and can produce nuts without inputs. But even so, cashew responds to fertilizer and sulphur dusting.

Table 4.10 shows the regression results for tradable food crops (i.e., rice, maize and wheat). As in the previous regressions, the coefficients of the area under cultivation for the case of wheat, rice and maize are negative and statistically significant at 1% confidence levels. Weather dummies bear the predicted signs and are statistically significant at 5% for the case of wheat and 1% for the case of rice and maize. The liberalization dummy is negative at 10 % confidence level for the case of wheat. In other crops, (i.e., rice and maize) liberalization dummies are statistically insignificant albeit with negative signs. In all three regressions, the goodness of fit as shown by the adjusted R-squared in (column 2) of each crop improved remarkably. Like in the case of cash crops, misspecification test suggest that our results are free from violation of classical linear regression assumptions.

In order to check for the stability of regression coefficients, the CUSUM and CUSUMSQ tests of structural stability proposed by Brown *et al*, (1975) were performed for all regressions. These tests are displayed in two graphs, one giving the plot of CUSUM and the other giving the plot of CUSUMQ. Each graph also displays a pair of straight line drawn at the 5% level of significance. If either of the lines specified is crossed, the null hypothesis that the regression equation is correctly specified must be rejected at the 5% level of significance. The plots given in figures 4.1, 4.2 and 4.3 confirm the stability of regressions coefficients.

4.4.1 Alternative Liberalization Indicators

We next subject our results to alternative liberalization indicators. We first acknowledge that one of the highly controversial issues in trade liberalization debate is how to define the liberalization index (Levine and Renelt, 1992; Edwards, 1998, Hanson and Harrison, 1999; Rodrik 1998; Rodrik and Rodriguez 2000). For example, exchange rate distortion is argued to measure other poor macroeconomic policies. An average tariff is also argued to underestimate the true level of protection especially when it is used simultaneously with quantitative restrictions, Pritchett *et al*. (1994). Despite radical criticisms that have been levelled against the Sachs and Warner (1995) liberalization index (see for example, Rodrik and Rodriguez, 2000), this index is not useful in time series studies.

In spite of the controversies involved in defining liberalization index, Harrison (1996), for example argues that price comparisons between goods sold in the domestic and international markets could provide an ideal measure of the impact of trade policy, particularly in the absence of domestic policy distortions. Direct price comparisons would incorporate the impact of the various policies that affect domestic prices: tariffs, quotas, different exchange rates for imports and exports, and subsidies. The simplest measurements of protection are "price gaps". Amongst those, the most popular measure is the so-called "nominal protection coefficient" defined as the percentage ratio between the domestic price and undistorted price, generally taken to be the border price. Both domestic and border prices are measured in a common currency by using an appropriate exchange rate, Scandizzo, (1989). In conformity with Scandizzo, (1989) and Harrison (1996) among others, we use nominal rate of protection defined as the ratio of producer prices to export (f.o.b) price expressed in the same currency as a measure of export liberalization.[32] In addition, we use change in the producer price index. Change in producer price index is expressed as percent changes, rather than as changes in

[32] There are of course other forms of measuring protection, apart from the NPR, such as the "effective rate of protection" measure. This measure is more precise insofar as it consider the value added but it also require complex data. Therefore, the NPR concept is the most widely used

index points, because the latter are affected by the level of the index in relation to its base period, while the former are not.

We do not hypothesize a *priori* on the sign of price coefficient (i.e, the ratio of producer prices to export (f.o.b) price expressed in the same currency) as the effect of price on productivity is not unambiguous. Fulginiti and Perrin, (1993; 1999) argue that higher price might discourage productivity by making economic agents reluctant to pursue innovation. As a result, it is not surprising to find a negative relationship between price and productivity. On the contrary, higher prices tend to encourage productivity through innovation. In this case, a positive sign is expected. Our empirical specification is specified as follows:

$$y_t = \beta_0 + \beta_1 H_t + \beta_2 \left(\frac{pp}{ep}\right)_{t-1} + \beta_3 \left(\frac{pp}{ep}\right)_{t-1} * Libdummy + \beta_4 \left(\frac{Export}{GDP}\right)_{t-1} + \beta_5 Weather + u_t$$

Note that $\left(\frac{pp}{ep}\right)$ is the ratio of producer price to export price. The term $\left(\frac{pp}{ep}\right) * Libdummy$ is a multiplicative dummy, which is introduced here in order to take into account the effect of policy shifts from controlled price to market-determined price. The intuition here is that such a policy shift might have an impact on the slope of price coefficient. Table 4.11 reports the results for cotton, coffee and tobacco. In the first column of table 4.11, we report regression results assuming that nothing has happened in terms of policy change. In column 2, we introduce separately a multiplicative dummy, which takes into account the effect of a policy change. It is clear from the table that there is not much difference in terms of liberalization coefficients. That is, it does not make significant difference in terms of results whether one uses price ratio or a multiplicative dummy. The same snapshot is replicated in table 4.12, 4.13, 4.14 and 4.15. These results are to some extent not contradictory with McKay, Morrissey, and Vaillant (1999) who argued that the potential for agricultural sector response to liberalization of agricultural prices and marketing in Tanzania might be quite significant, though *not* for the production of traditional export crops such as coffee, tea, and cotton.

A closer inspection in the specification tests in table 4.11 up to 4.15 show that our regressions do not suffer from serial correlation, normality, linearity and Heteroscedasticity problems. The "F" statistic supports the hypothesis that all explanatory variables in each regression are jointly significantly from zero. In addition, we also note that the difference in predictive power between column 1 and 2 is not non-trivial. The striking feature from these results is that they are generally not in conflict with our earlier results (i.e., tables 4.8, 4.9, 4.10). In particular, it is interesting to note that the estimated coefficients have typically maintained the same pattern in terms of signs and level of significance, suggesting that our earlier results were not driven by the definition of liberalization dummy. And since, price liberalization is one of the major hallmarks of trade liberalization policies, the empirical results emanating from this study casts further doubt on the efficacy of price mechanism on the allocation of resources in the economy.

The fact that producer prices provide insignificant results has also been a matter of intense debate in developing countries, Maurice and Montenegro (1997). In contrast to the orthodox economic theory, some authors (e.g., Bond, 1983) have exhibited misgivings on the efficacy of price mechanism especially in sub-Saharan Africa for at least three reasons. First, subsistence sector is assumed to be risky averse activity and farmers may value leisure rather than production. Indeed, the correlation between producer prices and output offers little clue on the farmer's production choice between food and cash crops, and between wage work and work on one's farm. Second, farmers are assumed to have income targets. Consequently, if producer prices are increased, the production of smaller amount of commodity's output may provide the necessary income. As a result, there is a perverse response of producer prices to supply response, which result in a backward sloping supply curve, Bond (1983). Third, the extent of price transmission may be limited by a number of factors including transport costs and other costs of distribution; the extent of competition between traders, the functioning of markets, infrastructure, domestic taxes and regulations.

Moreover, price transmission is likely to be particularly ineffective for poor people living in remote rural areas and in extreme instances producers or consumers can be completely insulated from changes taking place at the border—i.e. goods cease to be tradable. Stephan Goetz (1992) reports that high fixed transport costs prevent some households from trading in many parts of sub-Saharan Africa. Nicholas Minot (1998) found in Rwanda in the early 1980s that changes in relative prices at the border had little effect on predominantly rural low-income households because of their isolation from the cash economy. This presumably reflects their physical isolation, which curtails their ability to gain from trade and trade liberalization, and thus reduces the level of their income significantly.

A study by López, *et al* (1995) in Mexico found that farmers with low levels of capital inputs were less responsive to price incentives than those with higher levels. Heltberg and Tarp (2002) obtained similar results for Mozambique. Gilbert (2003) examines the liberalization of international commodity trade with specific reference to the West African Cocoa Producers, in the sense that producers face world price rather than domestic prices. It is shown that producer prices have tended to rise as a share of FOB prices as intermediation costs and tax has declined. However, in conjunction with inelastic demand, the downward shift of aggregate supply curve resulted in lower world prices. Farmers therefore get a higher share of lower price. The incidence of the liberalization benefits in cocoa is largely on developed country consumers at the expenses of the governments of the exporting countries and farmers in liberalizing (non-African) countries. Farmers in liberalized African markets are broadly neither better nor worse off.

In the context of Tanzania, a study by Kilima (2006) investigated pass-through effects of price shocks from the world market (a proxy for export price) to specific domestic commodity prices for sugar, cotton, wheat and rice in Tanzania. As part of estimation technique, both Co-integration and Granger causality were utilized by Kilima (2006) to test for price linkages. The co-integration results for sugar, cotton, wheat, and rice showed that the Cost Insurance and Freight (CIF)/Free on Board (FOB) prices in Tanzania are not well integrated with the world market prices. Granger-causality tests, however, unveiled the existence of a unidirectional causality—commodity prices in the world market Granger-caused prices in Tanzania. The cointegration results imply that commodity prices in the world market and local markets in Tanzania are not synchronized. Although some shocks from the world market passed through to Tanzania as suggested by the Granger causality test lack of cointegration may be attributed to cumbersome of export procedures and internal taxes, Kilima (2006) and lengthy supply chain from the farm gate to the export market.

Nonetheless, our empirical results should be interpreted with great caution. These results should not be construed to suggest that land productivity is unresponsive to price because they do not say anything about the *long run* impact of price change on productivity growth. One reason why the producer prices display insignificant results could be that land productivity is not sensitive to short-term changes in the ratio of producer price to export price. Another reason why land productivity is not responsive to price change could be connected to the choice of price variable. For example, if farmers for whatever reasons formulate their price expectation using relative prices between different crops and yet the ratio of producer price to export price is used in estimation, the conclusion that land productivity is not responsive to prices is flawed. Lastly, the existence of ineffective price transmission mechanism between producer price and the export price due length supply chain and other distortions could as well be the source of insignificant results.

4.4.2 Panel Data Analysis

So far, our empirical analyses have relied on time series data. However, a more appealing analysis would involve the use of panel data. By blending the inter-crop differences and intra-crop dynamics, panel data have several advantages over time-series data. First, panel data usually contain more degrees of freedom and more sample variability than time series data which is a panel with N = 1, hence improving the efficiency of econometric estimates (Hsiao, *et al*., 1993; Hsiao, 2005). Second, panel data has a greater capacity for capturing the complexity of crops behavior than a single time series data. It is frequently argued that the reason that a researcher finds or does not find certain causal effects in econometric analysis is due to omission of certain variables in one's model specification which are correlated with the included explanatory variables. However, since panel data contain information on both the inter-temporal dynamics and the individuality of the entities, it is capable of controlling the effects of missing or unobserved variables.

Indeed, Hsiao (1993) argues that panel data generates more accurate predictions for individual outcomes by pooling the data rather than generating predictions of individual outcomes using the data on the individual in question. If individual behaviors are similar conditional on certain variables, panel data provide the possibility of learning an individual's behavior by observing the behavior of others. Thus, it is possible to obtain a more accurate description of an individual's behavior by supplementing observations of the individual in question with data on other individuals. There are a number of techniques, which are used to estimate panel data regressions, Green, (2003); Wooldridge, (2002). In a panel framework, equation 4.1 is re-written as follows:

$$y_{i,t} = \beta_0 + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad i = 1,...,N; t = 1,...,T \qquad (4.3)$$

$$E(\eta_i) = E(\varepsilon_{it}) = E(\eta_i \varepsilon_{it}) = 0$$

Where, $y_{i,t}$ is a vector of dependent variables (i.e., output per hectare in our case), $X_{i,t}$ is a vector of explanatory variables, η_i stands for an unobserved crop-specific effect, $\varepsilon_{i,t}$ is the disturbance term, and subscripts i and t represent crop and time period respectively. The above equation could be written as follows:

$$\bar{y}_i = \beta_0 + \beta^{'} \bar{X}_i + \eta_i + \bar{\varepsilon}_i \qquad (4.4)$$

Where $\bar{y}_i = \frac{\sum_t y_{i,t}}{T_i}$, $\bar{X}_i = \frac{\sum_t X_{i,t}}{T_i}$ and $\bar{\varepsilon}_i = \frac{\sum_t \varepsilon_{i,t}}{T_i}$. Subtracting (4.4) from (4.3) yields:

$$(y_{i,t} - \bar{y}_i) = \beta^{'} (X_{i,t} - \bar{X}_i) + (\varepsilon_{i,t} - \bar{\varepsilon}_i) \qquad (4.5)$$

These two equations (i.e. 4.4 and 4.5) provide the basis for estimating β. In particular, equation 4.4 is known as the “between estimator”. The “between effect” regression is used to control for omitted variables that change over time but are constant between cases. It permits the researcher to use the variation between cases to estimate the effect of the omitted independent variables on the dependent variable. The other technique used to estimate β is called the “random effects estimator”, which is essentially a matrix of a weighted average of the estimate produced by the between and within estimators. Equation 4.5 is known as the “fixed effects estimator” (within estimator). The fixed effects regression is used to control for omitted variables that differ between cases (i.e. crops in the context of this study) but are constant over time. It allows the use of changes in the variables over time to estimate the effects of the independent variables on the dependent variable, and it is one of the main techniques used for analysis of panel data.

The fixed estimates are, however, conditional on the sample that ν_i are not assumed to have a distribution, but are instead treated as fixed. On the other hand, the between estimator assume that $\bar{X}_i$ and η_i are uncorrelated. When $\bar{X}_i$ and η_i are correlated, the estimator cannot determine how much of the change in $\bar{y}_i$, is associated with the increase in $\bar{X}_i$, to assign to β versus how to attribute to the unknown correlation.[33] The random effect estimator requires the same no-correlation assumption. In comparison with the between estimator, the random

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[33] This would suggest the use of instrumental variable estimator, $\bar{Z}_i$, which is correlated with $\bar{X}_i$ but uncorrelated with η_i

effects estimator produces more efficient results. The between estimator is less efficient because it discards the overtime information in the data in favour of simple means; random effect uses both the within and the between estimator.

In practice, running the regression with “between effects” is equivalent to taking the mean of each variable for each case across time and then running a regression on the collapsed dataset of means. As this results in loss of information, between effects are not used much in practice. A researchers who wants to look at time effects without considering panel effects generally will use a set of time dummy variables, which is the same as running time fixed effects. The between effects estimator is important because it is used to produce the random effects estimator. If there is a reason to believe that some omitted variables may be constant over time but vary between cases, and others may be fixed between cases but vary over time, then we can include both types by using random effects.

The next step in our estimation involves the Generalized-Method-of-Moments (GMM) estimators developed for dynamic panel data that were introduced by Arellano and Bond (1991), and Arellano and Bover (1995). Consider the following regression equation:

$$y_{i,t} - y_{i,t-1} = (\beta_0 - 1) y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (4.6a)$$

Which could also be re-written as:

$$y_{i,t} = \beta_0 y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (4.6b)$$

Since our regression (i.e., 4.6b) is in dynamic form, estimating that equation by OLS would produce biased results. In principle, there are two sources of bias. First, since $y_{i,t}$ is a function of η_i, $y_{i,t-1}$ will also be a function of η_i thus rendering OLS biased and inconsistent. Second, η_i is likely to be correlated with at least with one or more or the right hand side variable. To circumvent these challenges, Arellano and Bond (1991) proposed differencing the equation in order to mop out crop-specific effects. In order to eliminate the crop specific effects, we take the first difference of equation 4.6b as follows:

$$y_{i,t} - y_{i,t-1} = \beta_0 (y_{i,t-1} - y_{i,t-2}) + \beta^{'} (X_{i,t} - X_{i,t-1}) + \varepsilon_{i,t} - \varepsilon_{i,t-1}$$

Nevertheless, differencing equation 4.6b complicates econometric issues since it introduces a new bias in equation as the error term $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ is correlated with the lagged dependent variable $y_{i,t-1} - y_{i,t-2}$. Assuming that the disturbance term is not auto-correlated, Arellano and Bond (1991) propose a Generalized Method of Moments (GMM) in which lagged values of explanatory variables are used as instruments. In particular, the use of instruments is required to deal with two things here. First, the endogeneity of explanatory variables, and second, the problem that by construction the new disturbance term $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ is correlated with lagged dependent variable $y_{i,t-1} - y_{i,t-2}$. Given the assumptions that the disturbance term is not serially correlated and the explanatory variables are weakly exogenous, the GMM dynamic panel estimator uses the following moment conditions:

$$E[y_{i,t-s} .(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \qquad for\ s \geq 2; t = 3,...,T \qquad (4.7)$$

$$E[X_{i,t-s} .(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \qquad for\ s \geq 2; t = 3,...,T \qquad (4.8)$$

The GMM estimator based on the above conditions is the difference estimator. However, there are some conceptual and statistical limitations with this difference estimator. Conceptually, we would also like to study the across the “crops” relationship between trade liberalization and land productivity, which are eliminated in the difference estimator. Statistically, Alonso-Borrego and Arellano (1996) and Blundell and Bond (1997) show that when the explanatory variables are persistent over time, lagged levels make weak instruments for the regression equation in differences. Instrument weakness influences the asymptotic and small-sample performance of the difference estimator. Asymptotically, the variance of the coefficients rises. In small samples, weak instruments can bias the coefficients.

In an attempt to reduce potential biases associated with the GMM estimator, it is recommended to use the SYSTEM GMM that combines the regression in differences with the regression in levels, Arellano and Bover, (1995); Blundell and Bond (1997), Bond and Hoeffler and Temple (2001). The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumption: although there may be correlation between the levels of the right-hand side variables and the crop-specific effect in equation 4.6b, there is no correlation between the differences of these variables and the country-specific effect, i.e.

$$E[y_{i,t+p}.\eta_i] = E[y_{i,t+q}.\eta_i] \qquad \textit{for all } p \textit{ and } q$$

And $$E[X_{i,t+p}.\eta_i] = E[X_{i,t+q}.\eta_i] \qquad \textit{for all } p \textit{ and } q \qquad (4.9)$$

The additional moment conditions for the second part of the system (the regression in levels) are:

$$E[(y_{i,t-s} - y_{i,t-s-1}).(\eta_i + \varepsilon_{i,t})] = 0 \quad \textit{for } s = 1 \qquad (4.10)$$

$$E[(X_{i,t-s} - X_{i,t-s-1}).(\eta_i + \varepsilon_{i,t})] = 0 \quad \textit{for } s = 1 \qquad (4.11)$$

Thus, we use the moment conditions presented in equations (4.7), (4.8), (4.10), and (4.11), use instruments lagged two period, and employ a GMM procedure to generate consistent and efficient parameter estimates. It is worth noting that consistency of the GMM estimator depends on the validity of the instruments. To address this issue we consider two specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1997). The first is a Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term is not serially correlated. In both the difference regression and the system difference-level regression we test whether the differenced error term is second-order serially correlated.

In appreciation of the above estimation techniques, we extend the analysis into a panel setting.[34] Since our analysis includes more crops than in the case of time series, three indicators of trade liberalization are introduced: KOF globalization index (Dreher, 2006), updated Sachs and Warner index (Wacziarg and Welch, 2008)[35] and Freedom in international trade (Gwartney, *et al*, 2008).[36,37] The globalization index measures three main dimensions of globalization: economic, social and political. In addition to three indices measuring these dimensions, e an overall index of globalization captures: actual economic flows, economic restrictions, information flows, personal contact and cultural proximity. As is common in panel data econometrics, we expressed our variables in five years average in order to have lower T, and large N.[38] With an exception of the updated Sachs and Warner Index, all other variables are expressed in logarithms.

A few comments about the updated Sachs and Warner Index are worth noting here before we proceed with estimation. The first yea of liberalization according to the updated Sachs and Warner Index is the year after which all of the Sachs-Warner openness criteria are met.[39] In Tanzania, these criteria were met in 1995, Wacziarg and Welch (2008). The choice of liberalization year is based on primary-source data on annual tariffs, non-tariff barriers, and black market premium. A variety of secondary sources were also used, particularly to identify when export-marketing boards were abolished and multiparty governance systems replaced single party rule.

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[34] The panel involves the following crops: cashewnuts, coffee, cotton, tea, tobacco, maize, rice, wheat, sugarcane, groundnuts, pulses, pyrethrum, sunflower, banana, sorghum, millet and cassava.
[35] As mentioned earlier, the updated Sachs and Warner index coincides with liberalization dummy for cash crops.
[36] For detailed definitions of these variables see the cited authorities.
[37] Freedom in International trade is updated in Dreher, Axel, Noel Gaston and Pim Martens (2008), *Measuring Globalization – Gauging its Consequences* (New York: Springer).
[38] Five-year averages are: 1970-1974, 1975-1979,1980-84,1985-1989,1990-1994,1995-1999,2000-2004.
[39] According to Sachs and Warner, an economy is defined as closed if satisfies at least one of the following conditions: tariffs in the mid-1970s were 40 percent or more, quotas in the mid-1980s were 40 percent or more, the black market premium (computed separately for the 1970s and 1980s) was 20 percent or higher in either the 1970s or 1980s, the country had a state monopoly on major exports, the country had a socialist system.

Table 4.16 reports the fixed effect regression results. In particular, column 1 in table 4.16 shows that the estimated coefficient of the area under cultivation carries a negative sign, which is statistically significant at 1% confidence level. The impact of trade liberalization on land productivity is mixed, however. While globalization index enters positively and significantly at 1% confidence level in the fixed effect regression, freedom in international trade enters negatively and significantly at 1% level. The updated Sachs and Warner index, although not statistically significant, carries a negative sign. In column 2 we report the estimated results for Random effects model. It is clear that the estimated coefficient under the Random effect model do not differ from fixed effects in terms of magnitude, signs and levels of significance.

The Breusch-Pagan Lagrange multiplier (LM) test designed to test random effects shows that individual specific effects are significant (chi2 =339.91, prob chi2=. 0000). The Breusch-Pagan test is also supported by the Hausman's specification test. Basically, the Hausman test is a test of the equality of coefficients estimated by the fixed and the random effects estimators. If the coefficients differ significantly, either the model is misspecified or the assumption that the random effects v_i are uncorrelated with the regressors X_{it} is incorrect. If our model is correctly specified and v_i is uncorrelated with regressors (i.e X_{it}), then the subset of coefficients that are estimated by random effects should not differ systematically. The Hausman's test (Prob>chi2 = 0.7854) shows that the fixed effect model is our preferred specification.

However, one problem with our earlier estimation is that the area under cultivation is not exogenous. Other variables are assumed to be exogenous since there is no theoretical or empirical justification, which indicates that Globalization index/freedom in international trade/updated Sachs and Warner index could be influenced by land productivity (i.e., output per hectare). Indeed, most of trade reforms that were adopted in the 1990s—the basis upon which the updated Sachs and Warner index is constructed are externally imposed by multilateral organization. Thus, to circumvent the endogeneity problem, we use the Instrumental Variable approach.[40] The lagged area under cultivation is used as instrument. This instrument is correlated with the current area under cultivation but uncorrelated with dependent variable.[41] The estimated results for instrumental variable in both fixed and random effects are reported in column 3 and 4 respectively in table 4.16. Clearly, it can be seen that, with an exception of international trade freedom index, other variables have entered significantly with the same signs in both the fixed effect and random effects models.

4.5 Discussion of Regression Results

The regression results have shown that while there is some consistency in support of the existence of diminishing returns to land for both cash and food crops, the impact of liberalization on agricultural productivity is at best mixed. *Prima facie*, we find unpersuasive evidence based on time series regressions to establish the impact of trade liberalization on increased productivity. Our results would have been more persuasive if the panel regressions had produced unambiguous results. However, this turns out not to be the case. Indeed, the above results echo the findings reported by Danielson (2002) who found the impact of *structural adjustment* to be rather weak in galvanizing the supply response of individual crops in Tanzania. In a similar study, which uses descriptive analysis, Skarstein (2005) argues that economic liberalization has resulted into a declined productivity of small holders in Tanzania. Ponte (2002) argues that there is no difference in crop performance before and after the economic reforms.

A quick examination in table 4.1 supports the empirical results explained earlier. Specifically, average productivity for coffee crop plummeted from 4506 Hg/Ha in 1986-90 to 3924 Hg/Ha in 1996-00. In the case of tea, average productivity declined to 12,762 Hg/Ha from 13,587

[40] We used System GMM to solve this problem. However, the estimated results were not significant. Hence we choose to use the Instrumental variable approach.
[41] Note that the dependent variable is $Y_{t,i}/H_{t,i}$. Where; $Y_{t,i}$ is output at time t, and $H_{i,t}$ is the area under cultivation at time t.

Hg/Ha between 1986-00 and 1996-00 respectively. Although the productivity of cashewnuts took off in the late 1990s, it is important to note that the increased average productivity has come at a cost of increased area under cultivation. While the area under cultivation rose from 36,000 hectares in 1986-90 to 56,000 hectares in 1991-95—an increase of 20,000 hectares, the average productivity rose by 2448.

A study by the World Bank (2005) shows that smallholder's tea production declined to 10% in the mid 1990s and to 5% by 1998—the lowest level since tea was introduced as a smallholder crop. Yield per hectares have dropped from about 500 kilograms per hectares in 1990 to about 130 kilograms per hectare in 1998/99 before rising to over 200 kilograms per hectare by 2002 (World Bank, 2005). Table 4.1 shows that despite an increase in the area under cultivation from 12,400 hectares in 1975 to 19,000 hectares in 2000—an increase of roughly 50%, output per hectare has increased by 11% over the same period. Similar trend is displayed by tobacco, maize, rice and wheat. All in all, what is emerging from table 4.1 is that the expansion of the area under cultivation has not been accompanied by a significant increase in output per hectare.

The performance of cashew in 1990s is due to increased use of agrochemical. The increase in the use of chemicals is ascribed to the activities of cashew input development fund (CIDF) that is allowed to levy 2% of the value of cashew exported and provides credit for sulphur imports by traders and supplied to farmers (Poulton, 1998). The surge in tobacco production is partly ascribed to the inflow of foreign direct investment by private companies as, e.g., DIMON Inc, which took place in the 1990s. DIMON Inc. is the second-largest independent leaf-tobacco merchant in the world and is engaged in virtually all areas of the industry, including purchasing, processing, storing, and selling leaf tobacco. The company owns tobacco leaf growing companies in the United States and more than 30 other countries, as well as 15 factories for processing the product, which is then sold to manufacturers of Americanblend cigarettes throughout the world. Indeed, the liberalization of tobacco marketing led to an initial surge in output as the new market entrants competed with each other for market share, providing inputs on credits to primary societies. Even though, tobacco production in Tanzania is still dominated by small-scale subsistence farmers highly dependent on family labour, hand tools, natural resources as well as animal-drawn farming implements.

The prevalence of a negative relationship between the area under cultivation and land productivity is not altogether surprising. As a matter of facts, this relationship is one of the oldest concepts in economic literature.[42] However, it is stressed in this chapter to underscore the important point, which is frequently ignored by the proponents of trade liberalization measures in agrarian dependent economies. On the theoretical grounds, the neo-classical theory of international trade suggests that specialization according to comparative advantage would increase productivity. However, the evidence from time series and panel data as estimated in this chapter do not provide bold support of increased productivity. Indeed, the mere presence of diminishing return to land is incompatible with the conventional wisdoms that traditional theories of comparative advantage would tend to suggest.

Although diminishing returns has been a typical feature of agricultural production in Tanzania, its persistence especially during the post liberalization era has been partly reinforced by diminishing role of state in providing necessary intervention in the agricultural sector in terms of subsidies and other technical know how. Yet, despite the fact that the private sector has been permitted to participate in the production and marketing of export crops, it has not always been able to play the role previously played by the state. The withdrawal of state from agricultural sector has left rural areas at oblivion position. The resources used to finance agriculture and rural areas have declined tremendously in the recent past. For example, a study by Mashindano and Limbu, (2001) reported that Tanzania spends below 1% of GDP on

[42] Diminishing return was first described by the Greek philosopher Xenophon—the man who also coined the term economics - around 550 BC (Reinert, 1996, pp.2)

agriculture compared to about 12% in most developing countries. The budget allocated to the agricultural sector has continued to plummet over time making agricultural research much more difficult to carry out. The result is that there is a continued deterioration in the quality of export crops, especially for cotton and coffee, Baffe (2003; 2004). Currently, there is a continued weak linkage between extension officers and peasants, Skarstein, (2005)

Indeed, the roll back of state in supporting agriculture through the banking sector has worsened the situation.[43] The demise of the cooperative unions with the deregulation of export crop marketing meant that the links between inputs, finance and output exchange were broken, (Sen, 2005). At present, the banking sector is operating on commercial profitability and finds it difficult to finance small holders because transaction costs are prohibitive both in terms of processing the loan and following up repayment. Only 6% of households in rural areas have one or more members with a bank account and only 4% participate in an informal saving group, NBS (2002). Even many microfinance institutions that are currently operating in the country are not too keen to finance agriculture. They prefer to lend to less risky activities such as poultry farming, tailoring and catering with regular incomes and hence regular repayments than agriculture which is longer term, risky, with seasonal incomes and repayments.

In an attempt to besiege input market failure, cotton development fund (CDF) was introduced in 1997. The CDF deals with distribution of seeds and chemicals at subsidized prices through district administrations. In 2002/03, passbooks were issued to cotton growers in order to record cotton sales and the corresponding amount inputs the cotton growers could claim during the next planting season. However, problems have emerged especially with fraud and failure to provide inputs in a time, Maro and Poulton (2002). Given the fact that input entitlements are based on the volume of production harvested in the previous year, those who

[43]The Cooperative and Rural Development Bank (CRDB) was mandated by the government to support agricultural sector before reforms.

were unable to top up entitlements with cash were unable to purchase higher levels of input, Maro and Poulton (2002).

A similar program was introduced in the case of coffee. Inputs were supplied through the national coffee voucher input scheme (NCVIS). Essentially, NCVIS is a forced savings mechanism operating as a cycle between coffee growers, buyers, input suppliers, and the NCVIS trust. Coffee buyers deduct a fixed percentage of farmers' income and deposit the deducted income into a special fund in which case farmers are given vouchers in return. Coffee growers in turn, use vouchers to purchase inputs from input suppliers, who convert the growers' vouchers at the NCVIS trust. The difficulty with this scheme, nonetheless, is that it is not easy to prevent farmers from either trading their vouchers or applying inputs purchased to other crops. Indeed, reports of forged vouchers, voucher trading at discount for non-input uses have been common.

Moreover, it is an indisputable fact that lack of strong institutions to regulate the agricultural sector has led the price of cash crop to fluctuate seasonally; very-low price after harvest and higher price at the end of the season. During the intervention era, the government was setting the price floor for the entire crop season. With the advent of liberalization this is no longer possible. It has become difficult to monitor prices as they change seasonally. Buyers with more experiences and competencies in bargaining on the market are able to influence considerable market power over the producers, who not only lack expertise in terms of bargaining but also they seem to be placed in a vulnerable position in the free market environment.

Indeed, despite the fact that the share of producer prices increased in the 1990s, such an increase has been muted by both fall in producer prices and world prices. Available evidence also affirms the deterioration in the terms of trade in the mid 1990s, World Bank (1999). The combined impact of deterioration in the terms of trade and falling in producer prices means the contribution of trade policy reforms in re-invigorating the export sector remains weak.

On the other hand, although one of the major aims of liberalization policies was to remove export taxes so that the welfare of small holders would be improved, it is questionable whether that aim has been achieved because there is a mushrooming of other local taxes on farmers' crops. In 1998/99 for example, while the total tax for Arabica coffee stood at T.Shs 180, Robusta coffee was slightly higher than Arabica T.Shs 84; equivalent to 18% and 22% share of producer prices respectively, Baffe (2004). Tea producers up to 2004 were subject to as many as 44 taxes, levies and licences (Baffe, *ibid*). Mitchell, (2004) shows that the share of total taxes in producer prices for cashewnuts was around 18% in 1998/99. The odds of the local tax system are that some taxes are specific and are not based on prevailing market price. As a result, producers are penalized during the low prices years when returns are very low.

Possible reasons for drop in major tradable *food* crops such as maize in the early 1990s could be connected to the end of pan-territorial pricing and higher cost of fertilizers following removal of subsidies. In particular, pan-territorial pricing was subsidizing the movement of maize from the southern highland (Iringa, Mbeya, Rukwa and Ruvuma regions) to Dar es salaam region, thus boosting production in the former regions. According to World Bank (2000) between 1987-89 and 1996-98 maize output declined by 13-19 percent in the regions of southern highlands, while expanding in other regions closer to the Dar es Salaam. Prior to the removal of subsidies, Southern Highlands consumed more than 50% of all fertilizers in Tanzania, Skarstein (2005). However, abolition of subsidies witnessed the sharpest fall in the fertilizer consumption because it is no longer affordable to the majority of peasants. The entry of private traders in input markets remained quite insignificant and when it occurs fertilizers prices are too prohibitive.

Last but not least, the current state of agricultural production technology is still underdeveloped. About 80% of cultivation is still done using hand tools, 15% using ploughs, and only about 5% use tractors—the use of tractors has declined dramatically (see figure 4.8 that uses data from World Development Indicators, 2005). Among the rural household, only 11% own a plough and only 0.2% have a tractor, NBS (2002). Most farmers use seeds from their previous harvest and apply little fertilizers and other chemicals. According to Mashindano and Limbu (2001), less than an average of 10 kilograms of fertilizer is used per cultivated hectare; which is far below the 49 kilograms average for Latin America and 98 kilograms average for the world as a whole. According to the coffee and cotton producer's surveys carried out recently in Tanzania, it is shown that only 13 percent of the coffee growers used inorganic fertilizers, World Bank (2005). Application of nutrients to cotton was equally low. Only about 15 percent of the growers applied organic sources of nutrients, and less than one percent applied inorganic nutrient sources, World Bank, (2005)

4.6 Concluding Remarks

This chapter has examined the effect of trade liberalization on land productivity in Tanzania. In addition, we have tested an inverse relationship hypothesis. The following results emerged out. First, the effect of trade liberalization on productivity is mixed. In the case coffee, tea and wheat, liberalization dummies appear to be negative and significant—in other crops, the signs are mixed and not significant. The panel regressions have also produced ambiguous results. Second, the empirical analysis supports the existence of diminishing returns to land. The fact that land productivity seems not to respond to change in policy environment are not so much due to its inability to adapt to changing policy, but rather to the constraints that the agricultural sector is facing, and that the potential for increased productivity may exist if these constraints are removed.

The results from this chapter have an important implication for development policy. First, the presence of diminishing return is incongruent with the widely advocated view that trade liberalization measures would help to promote productivity growth in comparative advantage's sector. Second, there is an urgent need for renewed intervention in the agricultural sector to reverse diminishing returns to land. But even so, there is a limit to surmount diminishing returns to land because this is a natural tendency in the agricultural sector. That is, any attempt to increase land productivity, could face constraints in terms of the quality and quantity of arable land. Even when technology is radically improved, there is a point at which, both the quality and quantity of land for agricultural production may not be of the same quality or the same quantity as the previous unit of land. This implies that there must be a good balance between agriculture and non-agricultural sector as part of a development strategy.

There are two major limitations in this chapter. First, the time series regression results display the short run relationships since we have used first difference in our estimation. However, the problem of using the first difference is that we are loosing valuable long run dynamics. In order to resolve this problem, the inclusion of an error correction term is recommended. The simplest way to perform this exercise involves a test for unit root in the residual from static regression. The absence of unit root implies that the lagged value of the residual must be included in the relevant regression as an error correction term. In this chapter, however, the residuals from static regression were non-stationary. Hence, we could not include the error correction mechanism.[44] The second limitation hinges on the paucity of control variables. Certainly, land productivity is affected by many factors—input prices, pests and diseases, etc. Further research entails the inclusion of additional covariates in order to ascertain the validity and accuracy of econometric results.

[44] A researcher might as well use the Johansen maximum likelihood in the context of VAR model. There is, nonetheless, little theoretical justification to perform this method in this chapter.

APPENDIX 4.0

Table 4.1 Average Productivity of Agricultural Crops

		Coffee		Cotton		Cashewnuts		Tobacco		Tea	
		Hectares	Hg/Ha	Hectares	Hg/Ha	Hectares	Hg/Ha	Hectares	Hg/Ha	Hectares	Hg/Ha
1970-75	Mean	110000	4929	374333	5321	204333	6050	21350	6715	11100	10253
	Std.Dev	10677	425	72984	346	19407	161	3800.	1184	862	1353
1976-80	Mean	98400	4922	399000	4470	114600	6009	29200	6071	16540	9942
	Std.Dev	11193	452	33933	602	35423	197	2421	557	1397	944
1981-85	Mean	112200	4879	415558	3234	73200	5725	24130	5699	9864	16726
	Std.Dev	6648	456	50908	556	16392	657	4120	994	1755	2883
1986-90	Mean	116000	4506	420842	4297	36000	5376	22263	6304	12584	13587
	Std.Dev	8215	573	52548	798	2236	651	2440	1482	31	1844
1991-95	Mean	126000	4506	417676	5229	56000	7824	36120	6623	18680	12102
	Std.Dev	8215	573	71266	1749	2236	1887	3021	451	109	1132
1996-00	Mean	116200	3924	297758	5251	76086	12210	42834	8597	18800	12762
	Std.Dev	6496	278	129544	558	13018	975	2582	1952	273	633
2001-05	Mean	122000	4518	383392	6441	82000	12708	34100	7131	19000	13421
	Std.Dev	4472	257	51498	1617	4472	466	223	61	.00000	.00000

Notes: Hg/Ha is a measure of output per hectare
Source: FAOSTAT (2005)

Table 4.2 ADF tests for Output /Hectare: Cash Crops

Variable	Level				First difference				Order of integration
	Without trend		With trend		Without trend		With trend		
	t-statistic	lags	t-statistic	lags	t-statistic	lags	t-statistic	lags	
Coffee	-1.6813	2	-1.9540	2	-4.2574	3	-4.3093	3	I (1)
Cotton	-.034830	3	-.61866	3	-5.1626	3	-6.1089	3	I (1)
Cashewnuts	-.32463	2	-2.0166	2	-6.0132	1	-6.0069	1	I (1)
Tobacco	-2.3200	3	-3.5203	1	-5.5571	3	-5.4521	3	I (1)
Tea	-2.7451	2	-2.9221	2	-4.7709	3	-4.8324	3	I (1)

Notes: (1) 95% critical value for the augmented Dickey-Fuller statistics is –2.9591 without a trend -3.5615 with a trend in levels

(2) 95% critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 4.3 ADF tests for Land under Cultivation

Variable	Level				First difference				Order of integration
	Without trend		With trend		Without trend		With trend		
	t-statistic	lags	t-statistic	lags	t-statistic	lags	t-statistic	lags	
Coffee	-2.0326	2	-2.5903	2	-6.5933	1	-6.4692	1	I (1)
Cotton	-1.1267	3	-1.3456	3	-7.1913	2	-7.1416	2	I (1)
Cashewnuts	-2.3062	2	-1.3753	2	-3.5052	1	-5.2727	2	I (1)
Tobacco	-1.7308	1	-2.0051	1	-4.5797	1	-4.5063	1	I (1)
Tea	-1.6964	1	-2.6992	2	-4.2950	3	-4.2184	3	I (1)

Notes: (1) 95% critical value for the augmented Dickey-Fuller statistics is –2.9591 without a trend -3.5615 with a trend in levels

(2) 95% critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 4.4 ADF tests for the share of Export to agricultural GDP

Variable	Level				First difference				Order of integration
	Without trend		With trend		Without trend		With trend		
	t-statistic	lags	t-statistic	lags	t-statistic	lags	t-statistic	lags	
Coffee	-1.5099	3	-.47192	3	-3.0263	3	-4.0952	3	I (1)
Cotton	-1.6929	1	-2.2646	1	-4.0274	1	-3.9649	1	I (1)
Cashewnuts	-1.3773	1	-2.4801	1	-4.4075	3	-4.3344	3	I (1)
Tobacco	-1.6814	3	-.61826	3	-3.9783	2	-5.5819	3	I (1)
Tea	-2.1551	2	-1.0802	2	-7.4115	1	-8.9547	1	I (1)

Notes: (1) 95% critical value for the augmented Dickey-Fuller statistics is –2.9591 without a trend -3.5615 with a trend in levels

(2) 95% critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 4.5 ADF tests for Output / Hectares: Tradable Food Crops

Variable	Level				First difference				Order of integration
	Without trend		With trend		Without trend		With trend		
	t-statistic	lags	t-statistic	lags	t-statistic	lags	t-statistic	lags	
Maize	-2.3060	3	-3.2698	2	-4.7305	2	-4.8035	2	I (1)
Rice	-2.3922	1	-3.0494	1	-5.5939	1	-5.5734	1	I (1)
Wheat	-2.8712	1	-2.6956	3	-7.0275	2	-7.2617	2	I (1)

Notes: (1) 95% critical value for the augmented Dickey-Fuller statistics is –2.9591 without a trend -3.5615 with a trend in levels

(2) 95% critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 4.6 ADF tests for Land under Cultivation: Tradable Food Crops

Variable	Level				First difference				Order of integration
	Without trend		With trend		Without trend		With trend		
	t-statistic	lags	t-statistic	lags	t-statistic	lags	t-statistic	lags	
Maize	-1.9131	1	-2.3961	1	-4.7547	1	-4.6986	1	I (1)
Rice	-2.0893	2	-2.8367	2	-3.4764	1	-3.6007	1	I (1)
Wheat	-2.6025	2	-3.4395	2	-5.9126	1	-5.8327	1	I (1)

Notes: (1) 95% critical value for the augmented Dickey-Fuller statistics is –2.9591 without a trend -3.5615 with a trend in levels

(2) 95% critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 4.7 ADF tests for Output/Agricultural GDP

Variable	Level				First difference				Order of integration
	Without trend		With trend		Without trend		With trend		
	t-statistic	lags	t-statistic	lags	t-statistic	lags	t-statistic	lags	
Maize	-2.5942	2	-.72911	2	-2.9365	1	-3.5235	1	I (1)
Rice	-1.3706	2	-1.6124	2	-4.5213	1	-6.6893	1	I (1)
Wheat	-1.6980	3	-1.2142	3	-3.8469	3	-4.7566	3	I (1)

Notes: (1) 95% critical value for the augmented Dickey-Fuller statistics is –2.9591 without a trend -3.5615 with a trend in levels

(2) 95% critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 4.8 Dependent Variable: First Difference of the Value of Output/Hectare

	Cotton		Coffee		Tobacco	
	1	2	1	2	1	2
Constant	276.7615	89.6130	40734.7***	38706.8***	1582.0	1657.2
	(452.7026)	(557.3318)	(4550.7)	(4609.1)	(1025.5)	(1149.9)
ΔHectares	-.030634***	-.035041***	-.17422***	-.14989***	-.85075***	-.91970***
	(.0057810)	(.0058751)	(.039751)	(.041316)	(.21842)	(.20515)
$\Delta(\text{Export/GDP})_{t-1}$		.91159*		.65302		2.9293***
		(.45390)		(.64170)		(1.0565)
Liberalization dummy		.0039962		-.023474**		-.028744
		(.0094982)		(.010226)		(.020552)
Weather dummy	-.5994.0**	-.58870**	-.56286***	-.47402*	-.6437.3**	-.73012***
	(2668.7)	(.26348)	(.26983)	(.26249)	(2528.3)	(.23769)
Adjusted R^2	.48	.52	.47	.54	.45	.54
F statistic	16.4887***	9.6630***	16.3002***	10.3860***	14.3831***	10.2088***
Serial Correlation	.031803[.858]	.11444[.735]	.71958[.396]	.095024[.760]	.2.8474[.102]	.39939[.527]
Functional Form	.1.2032[.273]	.053848[.816]	.44227[.506]	.40997[.527]	.15386[.695]	1.9932[.158]
Normality (χ^2)	2.2072[.332]	1.9426[.379]	.021736[.943]	.31483[.854]	1.1175[.572]	1.0956[.578]
Heteroscedasticity	.24994[.617]	.22598[635]	.051860[.161]	.10129[.752]	.001344 [.971]	.54927[.459]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.9 Dependent Variable: First Difference of the Value of Output/ Hectare

	Tea		**Cashewnuts**	
	1	2	1	2
Constant	392.2938*** (94.0070)	642.6928*** (115.3838)	523.7087 (423.5352)	138.0890 (474.1339)
ΔHectares	-.27092*** (.045682)	-.28724*** (.041360)	-.052119*** (.018531)	-.057747*** (.017169)
$\Delta(\text{Export/GDP})_{t-1}$		.081279 (.11178)		.82933** (.29980)
Liberalization dummy		-.0052442*** (.0016298)		.0059004 (.0075628)
Weather dummy	-.074956*** (.015605)	-.096476*** (.015451)	-.25643** (.10167)	-.28487*** (.093854)
Adjusted R^2	.62	.70	.35	.48
F statistic	27.6968***	19.9315***	9.9110***	8.4046***
Serial Correlation	.076650[.784]	.29407[.592]	.53479[.470]	.039913[.843]
Functional Form	.050525[.824]	1.9590[.173]	1.8401[.185]	.17554[.679]
Normality (χ^2)	4.2961[.117]	3.8238[.148]	2.5212[.283]	1.5914[.451]
Heteroscedasticity	1.0454[.314]	.025891[.873]	.52940[.472]	.050626[.823]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.10 Dependent Variable: First Difference of the Value of Output/Hectare

	Wheat		**Rice(paddy)**		**Maize**	
	1	2	1	2	1	2
Constant	570.0565**	1130.6***	1011.4**	1036.2	5.8299***	4.1453*
	(242.3573)	(365.1370)	(494.2936)	(779.7106)	(1.7573)	(2.3308)
ΔHectares	-.071006***	-.069371***	-.015441**	-.015028**	-.40432***	-.28609*
	(.013744)	(.013841)	(.0069451)	(.0072527)	(.12331)	(.16566)
$\Delta(\text{Output/GDP})_{t-1}$		.1422E-4		-.4665E-5		.7370E-9***
		(.1772E-4)		(.7918E-5)		(.1618E-9)
Liberalization dummy		-.086697*		-.033044		.6737E-7
		(.043822)		(.095855)		(.6493E-5)
Weather dummy	-.19937***	-.23337***	-.45813***	-.41256**	-.3732E-4***	-.1777E-4**
	(.047127)	(.047897)	(.13247)	(.15345)	(.8080E-5)	(.7717E-5)
Adjusted R^2	.57	.62	.26	.22	.40	.65
F statistic	22.9642***	14.0151***	6.7336***	3.1790**	12.2019***	16.8491***
Serial Correlation	.0094774[.923]	.097368[.757]	.16560[.687]	.044192[.835]	.016613[.898]	.39490[.535]
Functional Form	.063800[.802]	.052463[.821]	.20679[.653]	.20679[.653]	2.3824[.133]	1.3193[.260]
Normality (χ^2)	1.1737[.556]	.61176[.736]	3.2067[.201]	3.5070[.173]	1.9054[.386]	.47910[.787]
Heteroscedasticity	.34505[.561]	.081497[.777]	.35844[.554]	.35844[.554]	.87595[.356]	.0083593[.928]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.8A Dependent Variable: First Difference of the Value of Output/Hectare (Logs)

	Cotton		**Coffee**		**Tobacco**	
	1	2	1	2	1	2
Constant	.030582 (.063632)	.037941 (.089707)	20.3888*** (2.4851)	18.5893*** (2.6212)	.053605 (.034964)	.044697 (.045020)
ΔHectares	-1.4289*** (.25398)	-1.3801*** (.28564)	-89810*** (.24880)	-74066*** (.22569)	-.99022*** (.20100)	-.99028*** (.20761)
$\Delta(\text{Export/GDP})_{t-1}$		-.068558 (.17083)		.022794 (.046670)		.099419 (.095532)
Liberalization dummy		.024135 (.14529)		-.1035E-5** (.4922E-6)		-.021171 (.070549)
Weather dummy	-.83867** (.37290)	-.84525** (.39400)	-.4220E-4*** (.1306E-4)	-.3939E-4*** (.1317E-4)	-.18705** (.086141)	-.21986** (.095747)
Adjusted R^2	.43	.47	.52	.57	.51	.50
F statistic	17.2282***	7.9743***	19.8302***	11.5880***	18.4785***	9.0069***
Serial Correlation	.0062995[.937]	.031151[.861]	.51592[.473]	.014485[.904]	1.7138[.190]	.29158[.594]
Functional Form	.013970[.906]	.034530[.854]	.017972[.893]	.069509[.792]	.1.4983[.221]	1.1631[.290]
Normality (χ^2)	.011029[.995]	.012332[.994]	.27702[.871]	.49084[.782]	2.0909[.352]	2.1676[.338]
Heteroscedasticity	.96618[.326]	.59850[.445]	.038910[.844]	.18152[.670]	.0027268[.958]	.18541[.670]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.9A Dependent Variable: First Difference of the Value of Output/Hectare (Logs)

	Tea		Cashewnuts	
	1	2	1	2
Constant	.046525**	.042464*	.073419	.034658
	(.017638)	(.022922)	(.049430)	(.073780)
ΔHectares	-.57649***	-.60635***	-.82082***	-.91361***
	(.13149)	(.12984)	(.20413)	(.25822)
$\Delta(\text{Export/GDP})_{t-1}$		.10230***		.030676
		(.052102)		(.082737)
Liberalization dummy		-.026638		.062173
		(.034303)		(.10141)
Weather dummy	-.15975***	-.18848***	-.24198**	-.21526**
	(.045633)	(.046360)	(.091416)	(.10468)
Adjusted R^2	.49	.53	.46	.43
F statistic	16.7781***	10.0250***	15.1208***	7.0585***
Serial Correlation	.041488[.840]	.0084575[.927]	2.7310[.109]	1.9175[.177]
Functional Form	.18072[.674]	.56489[.459]	.11012[.742]	.44276[.511]
Normality (χ^2)	1.5718[.456]	1.1200[.571]	1.3595[.507]	2.1191[.347]
Heteroscedasticity	1.5469[.223]	1.5114[.228]	1.8927[.178]	2.6003[.117]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.10A Dependent Variable: First Difference of the Value of Output/Hectare (Logs)

	Wheat		**Paddy (Rice)**	
	1	2	1	2
Constant	.053931*	.11741**	.092870**	.66710
	(.027250)	(.044980)	(.041442)	(.78747)
ΔHectares	-.53129***	-.49346***	-.65003***	-.63121**
	(.094134)	(.099101)	(.22370)	(.23120)
$\Delta(\text{Output/GDP})_{t-1}$		.065985		-.028515
		(.095171)		(.041025)
Liberalization dummy		-.8213E-5		-.1546E-4
		(.4887E-5)		(.1634E-4)
Weather dummy	-.1813E-4***	-.2072E-4***	-.3635E-4***	-.3484E-4***
	(.5324E-5)	(.5620E-5)	(.1083E-4)	(.1115E-4)
Adjusted R^2	.58	.58	.29	.27
F statistic	24.1278***	12.4332***	7.9977***	4.1155***
Serial Correlation	.45350[.506]	.0056436[.941]	.51672[.478]	.54005[.469]
Functional Form	.21725[.645]	.17804[.676]	.72774[.400]	.81638[.374]
Normality (χ^2)	.40261[.818]	.28678[.866]	.47191[.790]	2.3257[.313]
Heteroscedasticity	1.1546[.291]	1.1615[.289]	.062817[.804]	.15459[.697]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.11 Dependent Variable: First Difference of the Value of Output/Hectare

	Cotton		**Coffee**		**Tobacco**	
	1	2	1	2	1	2
Constant	221.0501 (453.0100)	225.5550 (462.0690)	41662.5*** (4844.0)	41022.4*** (4848.1)	847.3946 (1012.4)	1007.7 (1040.7)
ΔHectares	-.035317*** (.0058816)	-.035889*** (.0060813)	-.18192*** (.042629)	-.17577*** (.042718)	-.82049*** (.21082)	-.74162*** (.23566)
Δ (Export/GDP)$_{t-1}$	.94373* (.47343)	.99242* (.57804)	.27383 (.67354)	.42035 (.80413)	2.3681** (.97587)	2.2156** (1.0026)
(Producer price/Export price)$_{t-1}$	-2.8415 (10.2905)	-1.7229 (12.7866)	-4.0515 (10.2505)	4.4005 (12.5600)	10.3994 (9.6272)	-8.2311 (26.0123)
Lib dummy$\times$ (Producer Price/Export price)$_{t-1}$		-.4135E-4 (.2711E-3)		-.2515E-4 (.2184E-3)		-.2258E-3 (.2925E-3)
Weather dummy	-.59909** (.26204)	-.60402** (.26868)	-.55589* (.29851)	-.58470** .28737	-.79586*** (.25095)	-.81492*** (.25399)
Adjusted R^2	.51	.50	.45	.46	.52	.51
F statistic	9.6034***	7.4194***	7.7141***	6.5082***	9.7553***	7.8108***
Serial Correlation	.21732[.641]	.31705[.573]	.50440[.478]	1.6485[.253]	1.3237[.250]	.86529[.352]
Functional Form	.017694[.894]	.00377[.951]	.22294[.637]	.036662[.848]	2.4837[.115]	1.8110[.178]
Normality (χ^2)	2.9992[.223]	2.6022[.272]	.023749[.988]	.019152[.990]	1.8365[.399]	1.7160[.424]
Heteroscedasticity Constant	.38015[.538]	.36739[.544]	.033797[.976]	.0065208[.936]	.17493[.676]	.38839[.533]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.12 Dependent Variable: First Difference of the Value of Output/Hectare

	Tea		Cashewnuts	
	1	2	1	2
Constant	405.0740***	397.8176***	297.3841	263.8541
	(103.3833)	(103.4173)	(389.8434)	(391.9101)
ΔHectares	-.26838***	-.25904***	-.055800***	-.055389***
	(.048046)	(.048769)	(.016536)	(.016601)
Δ (Export/GDP)$_{t-1}$	.030897	-.062086	.75866**	1.0598***
	(.16079)	(.16320)	(.30064)	(.31485)
(Producer price/Export price)$_{t-1}$	.13660	1.0710	2.5621	7.6207
	(.55456)	(1.0466)	(1.9036)	(5.9597)
Lib dummy× (Producer Price/Export price)$_{t-1}$		-.1119E-4		-.5599E-4
		(.1063E-4)		(.6248E-4)
Weather dummy	-.075766***	-.075013***	-.26116**	-.25827**
	(.016503)	(.016777)	(.092259)	(.091398)
Adjusted R^2	.59	.60	.50	.50
F statistic	12.7039***	10.4232***	9.0523***	7.3515***
Serial Correlation	.019833[.888]	.3104E-4[.996]	.032722[.856]	.38358[.536]
Functional Form	.12466[.724]	.10502[.746]	.024731[.875]	.44459[.505]
Normality (χ^2)	3.0515[.217]	2.4397[.295]	2.0553[.358]	1.9561[.376]
Heteroscedasticity	1.1761[.278]	1.5649[.211]	.0019412[.965]	.34435[.557]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.13 Dependent Variable: First Difference of the Value of Output/Hectare

	Cotton		Coffee		Tobacco	
	1	2	1	2	1	2
Constant	335.8430 (454.3107)	210.8760 (470.2251)	39105.6*** (4454.6)	37458.5*** (4443.1)	669.6928 (1042.4)	499.0363 (1118.8)
ΔHectares	-.034005*** (.0058577)	-.034685*** (.0058914)	-.15499*** (.042629)	-.13710*** (.039979)	-.86344*** (.20684)	-.89606*** (.21155)
Δ (Export/GDP)$_{t-1}$	.82516* (.45171)	.80578* (.45178)	.32981 (.60580)	.26814 (.58970)	2.2439** (.98516)	2.3789** (1.0403)
Producer price $_{t-1}$	-2.7460 (2.4820)	15.4368 (17.9978)	-4.5916** (1.7827)	-8.9184*** (3.1635)	4.8755 5.5677	10.7494 (13.8030)
Lib dummy× Producer price $_{t-1}$		-.1838E-3 (.1802E-4)		-.4661E-3 (.1744E-3)		.7187E-4 (.1541E-3)
Weather dummy	-.54672** .26144	-.94541* (.25490)	-.58363** (.25457)	-.57728** (.24733)	-.72326*** (.24247)	-.71089*** (.24735)
Adjusted R^2	.53	.54	.55	.58	.52	.50
F statistic	10.2822***	8.4457***	11.0994***	9.9436***	9.5255***	7.4510***
Serial Correlation	.097799[.754]	.20572[.650]	.075580[.783]	.50218[.479]	.47455[.491]	.77768[.378]
Functional Form	.019805[.888]	.019781[.888]	1.9758[.160]	1.4825[.223]	.95347[.329]	1.4091[.235]
Normality (χ^2)	1.0042[.605]	1.5422[.463]	.023468[.889]	23272[.890]	1.5079[.471]	1.4730[.479]
Heteroscedasticity	.37280[.541]	.33786[.561]	.015907[.900]	.4542E-3[.983]	.032353[.858]	.0096153[.922]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.14 Dependent Variable: First Difference of the Value of Output/Hectare

	Tea		Cashewnuts	
	1	2	1	2
Constant	505.0146***	517.9585***	332.3287	47.6061
	(119.6704)	(119.1073)	(400.0726)	415.9277
ΔHectares	-.26924***	-.27567***	-.055568***	-.058843***
	(.046103)	(.045179)	(.017049)	(.016500)
Δ $(\text{Export/GDP})_{t-1}$	.037123	-.016627	.83936**	.85827***
	(.12529)	(.13178)	(.31876)	(.30682)
Producer price $_{t-1}$	-1.1909	-.39396	.18569	7.1236*
	(.78444)	(1.0152)	(.57287)	(3.8830)
Lib dummy× Producer price $_{t-1}$		-.1593E-4		-.7029E-4
		(.1304E-4)		(.3894E-4)
Weather dummy	-.085491***	-.086779***	-.29047***	-.29615***
	(.017026)	(.016911)	(.094368)	(.090833)
Adjusted R^2	.62	.63	.47	.51
F statistic	14.2796***	11.9223***	8.1334***	7.6830***
Serial Correlation	.19742[.660]	.26249[.608]	.016984[.896]	.70425[.401]
Functional Form	.31491[.579]	.50995[.475]	.016715[.897]	.099296[.753]
Normality (χ^2)	2.5287[.282]	2.2971[.317]	1.4233[.491]	.65809[.720]
Heteroscedasticity	.82852[.370]	.57108[.450]	.086675[.768]	.22433[.636]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.15 Dependent Variable: First Difference of the Value of Output/Hectare

	Wheat		Rice (paddy)	
	1	2	1	2
Constant	724.8227**	768.0370**	922.9256	921.6666
	(266.4597)	(296.6941)	(564.3115)	(563.6797)
ΔHectares	-.073076***	-.073457***	-.014055*	-.014042*
	(.014089)	(.014354)	(.0073088)	(.0073079)
Δ (Output/GDP) $_{t-1}$	.5313E-5	.4202E-4	-.5340E-5	-.5339E-5
	(.1743E-4)	(.1799E-4)	(.7787E-5)	(.7786E-5)
Producer price $_{t-1}$	-.55714	-13.3017	-.60896	
	.41198	(35.8086)	(.84217)	
Lib dummy× Producer price $_{t-1}$		-.0012720		-.6151E-4
		(.0035736)		(.8410E-4)
Weather dummy	-.22901***	-.23215***	-.38679**	-.38635**
	(.049528)	(.051086)	.15598	(.15600)
Adjusted R^2	.59	.57	.23	.23
F statistic	12.6420***	9.8235***	3.3253**	3.3296**
Serial Correlation	.055529[.814]	.075143[.784]	.066594[.798]	.067798[.797]
Functional Form	.91585[.339]	.1.1178[.290]	.051842[.822]	.052968[.820]
Normality (χ^2)	.76115[.683]	.72871[.695]	3.8552[.145]	3.8662[.145]
Heteroscedasticity	.34324[.572]	.56839[.451]	.086544[.771]	.084654[.773]

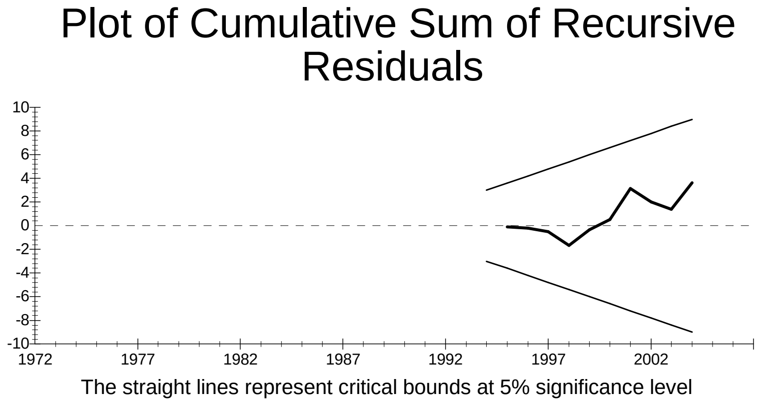
Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses; 3.Figure in brackets [] are p values; 4. Diagnostic Tests are reported using the Lagrange Multiplier statistic

Table 4.16: Panel Data Estimation
Dependent Variable is the logarithms of Output per hectare

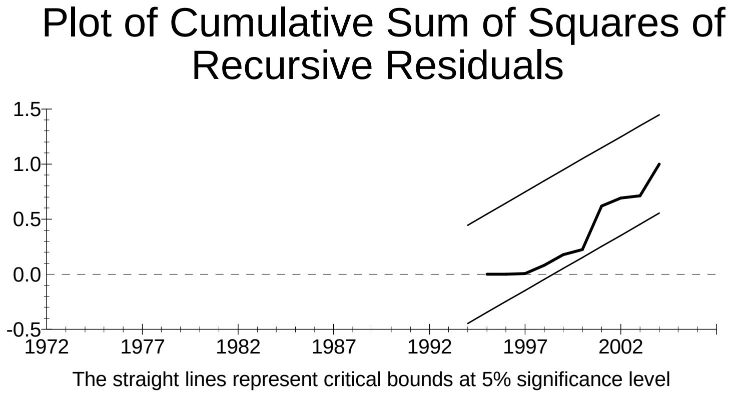
	Fixed Effects	Random Effects	IV fixed effects	IV random effects
Constant	11.2784***	11.1283***	13.0021***	12.4667***
	(1.231)	(1.2719)	(1.9431)	(1.8702)
Log hectare	-.3195***	-.3045***	-.4801***	-.4351***
	(.0608)	(.0591)	(.1349)	(.1238)
Log GBI	.9013***	.8941***	.9090509***	.9400**
	(.2717)	(.2717)	(.4368023)	(.4359)
Log FIT	-.7142***	-.7149***	-.6331	-.6910
	(.2570)	(.2571)	(.4716)	(.4673)
UPSW	-.01779	-.01766	-.01695	-.01826
	(.01142)	(.01142)	(.01574)	(.01569)
No.of Groups	17	17	102	102
No.of Obs	119	119	17	17
F test	15.74***	-	396***	-
Wald χ^2	-	61.94***	-	30.82***

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses

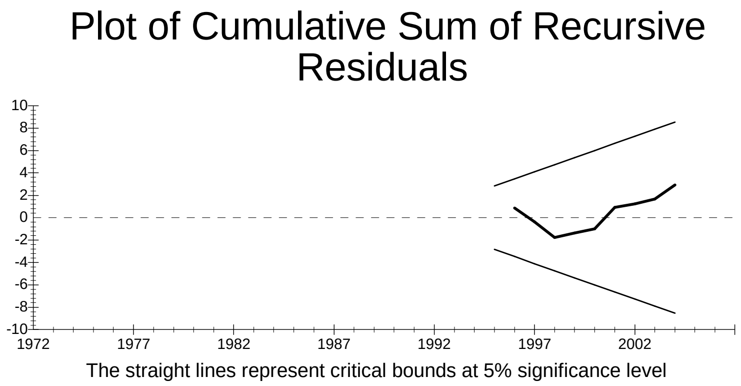
Cotton



Cotton



Coffee



Coffee

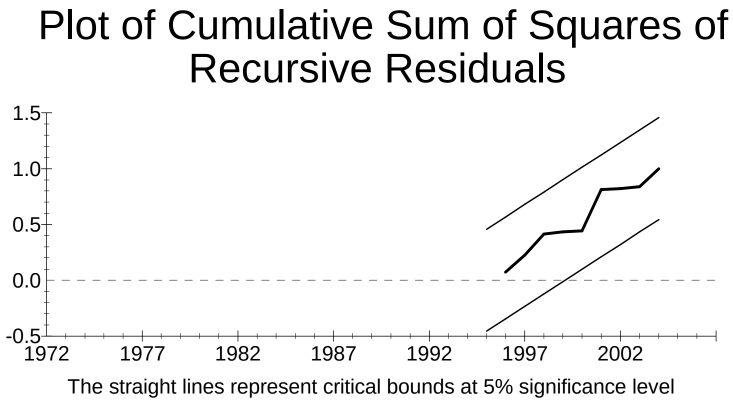
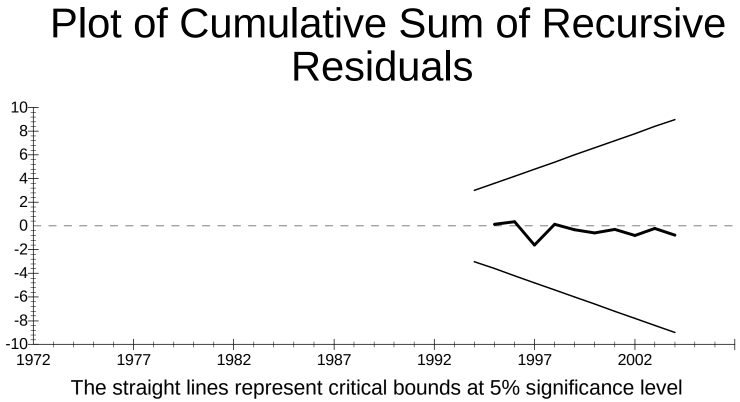
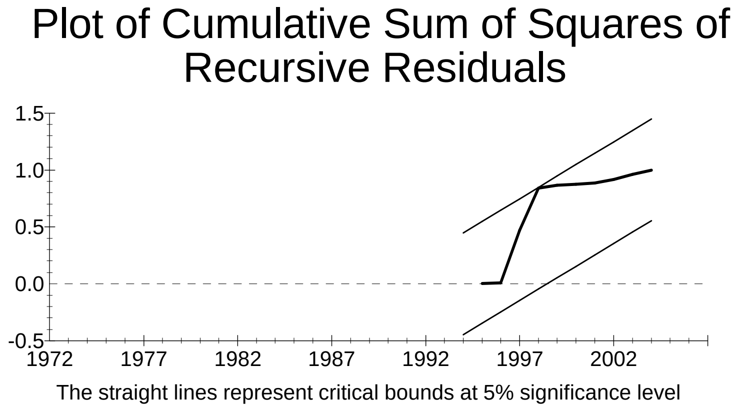


Figure 4.1 CUSUM and CUSUMQ

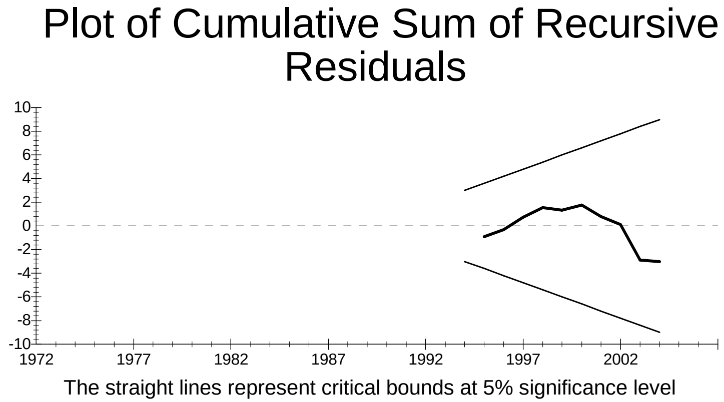
Cashewnuts



Cashewnuts



Tobacco



Tobacco

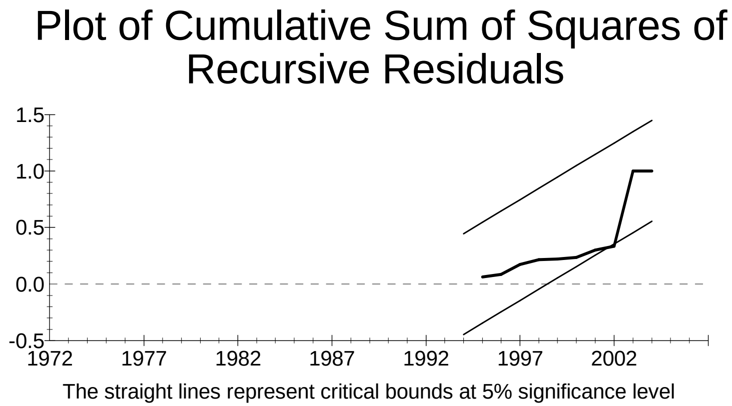
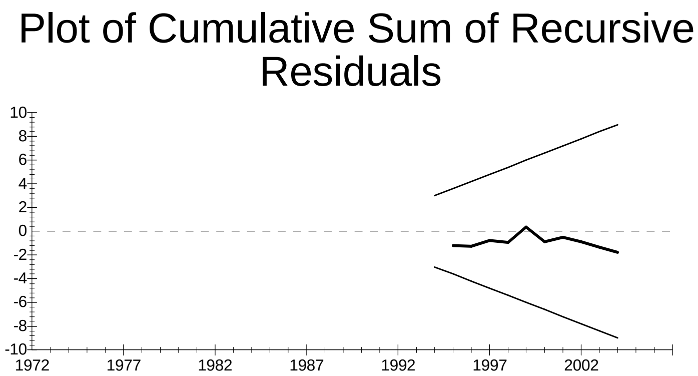


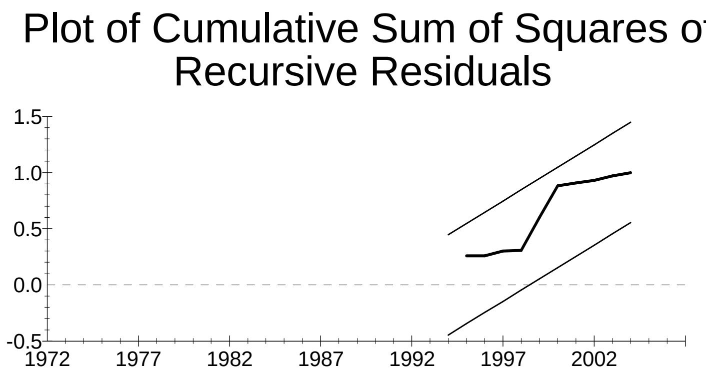
Figure 4.2 CUSUM and CUSUMQ

Tea



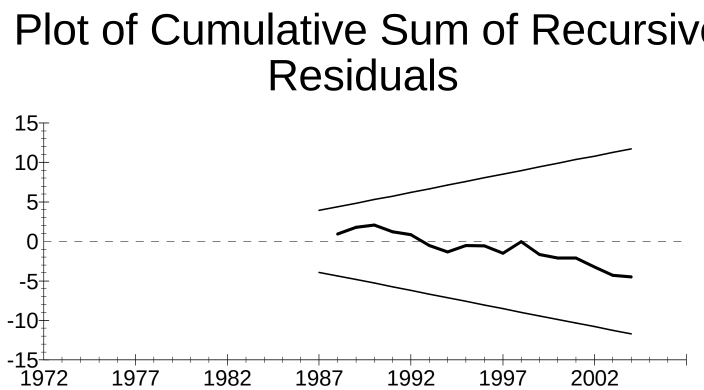
The straight lines represent critical bounds at 5% significance level

Tea



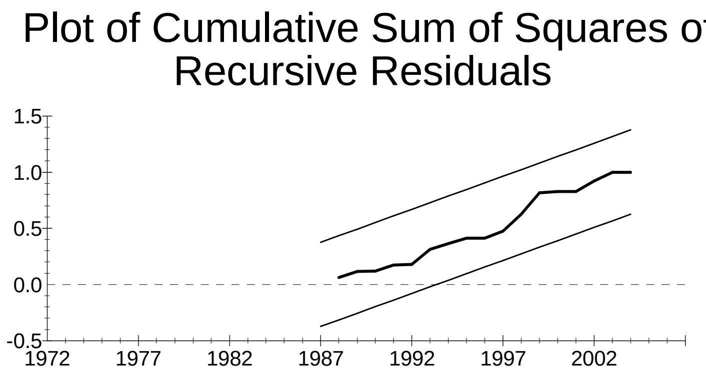
The straight lines represent critical bounds at 5% significance level

Wheat



The straight lines represent critical bounds at 5% significance level

Wheat



The straight lines represent critical bounds at 5% significance level

Figure 4.3 CUSUM and CUSUMQ

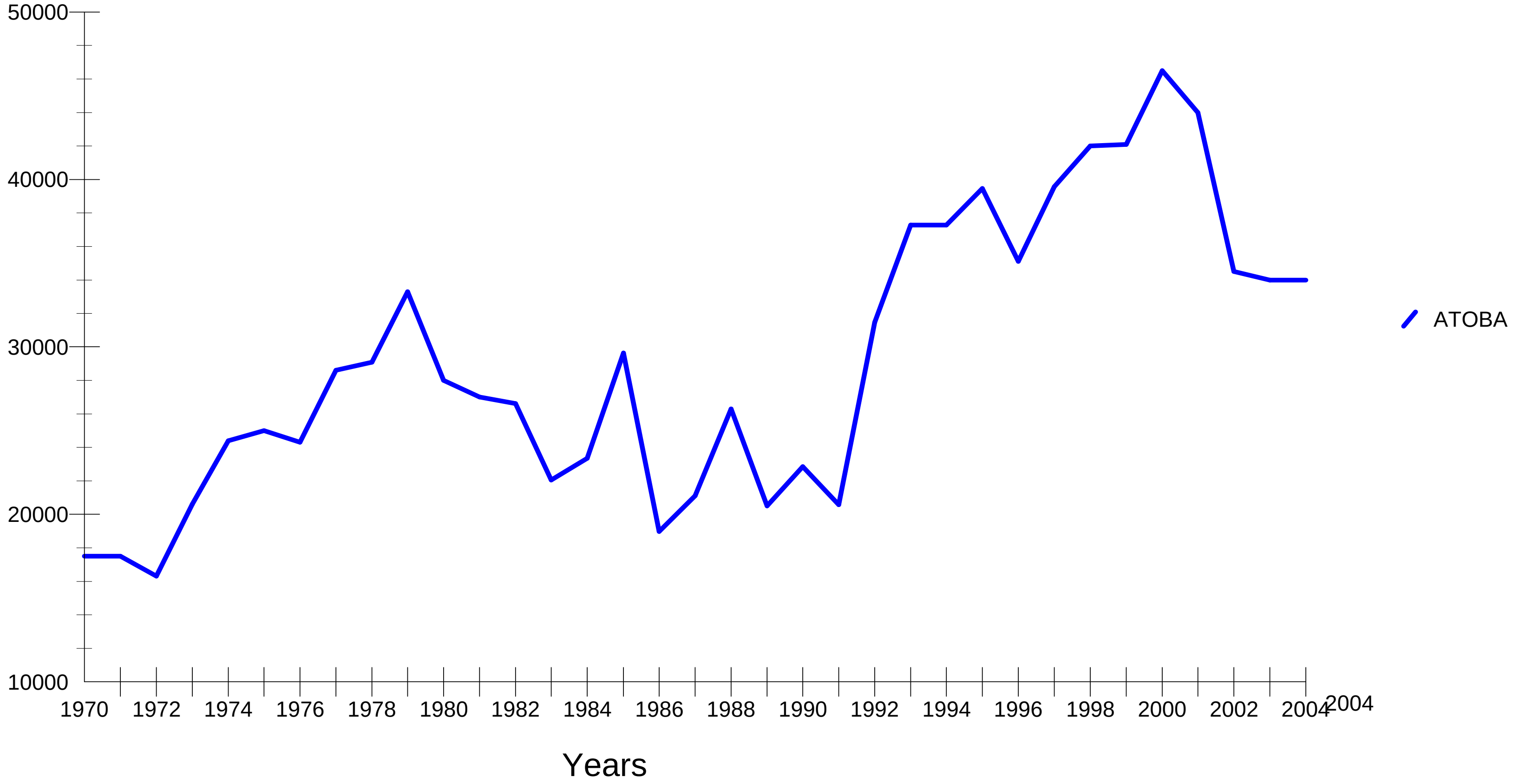


Figure 4.4 Plots of the Area under Cultivation for Tobacco: 1970-2004

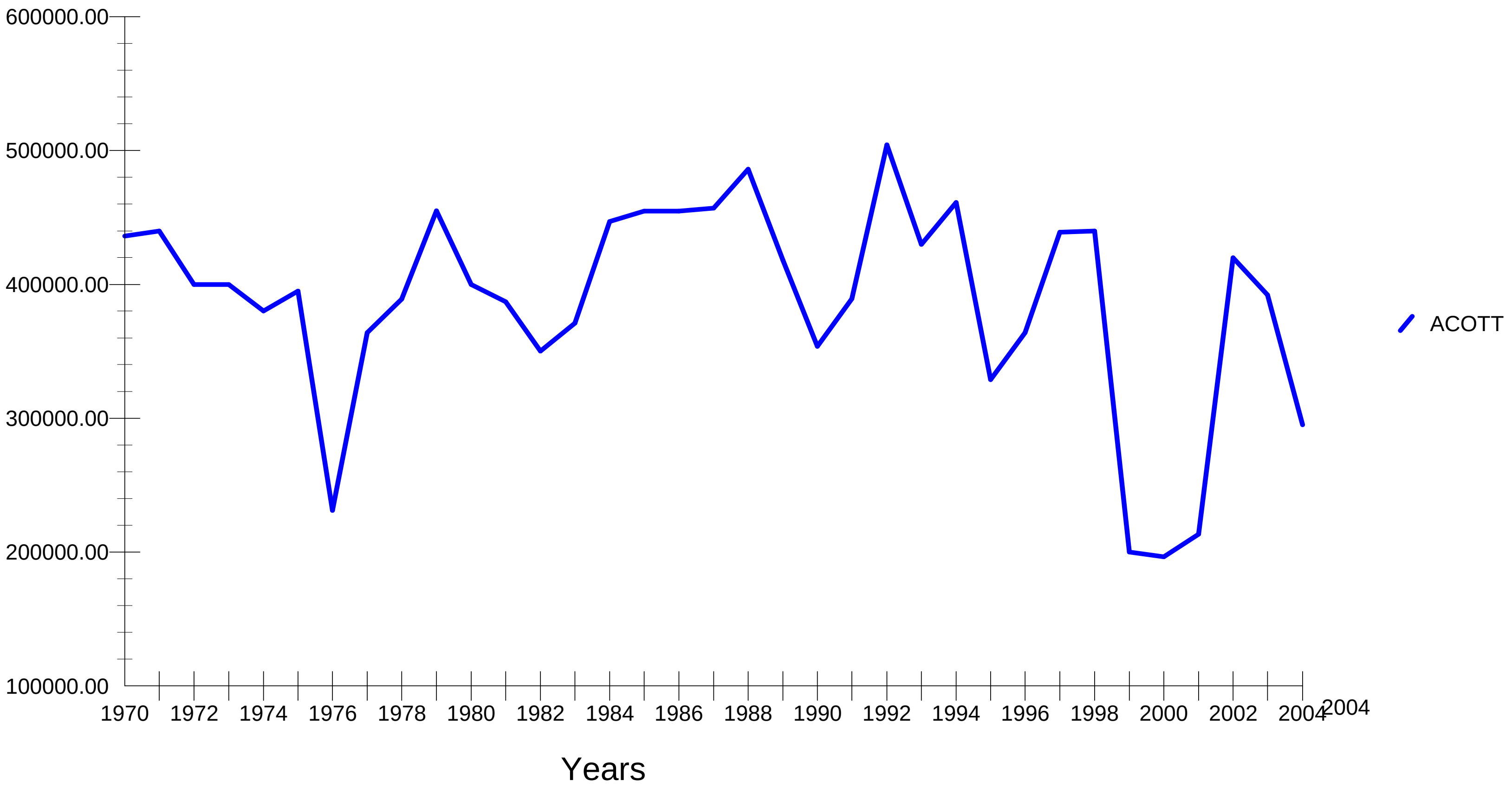


Figure 4.5 Plots of the area under cultivation for Cotton: 1970-2004

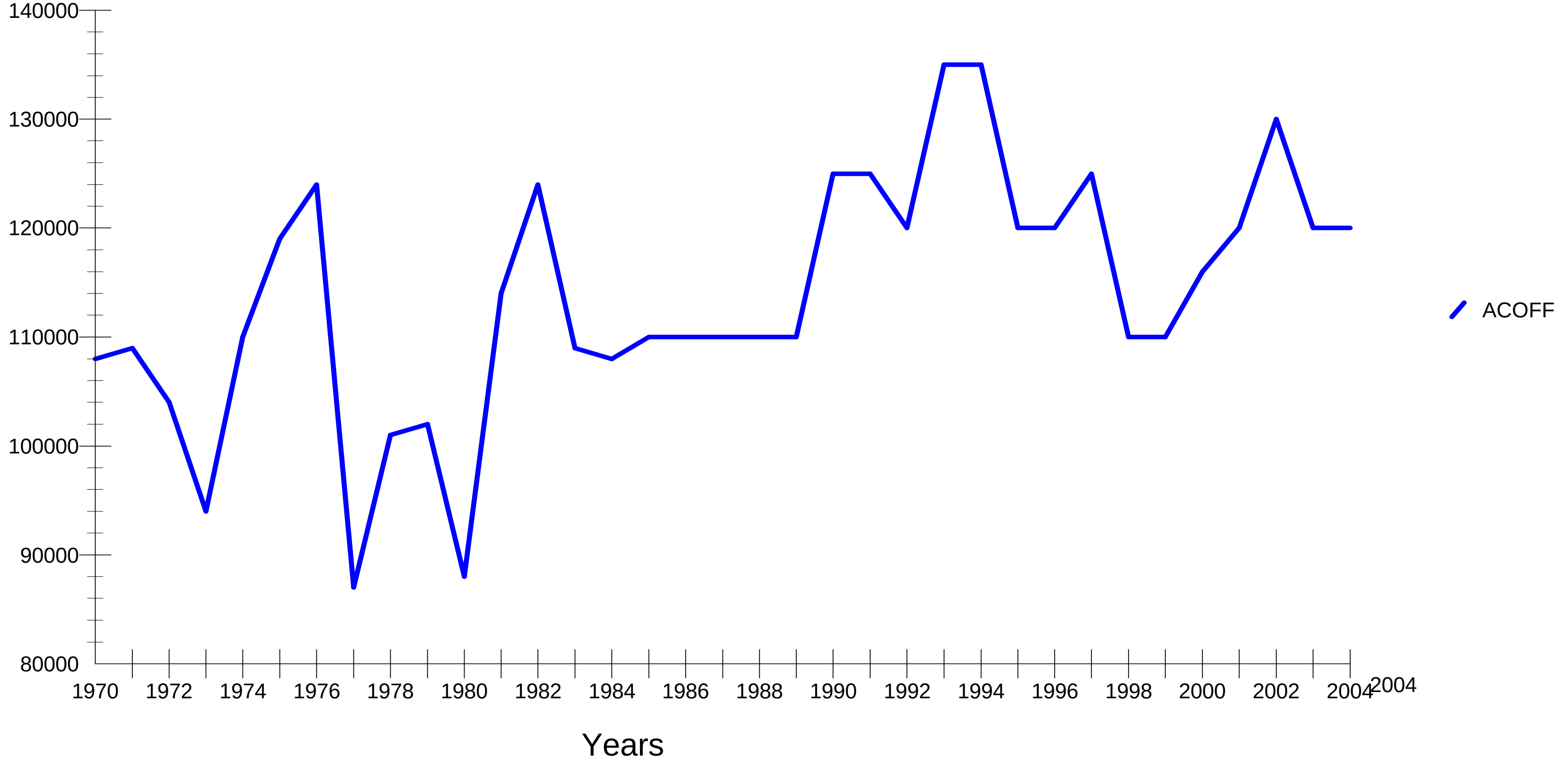


Figure 4.6 Plots of the area under cultivation for Coffee: 1970-2004

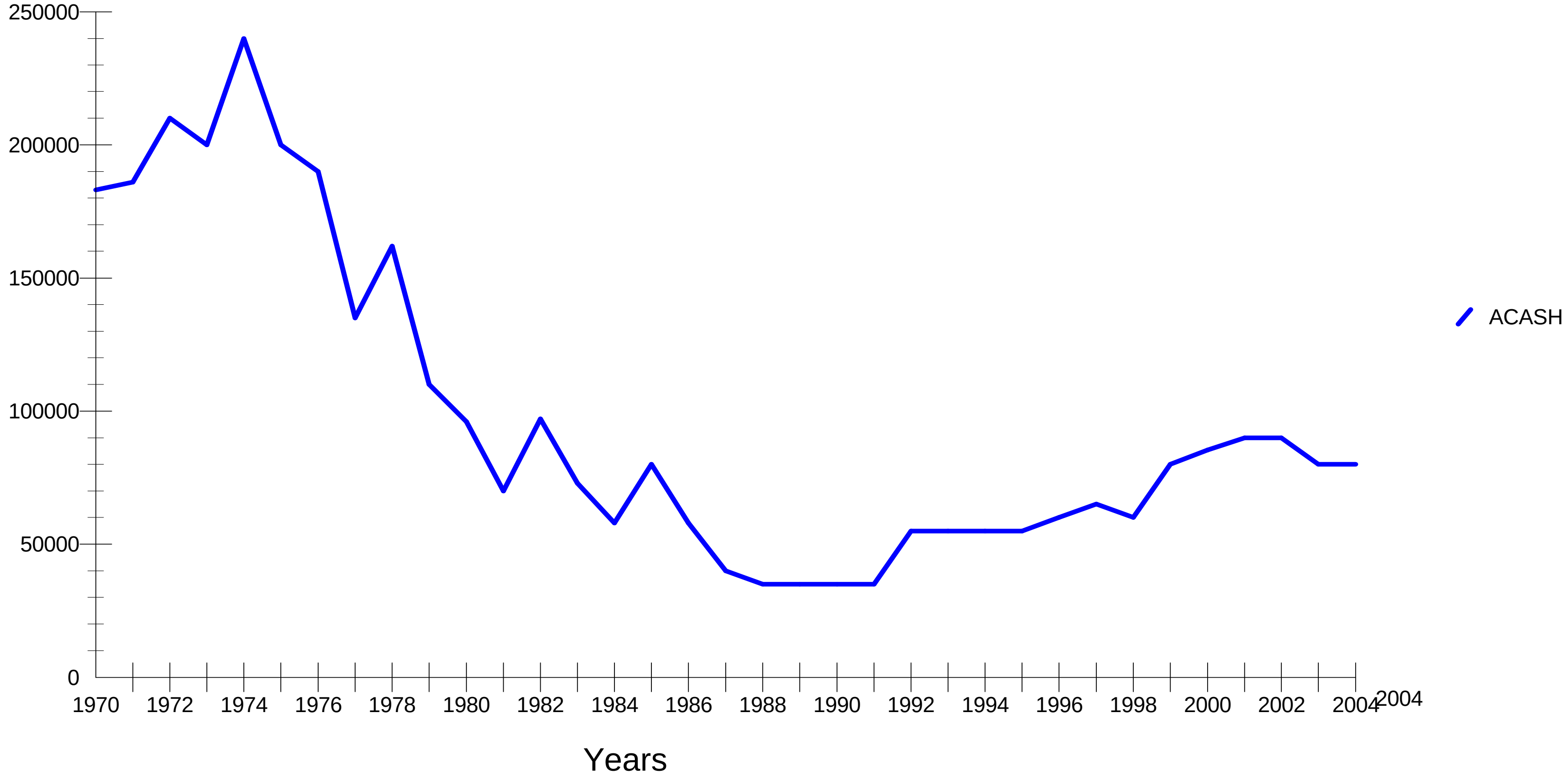


Figure 4.7 Plots of the area under cultivation for Cashewnuts: 1970-2004

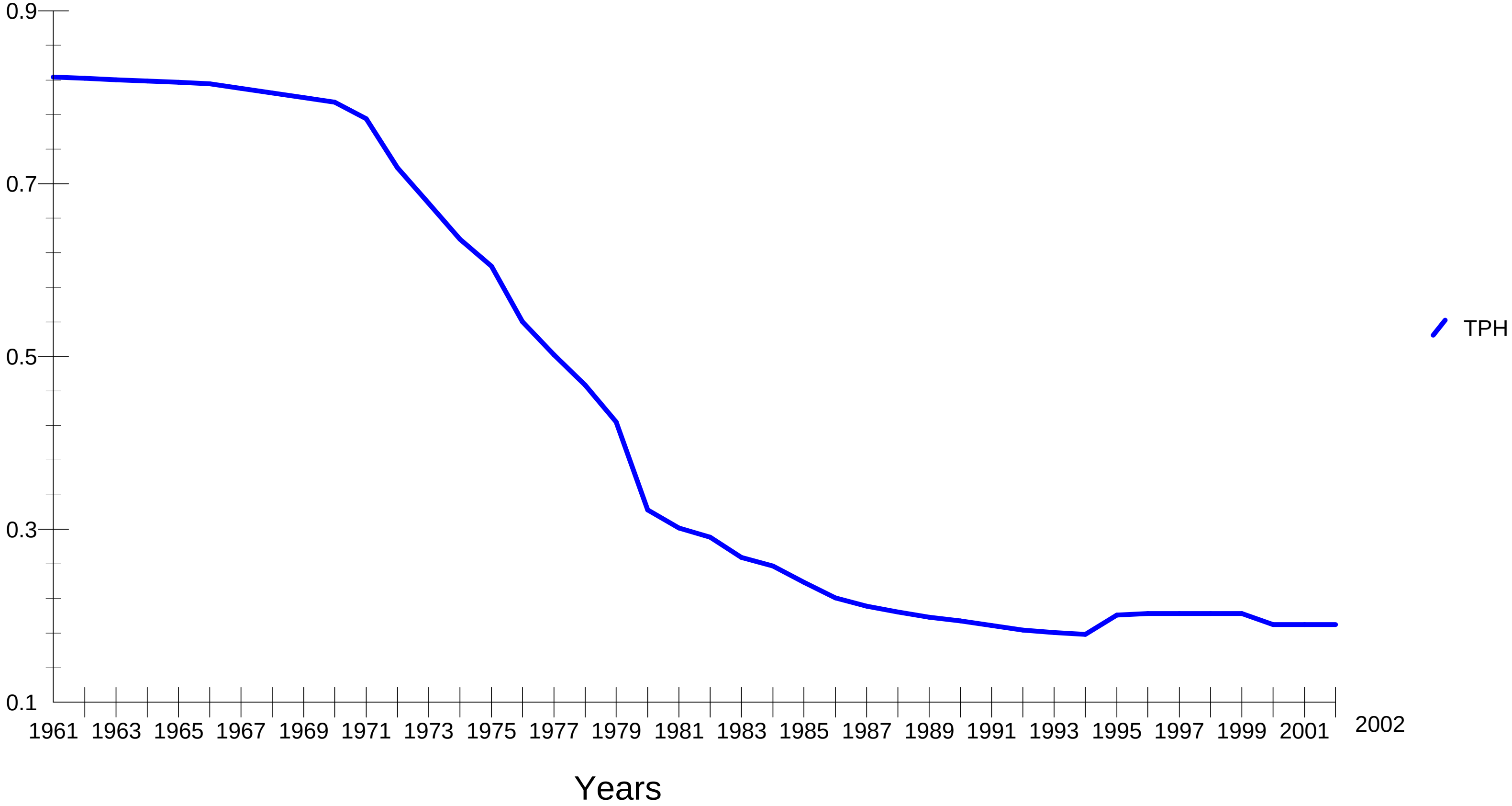
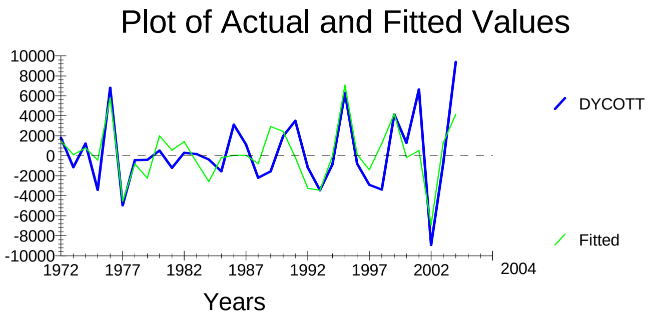
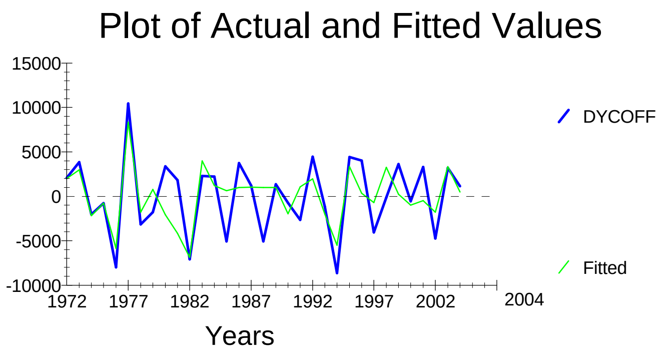


Figure 4.8: Agricultural machinery, Tractors per 100 Hectares of Arable Land

Column 2 (Table 4.8)



Column 2 (Table 4.8)



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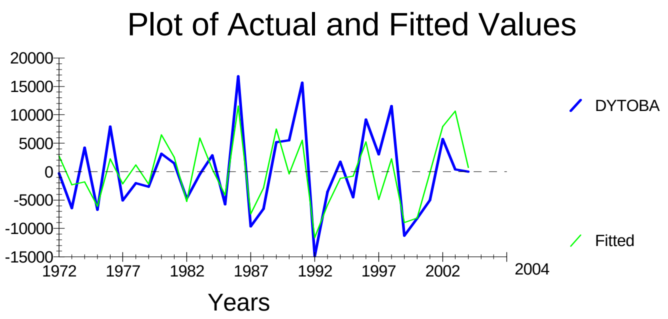

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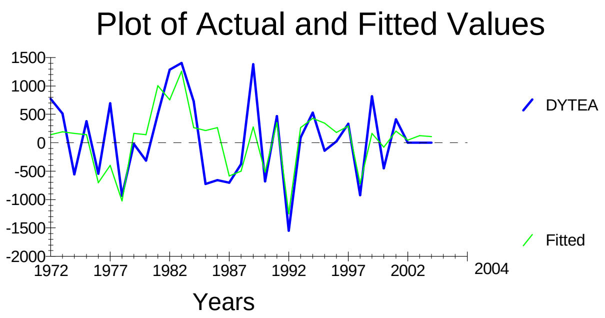
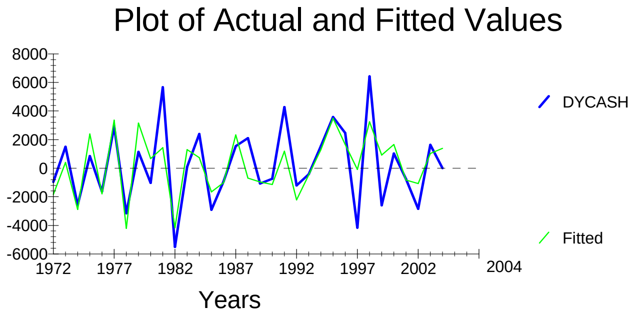
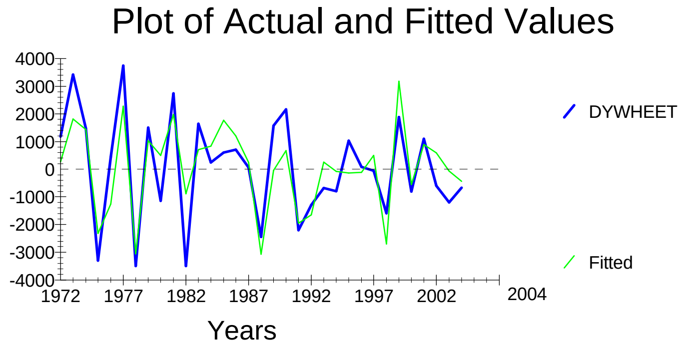


Figure 4.8: Plot of Actual and Fitted Values of Residual

Column 2 (Table 4.9)



Column 2 (Table 4.10)



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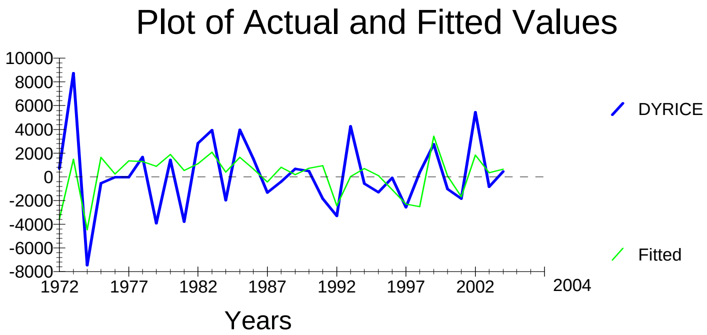


Column 2 (Table 4.9)

Figure 4.9: Plot of Actual and Fitted Values of Residual

CHAPTER FIVE
TRADE LIBERALIZATION AND DIMINISHING RETURNS IN UGANDA

5.1 Introduction

The major objective of this chapter is to carry out an empirical analysis similar to the one conducted in chapter four; however, this time we take Uganda as case a study in order to ascertain whether similar findings are also present in other countries that undertook comparable trade reforms over the last few decades. Two hypotheses are tested: first, land productivity is positively correlated with trade policy reforms. Second, land productivity is negatively correlated with the area under cultivation. The definition of land productivity adopted in this chapter is identical with output per hectare. This choice of this definition, far from being a measure of relative economic efficiency, has been dictated by data availability.

In addressing the objective of this chapter, we first choose two major export crops—coffee and cotton as our units of analysis, although the panel data estimation involve more than these two crops.[45] In general, the two crops are the leading export crops in terms of foreign exchange generation—while coffee, contributes between 20% and 30% of the foreign exchange earnings, cotton contributes around 5.5%. Moreover, these two crops employ a considerable segment of population in the country. In particular, coffee farms employ about 500,000 smallholders whose average farm size ranges from less than 0.5 to 2.5 hectares. In the broader picture, the coffee industry employs over 7 million families through coffee related activities—representing more than one quarter of Uganda's population, Lewin, *et al.*, (2004). On the other hand, it is estimated that there are 400,000 households who are engaging in

[45] The panel data analysis involves the following crops: Banana, Beans, cassava, castor oil seeds, chick peas, chillies and peppers, cocoa beans, coffee, cow peas, groundnuts, maize, millet, onions, peas pigeon peas, plantains, potatoes, rice, cotton, sesame, sorghum, soybeans, sugar cane, sunflower, sweet potatoes, tea, tobacco, tomatoes, vegetables, wheat, cereals, coarse grain, fibre crops, fruit excl melons, oilcakes, oilcrops, pulses, roots and tubers, vegetables &melons. .

cotton production and cotton industry as a whole employs about 2.5 million people, You and Chamberlin (2004).

There are several reasons why we have chosen Uganda as a case study. First, besides bordering with Tanzania, there are huge similarities in terms of production structure between these two countries. In particular, just like in Tanzania, agriculture is the most important sector in Ugandan economy as reflected in its share in the national economy—it contributes over 40% of gross domestic product. Second, like Tanzania, more than 80% of population in Uganda reside in the rural areas where agricultural production takes place. Third, agriculture is the most important sector for poverty reduction taking into account that more than 30% of households residing in the rural areas live below the poverty line (Okidi and MacKay, 2003). Fourth, in addition to forestry and mineral resources, agriculture is the sector in which the comparative advantage in Uganda resides. This is reflected in the share of primary exports in total exports being well above 40%. Fifth, both Tanzania and Uganda have been implementing trade reforms under the influence of IMF/World Bank since the mid 1980s. In the face of these similarities, it is naturally not implausible to ask whether the empirical findings that emerged in chapter four could also be replicated in Uganda.

Interestingly, the empirical findings that emerged from this chapter strongly support the inverse relationship hypothesis—existence of diminishing returns to land. On the other hand, the effect of trade liberalization on land productivity is inconclusive—majority of the estimated liberalization coefficients, though positive are statistically insignificant presumably due to the constraints that are inherently embedded in the agricultural sector. These constraints are discussed, and we argue that unless these constraints are removed, the effect of trade liberalization on land productivity in Uganda just like in the case of Tanzania is likely to remain counterproductive.

The remainder of this chapter is organized in five sections as follows. In section 5.2, we survey the evolution of trade policy in Uganda. In section, 5.3 we review the performance of the two major export crops: coffee and cotton over the last thirty years. While empirical analysis similar to the one conducted in the previous chapter is done in section 5.4, section 5.5 discusses the empirical results. Section 5.6 offers concluding remarks.

5.2 Evolution of Trade Policy in Uganda

The Ugandan trade policy regime from the 1970s to the mid 1980s was characterized by strong government intervention. State trading companies and marketing boards were legally bestowed with the right to regulate production and trading activities. At the same time, the fixed exchange rate regime coupled with tighter control over the foreign exchange were used as major instruments of trade policy. In addition, primary exports were heavily subjected to taxation by state marketing boards. Part of the export tax also filtered through over-valuation of the exchange rate, which penalized primary exports. Imports restrictions, price controls in the form of ceiling and floors, and other forms of tariff and non-tariff barriers were commonplace. As a result, the primary export sector collapsed and Ugandan economy succumbed into a severe economic crisis in the 1980s, Collier (2002).

In an effort to resuscitate the economy, the Government of Uganda has since 1987 been implementing trade policy reforms; initially as part of the overall economic recovery program (ERP) under the IMF/WB structural adjustment programs. As part of reforms, both inputs and products markets have been liberalized, trade barriers have been substantially rescinded, and prices are market determined. Tax on coffee was abolished in the 1992 and then re-introduced in the 1994 to contain the appreciation of the exchange rate following the boom in the coffee prices. However, it was then abolished in the 1996, Morrisey and Rudaheranwa (1998), Blake, *et al* (2002). Tariffs have been reduced significantly and many non-tariff barriers have been transformed into tariffs equivalents. For example, tariff rates of zero, 10%, 20%, 30% and 60% has been reduced to standard schedule with zero, 7% and 15% in 2001 although some goods face higher rates (Morrisey, *et al*, 2003). In 2002, the government of Uganda introduced the "Fixed Duty Drawback" Scheme under which the imports duties on raw materials that are used in the production of agricultural exports are refunded.

Further reforms entailed restructuring the roles of marketing boards. In that respect, Marketing boards have been privatized and the competition from other private agents has been permitted. The Coffee marketing board has lost most of its export market shares to other private exporters. Cotton Development Act was passed by the parliament in 1991, an Act that allowed the entry of private entrepreneur into cotton ginning and marketing. In addition, the Cotton Development Authority (CDO) was created in 1996 to monitor, promote and regulate the cotton sub-sector on behalf of the government. Specifically, the CDO issues ginning and export licenses and is in charge of managing a fund for the collection, processing, and distribution of cotton-seed for planting.

Other trade policy reforms include the replacement of trade license needed each time an export transaction is made with trade certificate that last at least six months. In May 1987, currency was devalued by 77% and *bureaux de changes* were introduced in the 1990. Since 1993 the exchange rate is determined by market forces of demand and supply. Beginning 1994, an Inter-bank market for foreign exchange combined with *bureaux de change* was launched. In principle, all these reforms have been introduced in order to arrest, reverse and even eliminate the trade deficit through increasing export earnings. Incentives geared towards the export-oriented trade and market determined exchange rate policies are expected to encourage both traditional and non-traditional exports. However, despite these draconian reforms, the share of merchandize export in GDP that were recorded in the 1990s and 2000s are far below those of 1960s and early 1970s (see figure 5.1). This trend is disturbing given the fact that Ugandan government has gone further down the road in liberalizing her economy, yet the tradable sector has not responded spectacularly as described in the next section.

5.3 A Review of Export Performance

In this section, we review the export performance over the last three decades. It is worth noting from the outset that export performance in Uganda is largely influenced by coffee sector. In other words, the performance of the export sector fundamentally reflects the performance of the coffee production. Having this in mind, we use three indicators of export performance: the share of merchandize export to GDP, the volume of production, and finally the the export earnings generated by a particular export crop. Figure 5.1 plots the share of merchandize exports in GDP. Data are taken from World Development Indicators, (2008). Clearly, although the trend in the share of merchandize exports to gross domestic product in the 2000s is higher than in the mid 1980s, it is neverthless below the export-GDP ration recorded in the early 1970s.

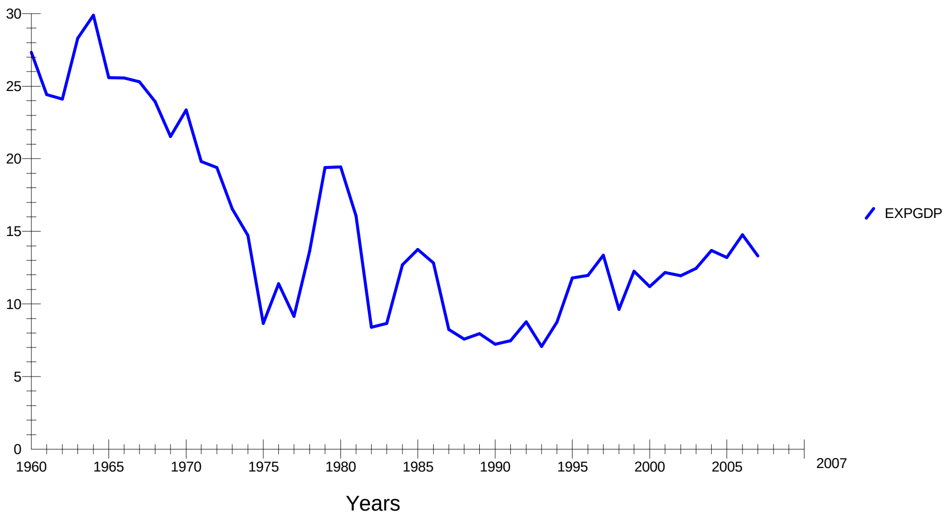


Figure 5.1 Exports as a Percentage of GDP

As remarked earlier, the trend in the share of merchandize export to GDP is greatly influenced by coffee and to a smaller extent by cotton production. Figure 5.2 illustrates that coffee production recorded an upward trajectory between 1960s and 1973. The average growth rate of coffee production between 1965 and 1970 was 12%; this figure, however, dropped to 0.22% during the 1971-75 (See table 5.1). The foreign exchange generated by coffee export when expressed in 2000 prices also rose steadily from US$117,127 to US$246,366 between 1970 and 1976 respectively; an increase of 110 percent. The 1977 recorded a peak in export earnings (US$452,638) largely caused by a sudden rise in international prices—coffee boom.

Table 5.1: Average Growth Rate (Volume in Metric tons)

	1965-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005
Coffee	12.66	0.22	-4.68	5.3	-1.2	9.8	1.6	4.28
Cotton	3.40	-16.17	-24.58	34.42	-14.85	18.41	15.70	-2.32

Source: Own computation, FAOSTAT (2008)

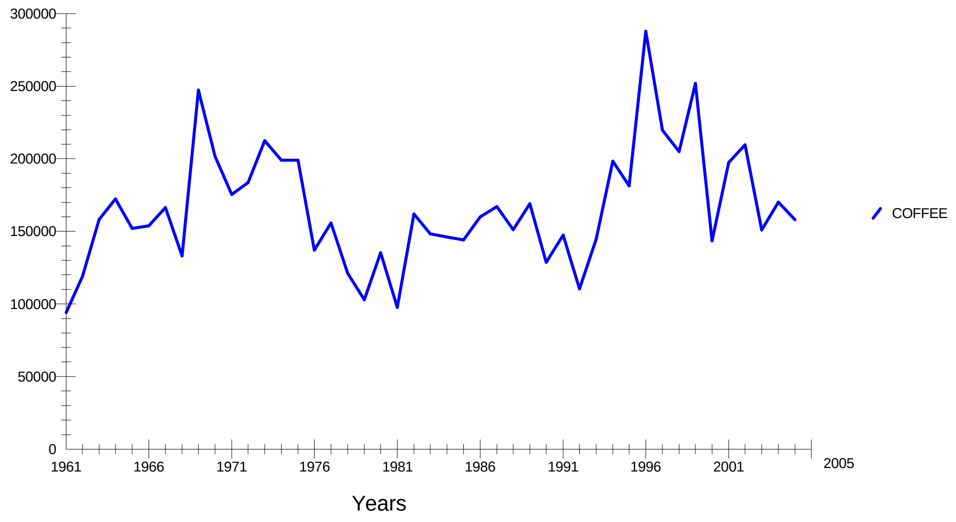


Figure 5.2: Coffee Production in Metric Tons

Similarly, cotton production prospered in 1960s and early 1970s (see figure 5.3). The area allocated to cotton reached 900,000 hectares in 1969 with a record output of 84,000 tons, making Uganda the third largest cotton producer in Africa, behind Egypt and Sudan, Baffe (2008). This partly explains why the share of merchandize export in gross domestic product was equally higher in that particular time as shown in figure 5.1. The average growth rate of cotton production between 1965-70 was about 3.40% before falling sharply to –16.17% during 1971-75 (table 5.1). The foreign exchange earned through cotton export expressed in 2000 prices also declined precipitously from US$342,271 to US $197,792 between 1972 and 1975 respectively; a drop of 42 percent, FAOSTAT (2008).

By the late 1970s, due to political and economic turmoil, cotton production declined to the lowest level and government officials were pessimistic about reviving this industry, Walusimbi (2002). Political instability during the early 1970s, coupled with failure of co-operatives to make timely payments to cotton growers, the disruption of research, failure to maintain and multiply the existing varieties, the decimation of the cattle population, and the poorly maintained ginning operations, eventually led to the collapse of the industry, Baffe (2008). It is also argued that farmers had turned to other crops partly because of the labour-intensive nature of cotton cultivation, inadequate crop-finance programs, poor marketing system and profitability of other crops relative to cotton, Walusimbi (2002).

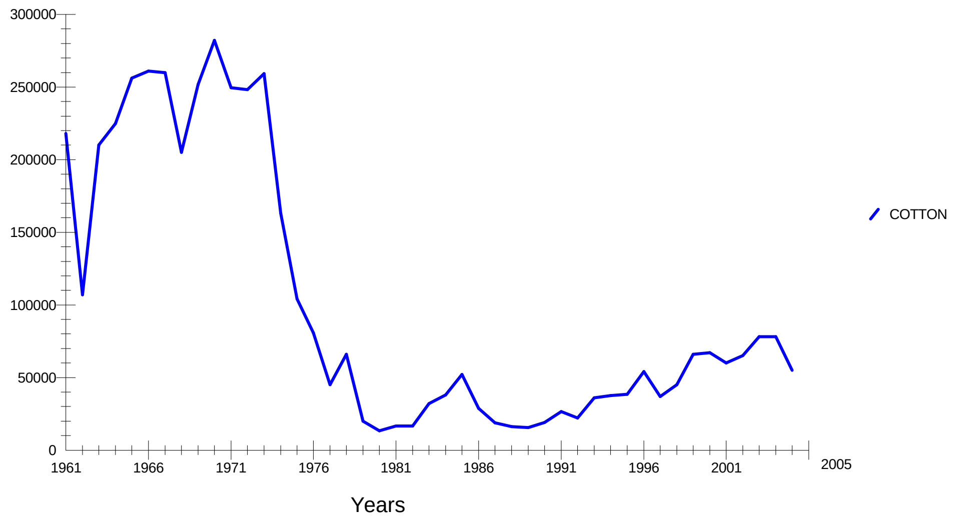


Figure 5.3: Cotton Production in Metric Tons

As seen in figure 5.1, we note a slight recovery in the share of export to GDP in 1980, a drastic fall in 1981, 1982; and then a sudden recovery before 1987. The jump in the share of export to GDP in the mid 1980s was once again largely caused by increased production of coffee. In particular, between 1984 and 1986, the European Economic Community (EEC) financed a coffee rehabilitation program that gave improved coffee production a high priority. This program also supported research, extension work, and training programs to upgrade coffee farmers' skills.

Alongside, in the mid 1980s the government of Uganda through Coffee Marketing Board launched an aggressive campaign to increase the export volumes. As part of the campaign, Parchment (dried but unhulled) Robusta producer prices rose from Ugandan Shillings 24 per kg in 1986 to Ugandan Shillings 29 per kg in 1987. Similarly, clean (hulled) Robusta prices rose from Ugandan Shillings 44.40 per kg to Ugandan Shillings 53.70 per kg over the same period. Prices for parchment Arabica were Ugandan Shillings 62.50 per kg, up from Ugandan Shillings 50 per kg over the same period. Then in July 1988, the government again raised coffee prices from Ugandan Shillings 50 per kg to Ugandan Shillings 111 per kg for Robusta, and from Ugandan Shillings 62 per kg to Ugandan Shillings 125 per kg for Arabica.

However, delay in implementing institutional reforms in the cotton sector is partly responsible for the poor performance in the late 1980s. As mentioned earlier, cotton is produced entirely by small holders who were organized in the form Cooperative Movements under the umbrella of Lint Marketing Board. However in late 1980s, the LMB plunged into financial problems due to mismanagement. Consequently, the cooperative movements became heavily indebted and farmers were culprits of both under payment and delayed payment for their produce. Brett (1994) argues that failure to introduce serious reforms in the cotton marketing from the beginning of the reforms resulted into sluggish recovery in the late 1980s.

The share of merchandize export to GDP rose slightly again in the mid 1990s driven primarily by the acceleration in the coffee exports, which in turn was fuelled by the boom in the international prices during the first part of that decade (Morrisey, *et al*, 2003). Equally, the reforms introduced in the cotton sector in 1993, coupled with the high prices of the mid-1990s, led to a considerable supply response with production reaching 20,000 tons in 1996. However, since then, the share of export to GDP has been falling largely as a result of drastic fall in coffee production. You and Chamberlin (2004), among others argue that dramatic drop in the world price contributed to this trend. The cause of price slump is due to oversupply of coffee in the world market which, in turn was caused by the rollback of International Coffee Agreement (ICO) in regulating coffee price since 1989, Chamberlin (2004). From 1962 up to 1989 the ICO operated a quota system, whereby coffee supplies in excess of demand were withheld from the market in order to stabilize the price. However, in 1989 the system was suspended because of failure to agree on quota distribution.

Meanwhile, following disappointing performance in the cotton industry in the mid 1970s to the late 1980s, the industry began to recover, albeit gradually in the 1990s. In 1994, cotton market was liberalized with the introduction of cotton sector development program. This program resulted in rapid expansion of the area under cotton cultivation. However, yields actually declined by 5.8% per year Walusimbi (2002). But even with great effort by Uganda government and International organizations such as World Bank and the International Fund for Agricultural Development (IFAD) since 1994, annual cotton production has stagnated at around 100,000 bales, Walusimbi (2002). Serunjogi *et al*, (2001) argues that the increase in the cotton production between 1994/95 and 1996/97 was mostly due to increase in area planted rather than increase in yields.

In terms of foreign exchange, both crops have performed poorly in the 2000s—see figures 5.8 and 5.9. Part of the problem is due to a fall in the volume of production caused by adverse weather conditions and other constraints that continue to besiege agricultural sector in general. Like wise, a fall in the world price, which is translated, into lower producer price is also a contributing factor. All in all, whatever yardstick one uses, the emerging picture is that the performance of export sector in 1990s and 2000s is lower than in the late 1960s and early

1970s. The poor performance of the coffee and cotton sectors has resulted into underperformance of the economy as a whole. Until the mid 1970s, Uganda had a successful tradable sector dominated by coffee and cotton, Belshaw *et al* (1999). However, production levels in the 1980s are lower than they were in the 1960s. As results, the contribution of agriculture in GDP has been irreversibly falling in the 1990s and 2000s (see figure 5.4). This trend is worrying given the dominance of agriculture in Ugandan economy and the continued rise in external balance deficit (see figure 5.5). In the next section, we return to the questions of inverse relationship hypothesis and; trade liberalization and land productivity—the central theme of this chapter.

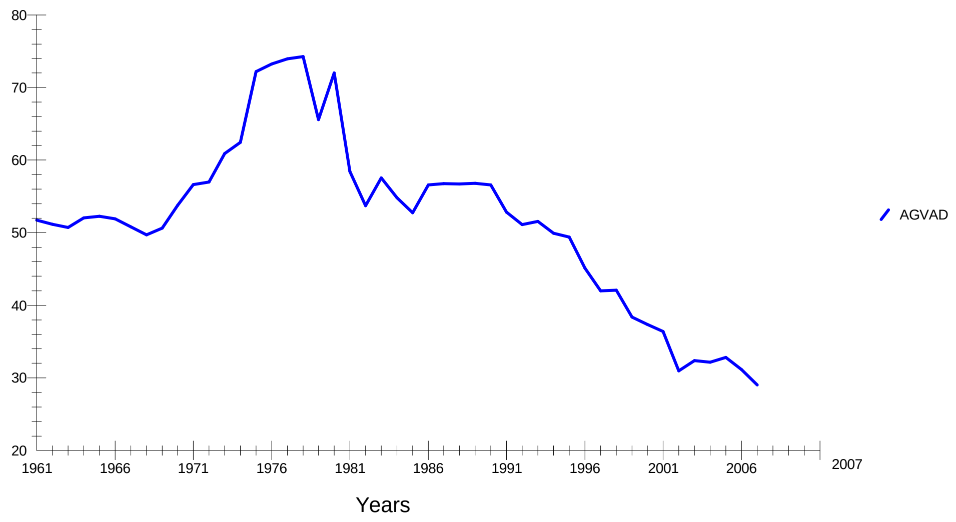


Figure 5.4: Agriculture value added as percentage of GDP

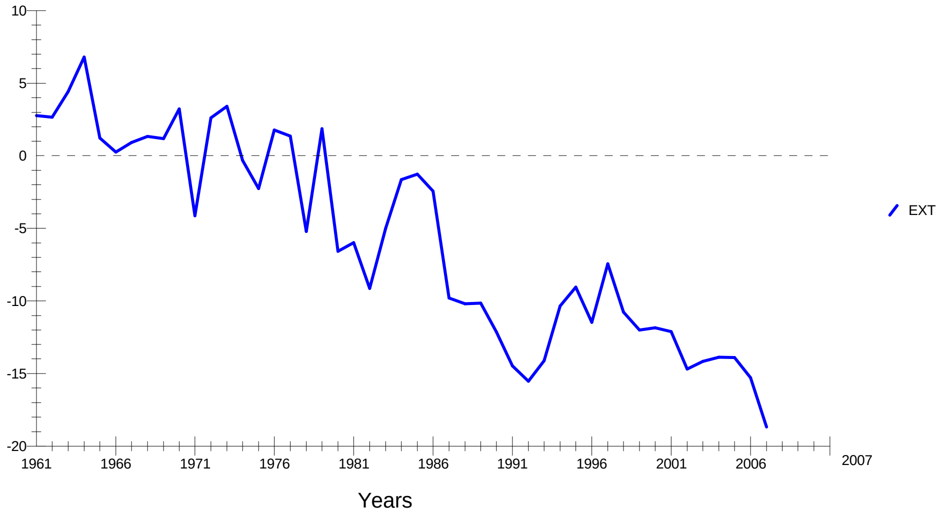


Figure 5.5 External Balance as a percentage of GDP

5.4 Econometric Specifications, Data and Empirical Results

The econometric specifications adopted in this section are identical to those presented in chapter four. The dataset on area under cultivation, output per hectare and export values are taken from FAOSTAT (2008). In addition, we have taken GDP data from World Development Indicators (2008), which helped us to construct the ratio of export to GDP. This indicator captures the impact of trade on land productivity. Price data are taken from various publications of World Bank and Ugandan Authorities.

Since trade liberalization has been an on-going process in Uganda, three dummies are used in the first place. The first dummy captures early liberalization of the late 1980s, which takes the value of 0 from 1970 up to 1988, and the value of 1 from that year onward.[46] The second dummy takes the value of 1 from 1990 onward and a value of zero before that year. Note that between 1990 and 1993 there was further liberalization—e.g. removal of tax on coffee,

[46] This dummy coincides with the up-dated Sachs and Warner Index by Waziarg and Welch (2008)

liberalization of ginning and marketing of cotton in 1991, etc. Until 1994, ginning and marketing of cotton of Uganda was regulated under the revised cotton Act (1964) and the Lint Marketing Board (LMB) Act (1959) which was later amended in 1976. Thus, our last dummy takes the value of 1 from 1994 onward and a value of zero before that year. The second indicators of liberalization are: change in producer prices and change in the ratio of producer price to export price. The third indicator of liberalization is KOF globalization index which measure three dimension of globalization: economic integration, social integration and political integration, Dreher (2006).[47] Weather dummies take the value of one for bad weather and zero otherwise.

In order to compare the empirical results reported in this chapter with those reported in chapter four, our variables are expressed in the first difference (the ADF tests for these variables are given in table 5.2). Table 5.3 reports the results for coffee crop. It is clear from column 1 the relationship between area under cultivation and output per hectare is negative. This relationship is statistically significant at 1% confidence level and continues to hold even when we introduce export to GDP ratio and the dummy for coffee boom in 1976 as additional explanatory variables. The estimated coefficient of the share of coffee exports in GDP is both positive and statistically significant. However, note that the effect of liberalization as captured by dummy is positive but not significant regardless of whether we use liberalization dummy that capture early liberalization (1988), liberalization of the early 1990 and post 1994 liberalization.

In all regressions (column 1 through 4), the adjusted R-squared is above 50%, an indication that the explained variation in our regressions are reasonably fair. The F-statistic suggests that

[47] More and detailed information about this index are available at: http://globalization.kof.ethz.ch/

regressors in each column are jointly significant at 1% confidence level. In addition, our regressions pass the battery of diagnostic tests. The CUSUM and CUSUM-Q test indicate that the estimated coefficients are stable (see figure 5.12 and 5.13) and the plot of residuals generated by regression indicate that the residuals are within the band (see figure 5.8).

In table 5.4, we introduce change in coffee producer price, change in the ratio of coffee producer price to export price, and KOF globalization index separately in column 1, 2 and 3 respectively. None of these indicators is statistically significant. However, we note that the 1976 coffee boom had a positive impact on output per hectare. The explanatory power in all three regressions (i.e., column 1, 2 and 3) in table 5.4 is above 60%. Indeed, diagnostic tests suggest that our results do not suffer from serial correlation, normality and Heteroscedasticity.

Table 5.5 gives the estimated results for cotton. Here we introduce SCRP dummy to account for Smallholder Cotton Rehabilitation Program, which took place between 1993 and 1996. In short, SCRP, funded by the International Fund for Agricultural Development (IFAD) had an objective of re-establishing research, seed multiplication, and developing animal traction. So, a dummy variable that takes the value of 1 between 1993 and 1996 captures the impact of this vital project. As in the case of coffee, we note in columns 1,2,3 and 4 in table 5.5 that the inverse relationship between the area under cultivation and output per hectare is once again, negative and statistically significant at 1% confidence level. The impact of SCRP project is positive and not statistically insignificant implying that the SCRP project had a considerable impact on the revival of cotton production. The adjusted R-squared in column 2, 3, and 4 indicate that the explanatory powers in our regressions are moderate. Note also that our regressions pass all batteries of diagnostic tests. The CUSUM and CUSUM-Q tests confirm the stability of the estimated parameters (see figures 5.14 and 5.15).

In table 5.6, we introduce change in producer price, the ratio of producer price to export price and KOF-globalization index for the case of cotton. In column 1, the impact of producer price on land productivity is positive and statistically significant at 10% confidence level. However, both globalization index and the ratio of producer price to export price, although they carry positive sign, are nonetheless statistically insignificant. Once again, the predictive powers of regressions are fairly modest. In addition, autocorrelation, non-normality, non-linearity and Heteroscedasticity are not problems in all regressions. As is in other cases, the CUSUM and CUSUM-Q tests confirm the stability of the regression coefficients.

We next extend the analysis into the panel data framework. Table 5.7 reports the results. The inverse relationship hypothesis is maintained in both fixed and random effects models. The impact of trade liberalization on land productivity is once again mixed. That is, while the globalization index carry a statistically significant positive sign, the updated Sachs and Warner index, is positive but not statistically significant. The estimated coefficients for weather dummy, the dummy for coffee booms, and the dummy for coffee sector rehabilitation project (SCRC) are statistically indistinguishable from zero. Breusch and Pagan Lagrangian multiplier chi2 (1) = 10987.20, Prob > chi2 = 0.0000 suggest that the fixed effect model is appropriate one. This test is also supported by the Hausman test Prob>chi2 = 0.9957

We finally control for potential endogeneity of the area under cultivation just like in chapter four. The lagged value of the area under cultivation is used as an instrument. The instrumental variable results are reported in column 3 and 4 in table 5.7. Once again, the inverse relationship hypothesis remains statistically significant at 1% confidence level. The effect of trade liberalization is inconclusive once more. The estimated coefficients of globalization index hold positive signs, which are statistically significant. On the contrary, the updated Sachs and Warner index, though positive, is not statistically significant.

5.5 Discussion of Results

The empirical results that emerged from this chapter suggest the presence of inverse relationship between yields (i.e., land productivity) and the area under cultivation. Second, the impact of trade liberalization on land productivity is mixed. These results are hardly surprising since the two economies share similarities in production practices, and most of the problems that inhibit productivity increase in Tanzania also exist in Uganda. In the next few paragraphs, we discuss some of the constraints that appear to perpetuate low and even negative land productivity in Ugandan agriculture.

First, the rate of soil nutrient depletion in Uganda is among the highest in sub-Saharan Africa, Nkonya, *et al* (2004). Soil conservation measures that helped to maintain the fertility of Uganda' soil were widely practiced prior to the 1970s. However, a combination of several factors including political turmoil led to the neglect of old investments and discouraged new investment in soil conservation. Next to the question of depletion of soil nutrient is land degradation. The most common physical component of land degradation is soil erosion. As a results, farmers' yields are in general less than one-third of potential yields found in research station, and yields of most crops have been declining since the early 1990s, Pender, *et al,* (2004), Deininger and Okidi, (2001).

Second, prohibitive input prices combined with inability of smallholders to replenish soil nutrients are seriously inhibiting land productivity. A study by Walusimbi (2002) in Uganda that involved a randomly selected 451 households found that only 5.4% of farmers use organic fertilizers and only 35.14% used pesticides. Omamo (2002) argues that the low rate of fertilizer utilization in Uganda and other African countries is partly a result of systematic exclusion of smallholders from fertilizer markets due to high prices. The private input traders in liberalized markets typically sell fertilizer to rural areas at prices that justifiably render its use unprofitable, Kaizzi (2002). This in turn creates low demand for fertilizers. Despite the fact that real input prices fell in the 1990s due to liberalization and greater competition in the market (Balihuta and Sen 2001), fertilizer prices remained relatively high and unaffordable to the majority of farmers. Woelcke *et al.* (2002) argue that substantial overhaul of the marketing system is required to give farmers sufficient incentive to use fertilizer and other sustainable land management practices.

The factors behind the high fertilizer prices are inefficiencies in the distribution system, characterized by inefficient procurement, high transportation costs, and imperfect competition due to a few big traders dominating the market, Nkonya *et al* (2004). These factors reinforce to increase the transaction costs of fertilizer marketing. The low volume of fertilizer imported into Uganda also contributes to the high transaction costs, IFDC (2001). It has been estimated that the cost, insurance, and freight (c.i.f.) price of fertilizer in Kampala could fall by a quarter only by increasing the volumes shipped to levels that would justify trainloads (IFDC 2001).

Third, the absence of efficient rural financial system also constitutes a significant hindrance to agricultural productivity in Uganda. Lack of credit not only contributes to overexploitation and degradation of the natural resource base (Pender 1996; Holden *et al*. 1998) but it also reduces the farmers' ability to acquire and use purchased inputs needed for sustainable agricultural development (Larson and Frisvold 1996). Access to credit through commercial channels for smallholders is practically difficult. Typically, lenders assume a huge risk when providing credit to this segment of the population, and the interest rates that need to be charged to offset this risk make the loans themselves unaffordable to smallholders. For example, Banks such as Standard Chartered and Stanbic, do not lend to farmers directly, but offer loans indirectly through the ginners and exporters by funding trading and ginning activities. (Nsibirwa and Tiffen, 2003). Even when credit is available, there is no guarantee that it will be used to improve agricultural production. A study by Deininger and Okidi (2001) found that only 15 percent of loans in 1999 were used to purchase inputs, and only 7 percent of loans were used for agricultural investments in land and livestock. The largest share of loans was used to finance health and education expenditures.

Fourth, most farmers work in the fields with primitive tools such as a hand hoe and are unable to access extension services that would help them to improve production and harvesting practices. A study by Walusimbi (2002) in Uganda that involved a randomly selected 451 households found only 47% of cotton farmers reported to have received agricultural training between 1990 and 2000 and only 39.4% had contact with extension officers in 2000. The use of tractors by small-scale farmers in general remains very limited—farmers cannot afford the hire costs since income from selling their produce has been falling due to lower and falling in real producer prices (see figures 5.6 and 5.7

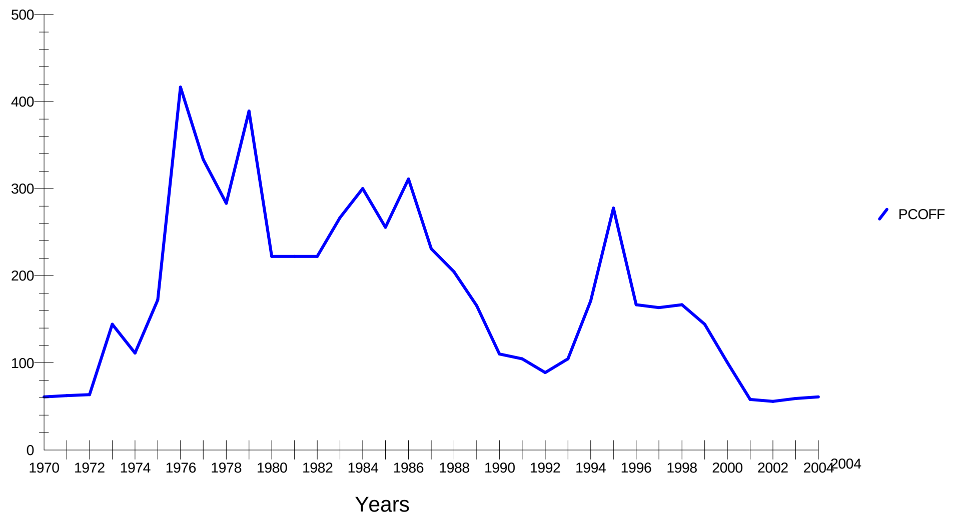


Figure 5.6: Real Price of coffee 2000=100

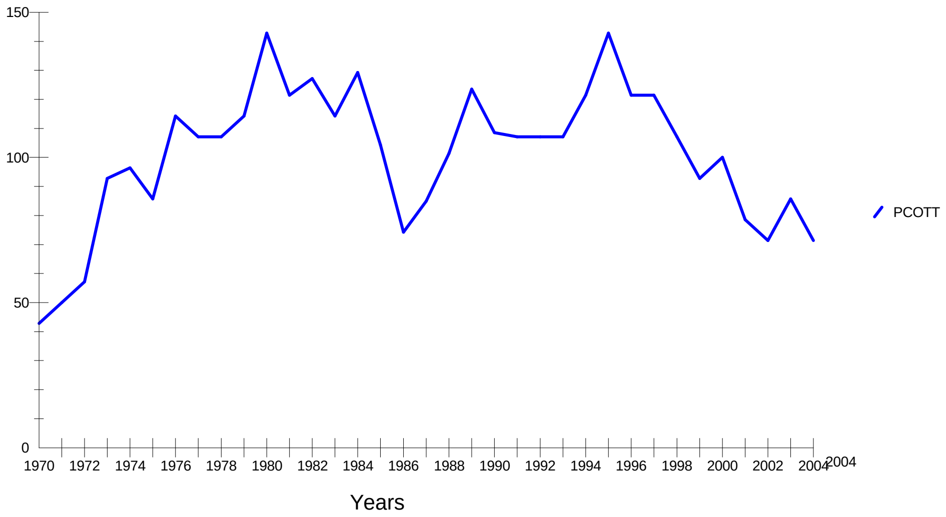


Figure 5.7: Real Price of cotton 2000=100

Fifth, inadequate Government Support to the agricultural sector is also compounding the problems related to land productivity. For example, between 1993 and 1996, the Small Holder Cotton Rehabilitation Project geared toward strengthening the cotton-breeding program in order to improve cotton planting and greater use of animal traction was launched. The project also aimed at improving the efficiency and impact of supporting services through national research and extension services. However, until 2002 some of the agronomic and integrated pest management technologies were not yet transferred to the farmers; and the improved ox-drawn implements were not yet available commercially, Walusimbi, (2002). Pesticides programme was, however, stopped during the 2001/2002-cotton season due to loan recovery problems caused mainly by avoidance of payments by farmers, Walusimbi, (2002). The likely reasons for farmers' reluctance to repay pesticides credits are that some farmers may received pesticides late or not at all, they may consider their ginners pesticides to be too expensive, or they may be defaulting on their sales contract in order to obtain higher prices from other buyers.

Last but not the least, poor infrastructure also prevent the transmission of price signals to farmers and render the production of agricultural products insensitive to price incentives (Rashid 2002). Poor infrastructure also hampers smallholders' access to modern agricultural inputs, which are usually imported or produced in urban areas. In addition, poor infrastructure insulates the rural economy from the market. Typically, areas with better market access are likely to receive higher prices for their outputs and pay lower prices for inputs due to lower transaction costs, Nkonya, *et al* (2004). It is also evident that better market-access areas are benefiting from privatization and market liberalization, which make inputs cheaper and easier to obtain (Omamo 2002). This is likely to promote increased use of inputs and increased participation in the market, and may promote more investment in land improvement.

5.6 Concluding Remarks

The major purpose of this chapter was two fold: first, to test the existence of inverse relationship in Ugandan tradable sector using coffee and cotton as our unit of analysis. Second, to examine empirically the effect of trade liberalization on land productivity. Four liberalization indicators have been employed: dummy variables, producer price, the share of producer price to the export price, and; finally the KOF globalization index. The empirical results have supported our hypothesis—the existence of diminishing returns. The impact of trade liberalization on land productivity, however, is not conclusive. The estimated coefficients are positive but not statistically significant.

This chapter has identified several causes of diminishing returns in Ugandan agriculture and inability of this sector to respond to the incentive created by liberalization package. More particularly, farm level constraints include: continued dependence on hand-hoe production, limited availability of some key inputs, limited access to credits, ineffective extension services, land fragmentation and low producer prices. In other words, inability of exports to respond to incentive created by trade liberalization is not so much to do with the sector itself, but rather it is due to farming practices, limited access to inputs, credit and new technologies. Thus, while trade liberalization is viewed to be beneficial, both through improving incentives to exports and providing gains to consumers, it does not guarantee increased productivity, leave alone export growth.

APPENDIX 5.0

Table 5.2: Augmented Dickey Fuller Test

Variables		First Difference			
		Without trend		With linear trend	
		t-statistic	lags	t-statistic	lags
Coffee	ΔLand Productivity	-3.7176	3	-3.6760	3
	ΔHectare	-6.8722	1	-6.7179	1
	Δ(Export/GDP)	-5.5586	1	-5.5292	1
	ΔProducer Prices	-4.6717	1	-4.9123	1
	Δ(Producer Price/Export Price)	-3.2163	2	-7.6281	1
	KOF-Globalization Index (GBI)	-2.5184	1	-4.5800	1
Cotton	ΔLand Productivity	-4.8137	1	-4.9817	1
	ΔHectare	-5.4185	3	-6.8322	3
	Δ(Export/GDP)	-4.0594	1	-3.6496	1
	ΔProducer Prices	-4.7541	1	-4.9853	1
	Δ(Producer Price/Export Price)	-6.9425	1	-6.9527	1
	KOF-Globalization Index (GBI)	-2.5184	1	-4.5800	1

Notes: Critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 5.3: OLS Estimation: Dependent Variable is coffee output per hectare 34 observations used for estimation from 1971 to 2004

	Column 1	Column 2	Column 3	Column 4
Constant	-1.3107 (2.1791)	-.53207 (2.8449)	-.35132 (2.6748)	-.41977 (2.4159)
ΔHectare	-.042101*** (.011451)	-.041765*** (.010145)	-.041617*** (.010122)	-.041392*** (.010097)
Weather	-3.4678*** (.73411)	-3.4011*** (.65137)	-3.3953*** (.65103)	-3.3984*** (.649230)
Δ(Export/GDP)		2.9477** (1.2148)	2.9581** (1.2141)	2.9493** (1.2127)
Coffee Boom		3.2218** (1.1765)	3.2418** (1.1721)	3.2336** (1.1646)
Lib Dummy 88		1.1751 (3.9296)		
Lib Dummy 90			.94071 (3.9266)	
Lib Dummy 94				1.4767 (4.1311)
Adjusted R^2	.52	.62	.62	.62
F-Statistic	18.8322***	12.0602***	12.0400***	12.0843***
Serial Correlation	2.7382[.108]	1.2376[.276]	1.2008[.283]	1.1517[.293]
Functional form	.0031299[.956]	.0029267[.957]	.0016809[.968]	.8062E-6[1.00]
Normality (χ^2)	.96185[.618]	.95748[.620]	.94218[.624]	.99473[.608]
Heteroscedasticity	1.2934[.264]	1.3276[.258]	1.3154[.260]	1.4553[.237]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses;
3. Diagnostic Tests are reported using the Lagrange Multiplier statistic
4. P-values are in square brackets []

Table 5.4: OLS Estimation: Dependent Variable is coffee output per hectare 34 observations used for estimation from 1971 to 2004

	Column 1	Column 2	Column 3
Constant	.25824	.30278	-.79599
	(1.9681)	(2.0173)	(2.2148)
ΔHectare	-.040920***	-.040256***	-.040837***
	(.010024)	(.010612)	(.010025)
Weather	-3.2274***	-3.3388***	-3.4294***
	(.65228)	(.67657)	(.64377)
Δ(Export/GDP)	2.0611	2.7993**	3.0256**
	(1.4055)	(1.3537)	(1.2003)
Coffee Boom	3.3784***	3.3710**	3.1547**
	(1.1431)	(1.2092)	(1.1545)
Δproduce Price_{t-1}	3.7803		
	(3.1988)		
$\Delta(\text{Producer Price /Export price})_{t-1}$		2.3129	
		(10.1997)	
KOF-GBI			130.6793
			(157.5519)
Adjusted R^2	.64	.62	.63
F-Statistic	12.4078***	11.5642***	12.4365***
Serial Correlation	1.7855[.181]	1.7077[.191]	1.0492[.306]
Functional form	.17401[.677]	.038016[.845]	.0063138[.937]
Normality (χ^2)	.69074[.708]	.89628[.639]	.56888[.752]
Heteroscedasticity	1.6000[.206]	1.3536[.245]	1.4133[.235]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses;
3. Diagnostic Tests are reported using the Lagrange Multiplier statistic
4. P-values are in square brackets []

Table 5.5: OLS Estimation: Dependent Variable is cotton output per hectare
34 observations used for estimation from 1971 to 2004

	Column 1	Column 2	Column 3	Column 4
Constant	.98298	1.7283	1.4701	1.0917
	(1.2312)	(1.5875)	(1.4610)	(1.2889)
ΔHectare	-.0017653**	-.0035211***	-.0035102***	-.0034921***
	(.8683E-3)	(.8529E-3)	(.8493E-3)	(.8379E-3)
Weather	-1.7238***	-1.5716***	-1.5781***	-1.6081***
	(.50206)	(.39869)	(.39847)	(.39485)
Δ(Export/GDP)		3.6970***	3.6058***	3.4933***
		(1.1006)	(1.0731)	(1.0280)
SCRP		1.5111**	1.4790**	1.5784***
		(.56321)	(.56478)	(.54906)
Lib Dummy 88		.11957		
		(2.0938)		
Lib Dummy 90			.66068	
			(2.0651)	
Lib Dummy 94				1.8862
				(2.0639)
Adjusted R^2	.31	.57	.57	.58
F-Statistic	8.4544***	9.7120***	9.7662***	10.1669***
Serial Correlation	.44627[.504]	.84715[.357]	.81703[.366]	1.1634[.281]
Functional form	.90578[.341]	2.5390[.111]	2.5926[.119]	.77353[.386]
Normality (χ^2)	.95810[.619]	.43178[.806]	.35236[.838]	1.0569[.590]
Heteroscedasticity	1.3306[.249]	1.0124[.314]	.90454[.342]	.80248[.370]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses;
3. Diagnostic Tests are reported using the Lagrange Multiplier statistic
4. P-values are in square brackets []

Table 5.6: OLS Estimation: Dependent Variable is Cotton Output per hectare
34 observations used for estimation from 1971 to 2004

	Column 1	Column 2	Column 3
Constant	1.5771	1.8729*	1.1590
	1.0164	(1.0562)	(1.1404)
ΔHectare	-.0030959***	-.0037470***	-.0034258***
	(.9812E-3)	(.9453E-3)	(.8306E-3)
Weather	-1.2733***	-1.6123***	-1.6350***
	(.41740)	(.40519)	(.39126)
Δ(Export/GDP)	3.9258***	3.9307***	3.4817***
	(1.0759)	(1.1165)	(1.0033)
SCRP	1.5717***	1.2832**	1.4447**
	(.53282)	(.60817)	(.54133)
Δproduce Price_{t-1}	11.6657*		
	(6.7278)		
Δ(Producer Price /Export $\text{price})_{t-1}$		8.3406	
		(8.9375)	
KOF-GBI			95.5999
			(76.4923)
Adjusted R^2	.60	.56	.59
F-Statistic	10.6144***	9.4746***	10.5643***
Serial Correlation	.60853[.435]	.53024[.467]	1.3838[.239]
Functional form	2.1123[.146]	1.2738[.259]	1.8756[.171]
Normality (χ^2)	.50167[.778]	.73469[.693]	.16582[.920]
Heteroscedasticity	.87218[.350]	1.1305[.288]	.74990[.387]

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses;
3. Diagnostic Tests are reported using the Lagrange Multiplier statistic
4. P-values are in square brackets []

Table 5.7: Panel Data Estimation
Dependent Variable is the logarithms of Output per hectare

	Fixed Effects	Random Effects	IV fixed effects	IV random effects
Constant	5077.367	4844.165	4457.752	4153.145
	(6767.319)	(12521.98)	(6897.284)	(12523.98)
Hectare	-.025818***	-.023657***	-.0282027***	-.0252378**
	(.0097003)	.0090764	.0115252	(.0105189)
GBI	1395.626***	1376.082***	1427.764***	1400.765***
	(321.1768)	(319.6204)	(329.8416)	(326.9897)
UPSW	.7040708	.771826	1.190514	1.273655
	(4.022979)	(4.020727)	(4.09215)	(4.089317)
Coffee Boom	-4.277164	-4.335387	-3.583044	-3.673945
	(5.569284)	(5.56738)	(5.658501)	(5.655687)
SCRP	4.512939	4.490401	4.567229	4.535791
	(4.373536)	(4.372494)	(4.425624)	(4.42458)
Weather Dummy	2.497648	2.501126	2.483923	2.488869
	(2.501126)	(5.650367)	(5.718135)	(5.717144)
No.of Groups	42	42	42	42
No.of Obs	1470	1470	1470	1470
F test	8.14***	--	66.90***	--
Wald χ^2	--	48.58***	698.06***	47.84**

Notes: 1. *** Implies significant at 1%, **significant at 5% and * significant at 10%
2. Standard errors in parentheses

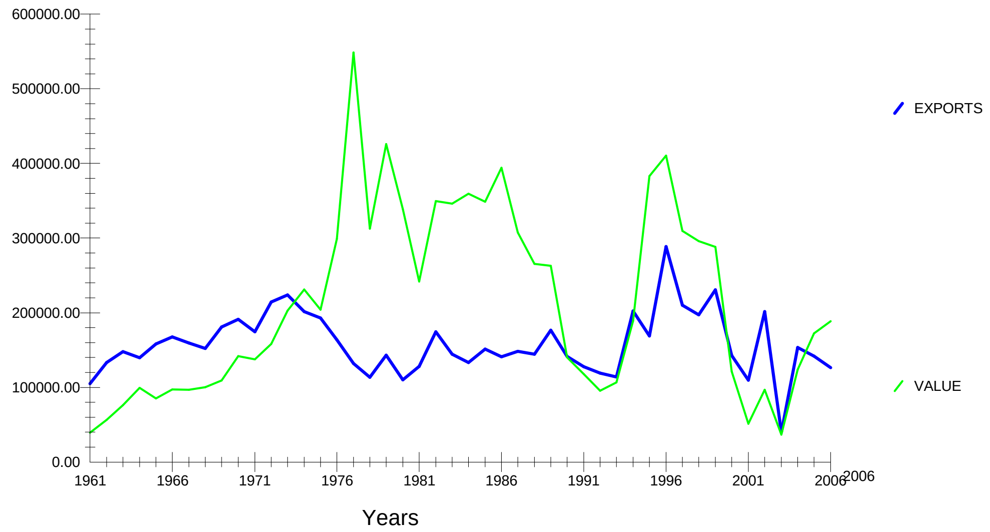


Figure 5.8 Coffee Exports and Value of Exports Earnings in Uganda

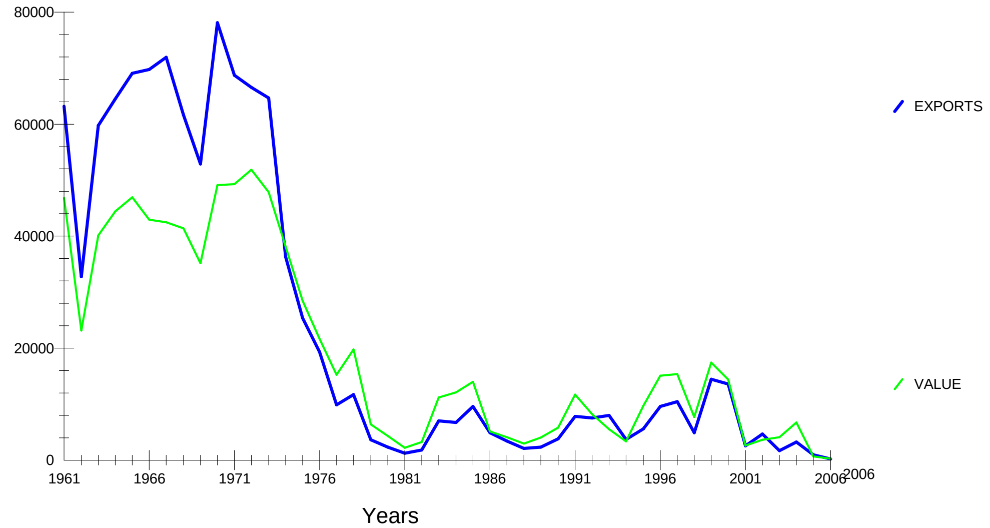
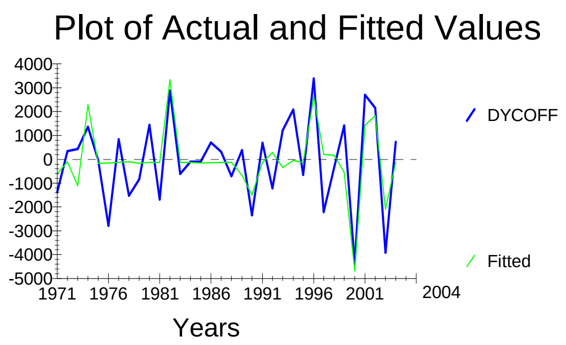


Figure 5.9 Cotton Exports and Value of Exports Earnings in Uganda

Column 1 (Table 5.3)



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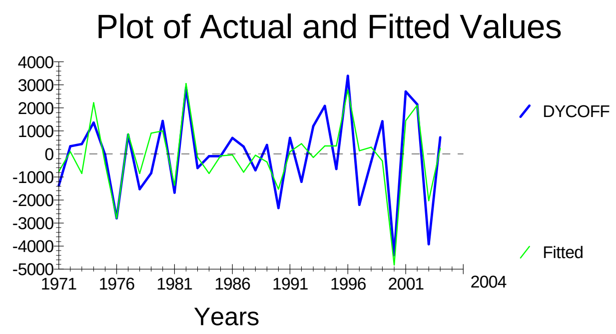

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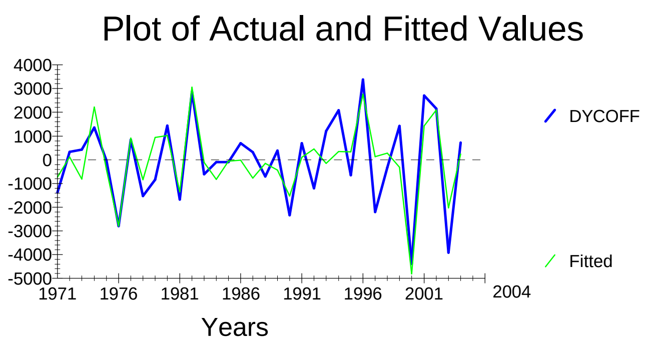

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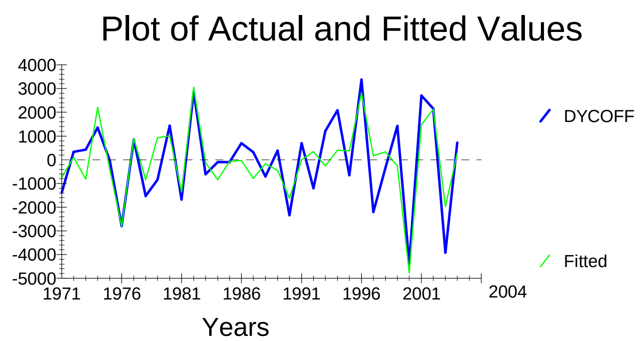
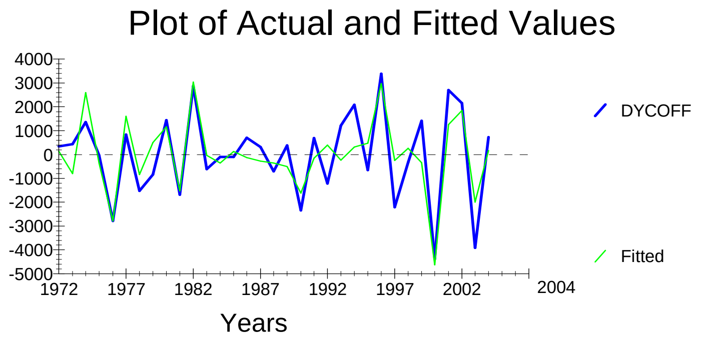


Figure 5.10: Plot of Actual and Fitted Values of Residual

Column 1 (Table 5.4)



Column 2 (Table 5.4)

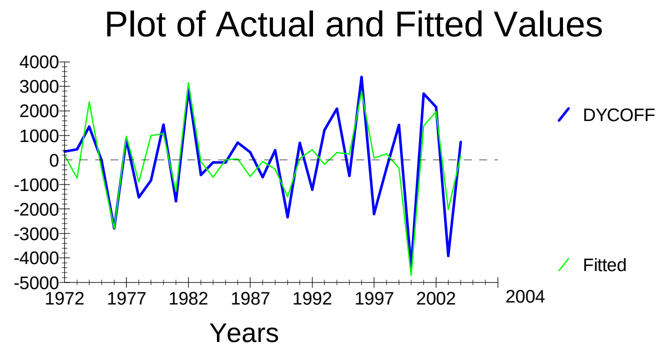
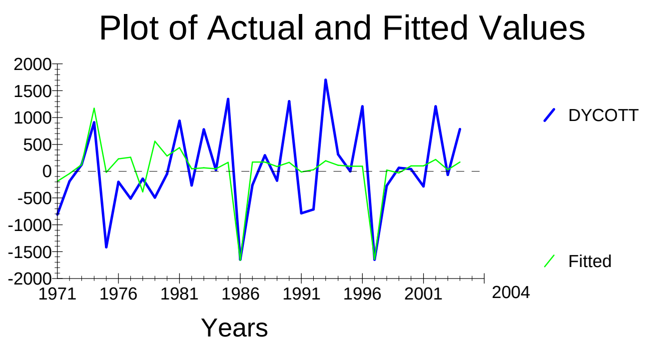


Figure 5.11: Plot of Actual and Fitted Values of Residual

Column 1 (Table 5.5)



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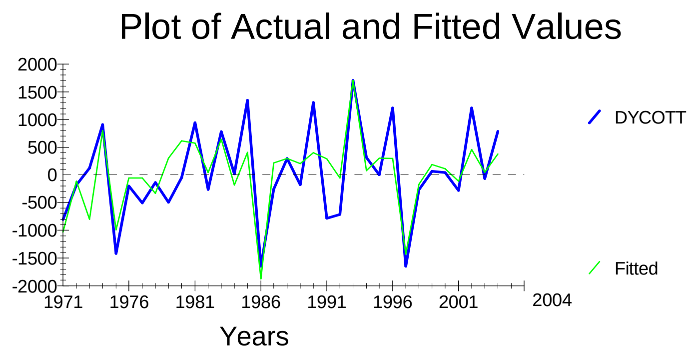

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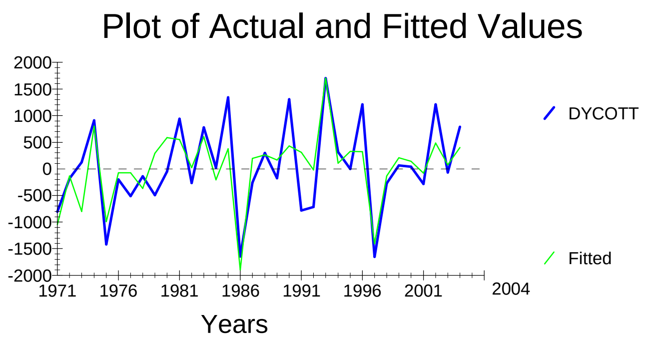

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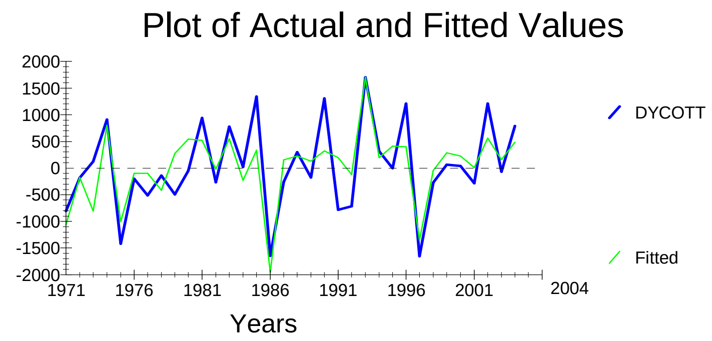
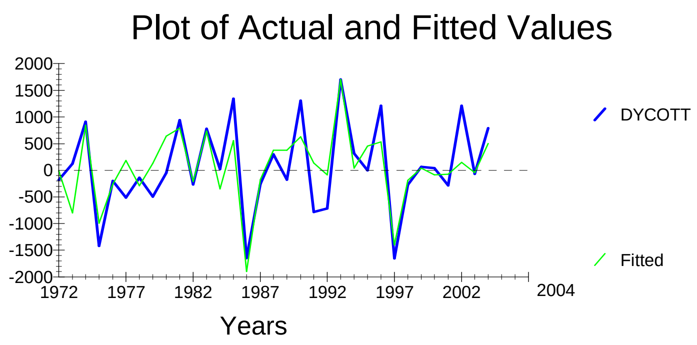


Figure 5.12: Plot of Actual and Fitted Values of Residual

Column 1 (Table 5.6)



Column 2 (Table 5.6)

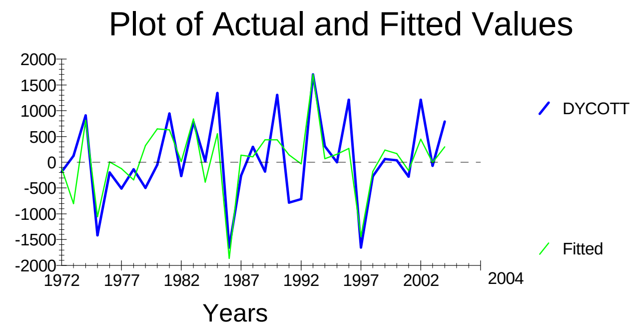
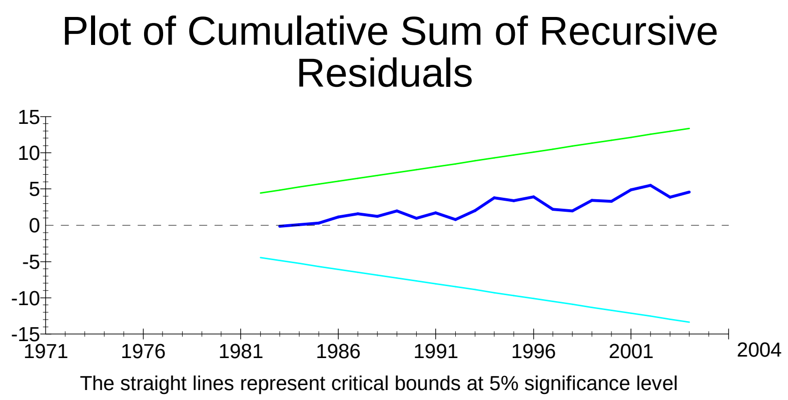


Figure 5.13: Plot of Actual and Fitted Values of Residual

Column 1 (Table 5.3)



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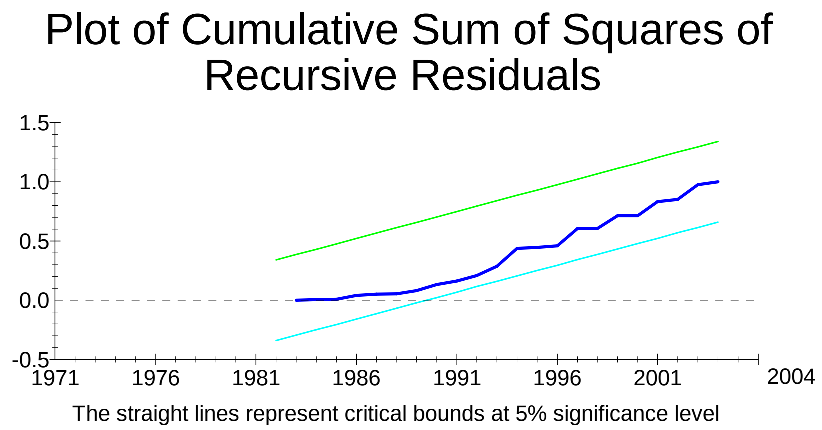

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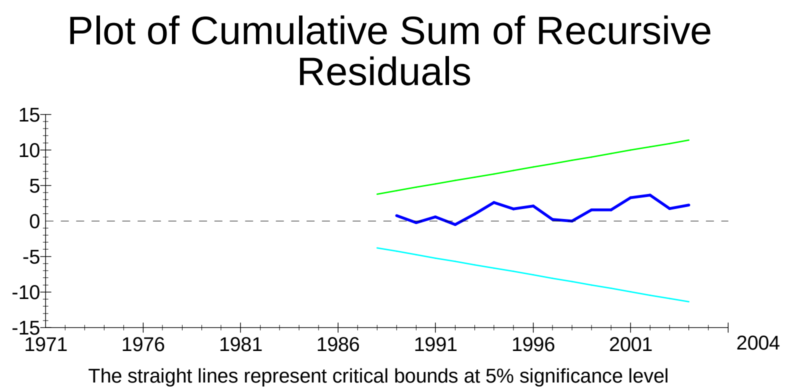

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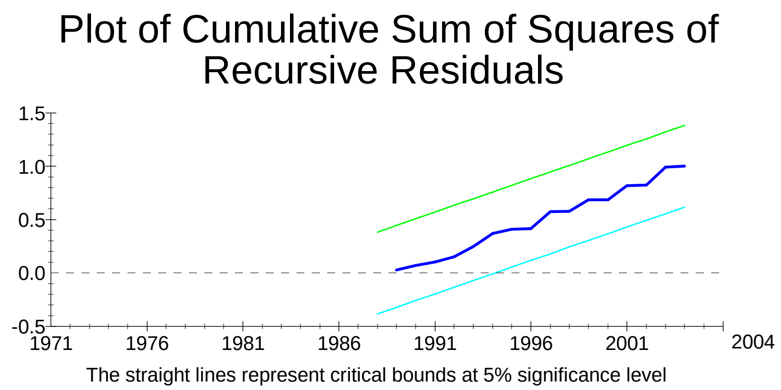
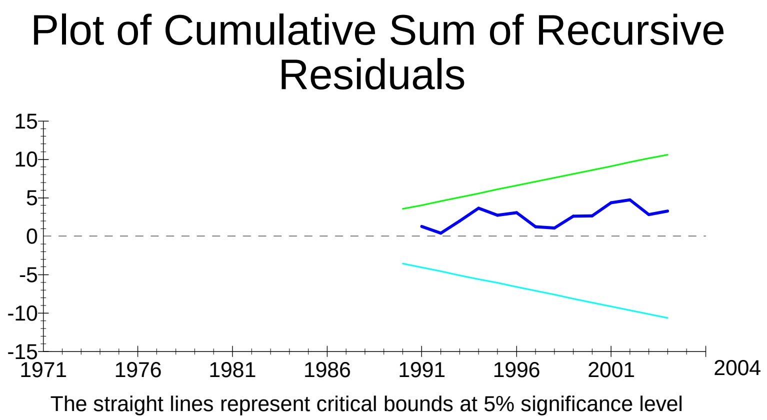


Figure 5.14: The Plot of CUSUM and CUSUM-Q tests

Column 3 (Table 3.5)



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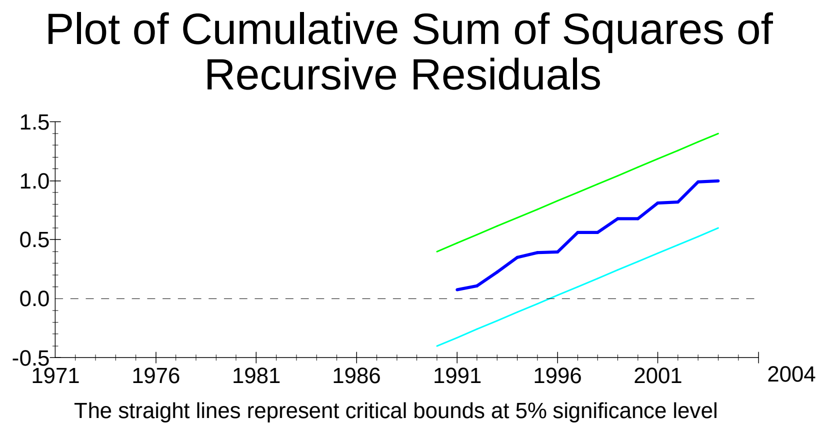
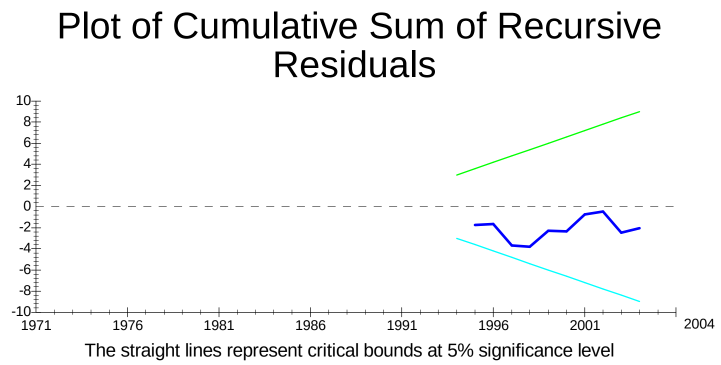


Column 4 (Table 3.5)



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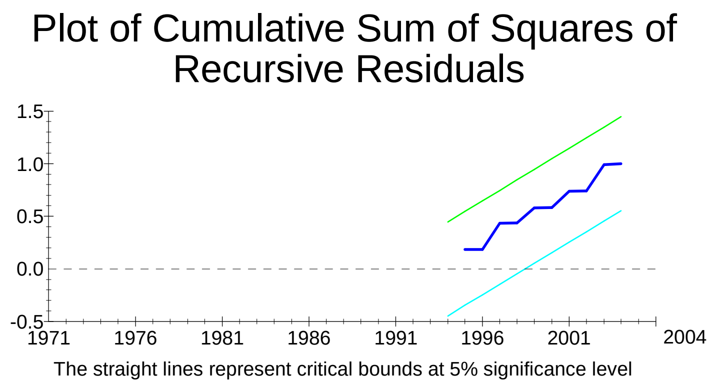
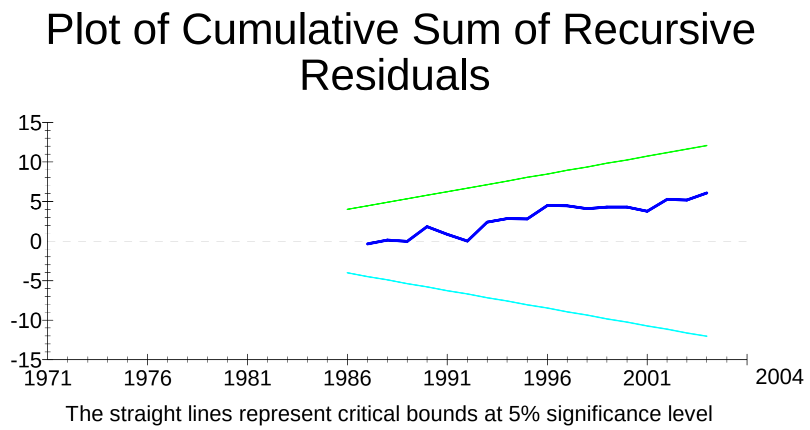


Figure 5.15: The Plot of CUSUM and CUSUM-Q tests

Column 1 (Table 5.6)



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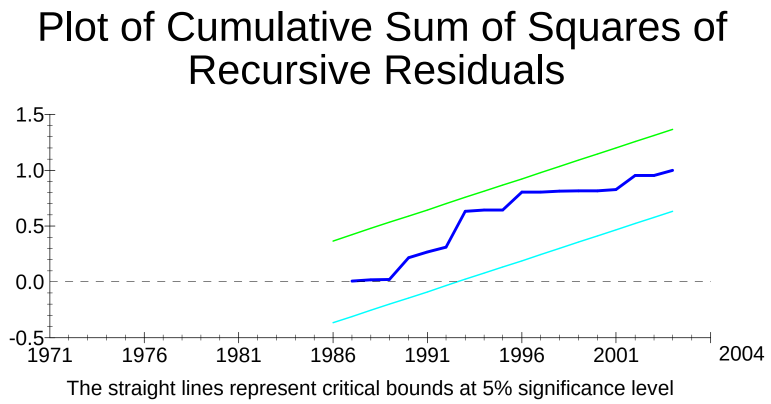

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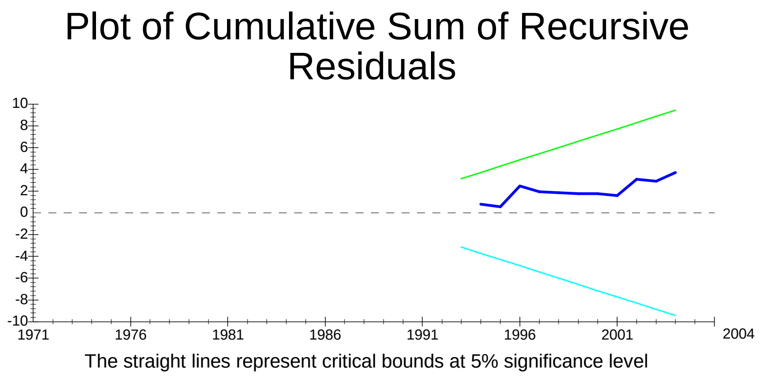

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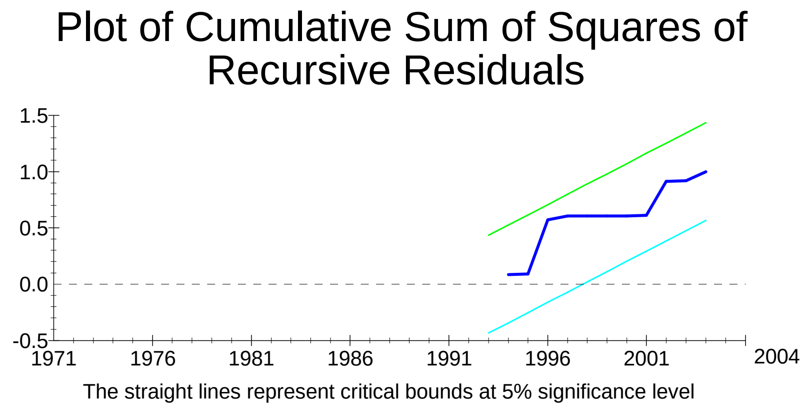
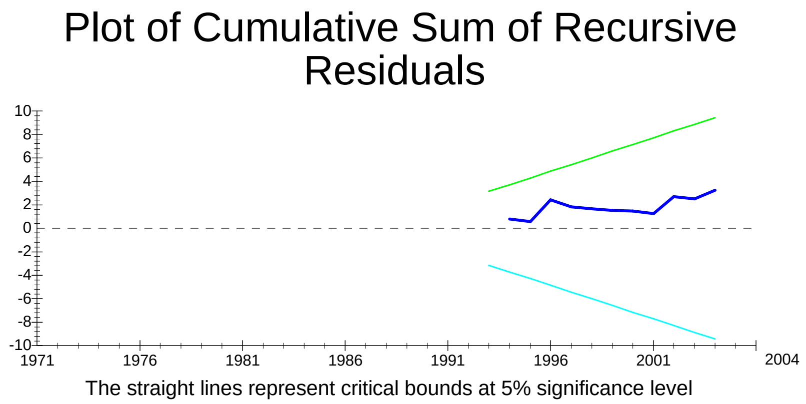
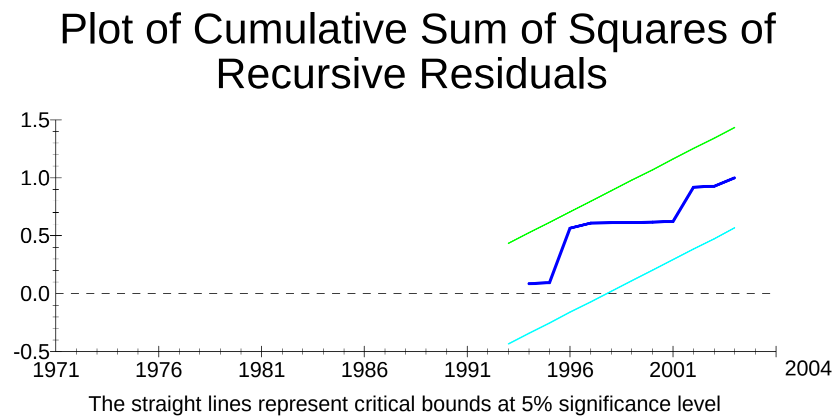


Figure 5.16: The Plot of CUSUM and CUSUM-Q tests

Column 3 (Table 5.6)



Column 3 (Table 5.6)



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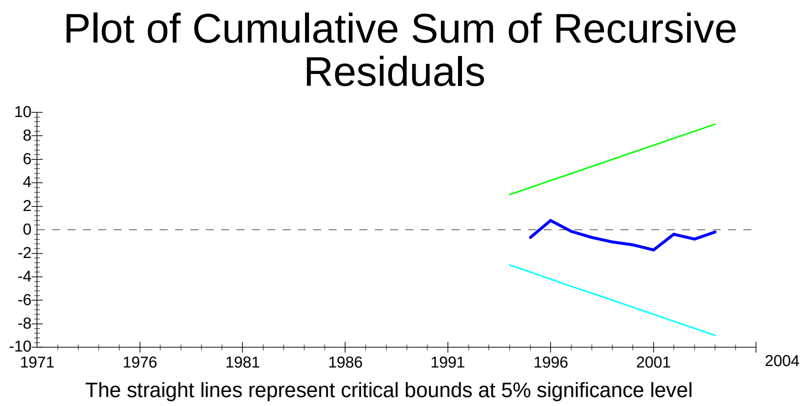

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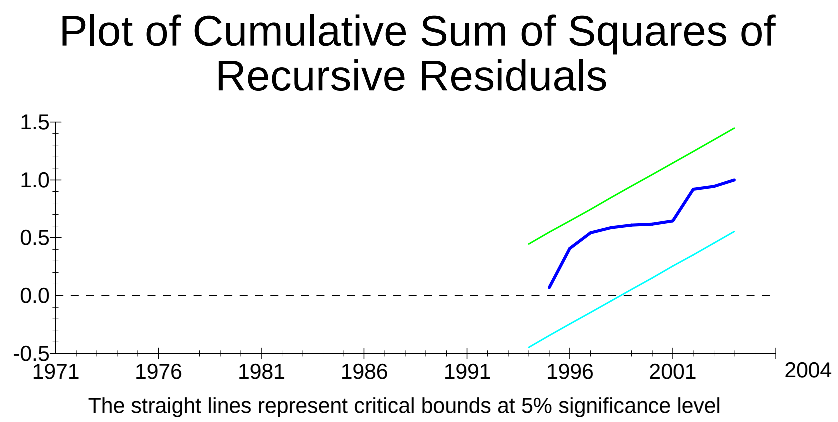

Figure 5.17: The Plot of CUSUM and CUSUM-Q tests

CHAPTER SIX
LONG RUN EFFECTS OF TRADE LIBERALIZATION ON ECONOMIC GROWTH

6.1 Introduction

The widely accepted view among economists is that, *ceteris peribus*, countries with fewer trade restrictions will have faster economic growth than countries with inward looking polices that heavily restrict trade, Edwards, (1992,1997); Frankel *et al.*, (1999); Krueger, (1998), Dollar and Kraay, (2004). This view is nonetheless, challenged by new trade theories which predict the ambiguous effect of trade liberalization on growth. As discussed in chapter 3, trade liberalization may accelerate increased foreign competition that could discourage innovation and hence reduces the pace of economic growth.

At empirical level, however, the conclusions derived from most studies on the effects of openness of growth typically rely on cross-section/panel settings in a group of countries, which ignore idiosyncratic changes that have occurred over time within a specific country. Although new development in panel data analysis offers a solution for controlling heterogeneity within the group of countries under investigation, this approach is, nonetheless, not immune to the empirical generalization.

In this chapter, we exploit Tanzanian dataset to explore empirically the connection between openness and growth. In doing so, we employ ordinary least square, Autoregressive Distributed Lag (ARDL) and Johansen Maximum Likelihood approaches to cointegration to test the hypothesis that openness (i.e., export plus imports over gross domestic product) and economic growth are positively correlated in Tanzania.

The remainder of this chapter is organized in six sections as follows. Section 6.2 specifies an econometric model and type of data that are used in empirical analysis. In section 6.3, we report the least square results. Section 6.4 outlines the ARDL approach to cointegration and give the empirical results. Section 6.5 sketches out the Johansen approach to cointegration and then report the estimated results. While section 6.6 discusses the results, section 6.7 concludes.

6.2 Econometric Model and Data

This section describes uses three econometrics methods mentioned earlier to assess the relationship between openness and economic growth. We the use standard growth equation as shown below:

$$y_t = \beta_0 + \sum_{i=1}^{k} \beta_i x_{i,t} + \delta z_t + u_t \qquad u_t \sim N(0,\sigma^2) \tag{6.1}$$

Different versions of this regression equation are used and the most preferable results are reported. Note that y_t stands for economic growth; defined as the log difference of the Real Gross Domestic Income adjusted for changes in the term of trade, x_i's are standard determinants of growth, e.g., growth of human capital, growth of population, and other relevant variables such as policy dummies and lagged dependent variables. Note that z is the share of exports plus imports over gross domestic product. As is standard in literature, this is our measure of openness. All variables are expressed in logarithmic form

The data are annual observation published by Alan Heston, Robert Summers and Bettina Aten, *Penn World Table* Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006. The data from Penn World Table Version 6.2 include: Real Gross Domestic Income adjusted for changes in the term of trade, Openness indicator defined as a sum of exports plus imports divided by the real GDP; and population, which is used as proxy for labour force. Secondary schools' enrolment data as proxy for human capital are taken from the Ministry of Education in Tanzania.

6.3 Empirical Results: Ordinary Least Square

The conventional wisdom in time series analysis underscores the importance of testing for unit root in time series data before running regressions. Having this in mind, we use the Augmented Dickey Fuller test (ADF) with and without a trend to test for the unit root. Note that the ADF is virtually the same as the Dickey Fuller (DF) test except the lag length has to be long in order to reflect the additional dynamics that cannot be captured by the DF to ensure that the error term is a white noise. The ADF is specified as follows;

$$\Delta X_t = \alpha + \gamma X_{t-1} + \alpha_2 t + \sum_{i=1}^{n} \beta_i \Delta X_{t-i} + e_t$$

Where; X_t is the variable to be tested, α is a constant term and t is a trend. The parameter of interest is γ. If $\gamma=0$, the $\{X_t\}$ sequence contains a unit root. The relevant null hypothesis is that: H_o $\gamma=0 \Rightarrow X_t \sim I(1)$ against the alternative hypothesis of H_A $\gamma<0 \Rightarrow X_t \sim I(0)$. Thus, the null hypothesis is rejected if the t-value of the estimated γ is significantly less than zero according to Dickey-Fuller critical value and we conclude that X_t is stationary, otherwise we do not reject the H_o and conclude that X_t is I (1) series.

Table 6.1 reports the results for unit root test. From the ADF statistics based on regressions with and without a trend we find that the null hypothesis that the first differences of these variables have a unit root is strongly rejected at 95% critical values. Hence, it seems reasonable to conclude that our variables are integrated in the first order. This is confirmed in columns (5) and (7) in table 6.1

We then employed the ordinary least square method to estimate our econometric model in the first difference. Table 6.2 reports the empirical results. The most important coefficient in our analysis is the openness indicator, which is both negative and not statistically indistinguishable from zero at 1% confidence level. The human capital coefficient as proxied by gross enrolment in secondary school is negative but not statistically significant. On the other hand, the coefficient for labour force as proxied by population is both negative and statistically significant at 1% confidence level. The F test shows that the estimated coefficients are jointly significant at 1% confidence level. Although the adjusted coefficient of determination is below 50%, our results pass the battery of diagnostic tests. Moreover, both the CUSUM and CUSUMSQ tests of structural stability confirm the stability of our regression coefficients (see figures 6.2 and 6.3).

The results presented in table 6.2 have assumed away major economic shocks that the country experienced over the last thirty years. Two major shocks are introduced in the regression analysis: the oil price hike of 1978 and the adoption of Structural Adjustment Programme in 1986. The oil dummy assumes the value of 1 in 1978 and zero elsewhere; the adjustment shock takes the value of 1 in 1987 and zero elsewhere. Table 6.3 reports the empirical results that take into account the impact of these two economic shocks.

Clearly, it can be seen from table 6.3 that our results have improved remarkably as a result of introducing economic shock. Both dummies carry negative signs, which are statistically significant at 1% confidence level. The most important coefficient in our analysis—openness indicator has maintained the same sign and the same level of significance. However, a closer comparison between the two empirical specifications reveals that the results presented in table 6.3 look better than that presented in Table 6.2. Note that the adjusted R^2 has risen to 70% from 45% reported in table 6.2. Both the Akaike information and Schwartz Bayesian Criteria suggest that the estimated model presented in table 6.3 is superior to that in table 6.2.

Until this point, however, it is important to note that the estimated coefficients reported hitherto display the short-run relationship since we have used the “first difference” in our estimation. In doing so, however, we are loosing valuable long run information. To overcome this shortcoming, a cointegration analysis is recommended. We return to this technique in the next sections.

6.4 Long Relationship: Autoregressive Distributed Lag (ARDL) Approach

In this section, we employ a cointegration analysis based on ARDL approach as advanced by Pesaran and Shin (1999) and Pesaran *et al.* (2001) to estimate the long run relationship between openness and economic growth. The main advantage of this procedure is that it can be applied regardless of whether the series are I (0) or I (1). That is, this approach avoids pre-testing procedures to verify whether the series are stationary or non-stationary. Another advantage of this approach is that it is more efficient in small or finite sample data set such as the one we are using in the current study. To implement this approach, we start by modelling equation 6.1 as an ARDL-Error Correction Model (ECM) as follows:

$$\Delta y_t = a_0 + \sum_{i=1}^{n} \varphi_i \Delta y_{t-i} + \sum_{i=1}^{n} \beta_i \Delta x_{i,t-i} + \sum_{i=1}^{n} \delta_i \Delta z_{i,t-i} + \pi_1 y_{i,t-1} + \pi_2 x_{i,t-1} + \pi_3 z_{i,t-1} + u_t$$

The implementation of this approach involves two stages. In the first stage, the existence of a long run relationship is tested by computing the “F” statistic which tests the significance of the lagged levels of the variables in the error correction form that underlie the ARDL model. This involves testing the null hypothesis of non-existence of long run relationship defined as:

$$H_0 : \pi_1 = \pi_2 = \pi_3 = 0 .$$

Against the alternative hypothesis defined as:

$$H_1 : \pi_1 \neq 0, \pi_2 \neq 0, \pi_3 \neq 0$$

The computed “F” statistic gives two sets of critical values. One set of critical values assumes that all the variables in the ARDL model are $I(1)$. Another set of critical values assumes that all the variables in the ARDL model are $I(0)$. In each application, this procedure provides a band covering all possible classification of the variables into $I(0)$ and $I(1)$. If the computed “F” statistic falls outside this band a conclusive decision can be made without needing to know whether the underlying variables are $I(0)$ or $I(1)$. If the computed “F” statistic falls within the critical value band, the result of the inference is inconclusive and depends on whether the underlying variables are $I(0)$ or $I(1)$.

The second stage in the ARDL approach involves the estimation of the long run coefficients. This is done when a stage one (a test for cointegration) shows that the relationship between variables is not spurious as it is the case in the current application. Since our observations are annual, we choose 2 as the maximum order of the lags in the ARDL and carry out the estimation over the period between 1970 to 2003. The F-statistic for testing the joint null hypothesis of no cointegration is 4.4. Using the asymptotic critical value computed by Pesaran, *et al*. (2001), the test statistic exceed the upper of the critical value band at 99% confidence level. Therefore, we can safely reject the null of no cointegration irrespective of the order of the integration.

The ARDL (1,0,2,2) Selected Based on SBC is reported in table 6.4. The coefficient of openness indicator remains negative and not statistically insignificant at 1% confidence level. The lagged coefficient of GDP growth rate is positive and statistically significant at 1%. The coefficient of human capital lagged two years carry positive sign and is statistically significant at 1% confidence level. The coefficients for population have produced mixed signs. Note that the underlying ARDL equation passes all diagnostic tests. The predictive power of the ARDL model as shown by the adjusted R^2 is very high, suggesting that the influence of omitted variables is trivial. The F-statistic indicates that our regressors are jointly significant at 1% confidence level.

The long-run coefficients are reported in table 6.5. The coefficient of openness indicator is once again negative and statistically significant at 1%. However, this time, the estimated coefficient of human capital as proxied by gross enrolment is positive and significant at 1%. The population coefficient is also both negative and statistically significant at 1% confidence level. This result is not surprising given that population growth has been growing annually at an average of 2.8, even at times when economic growth was negative in the 1980s.

The final step in the ARDL involves the estimation of the error-correction model. According to Granger's representation theorem (Engle and Granger, 1987) if a set of variables are cointegrated, then there exists a valid error correction representation of the data. The coefficient of error correction term for growth equation is –0.39 and is statistically significant at 1% confidence level suggesting that the pace at which the equation returns to its equilibrium once it has been shocked is not fast enough.

We also report ARDL, long run and ECM estimates based on Akaike Information Criteria (AIC) in tables 6.7, 6.8 and 6.9 respectively. The estimated results based on AIC do not differ remarkably from those based on SBC in tables 6.4, 6.5 and 6.6. The openness indicator in table 6.7 continues to hold negative sign, which is statistically significant. Similarly, the long run coefficients reported in Table 6.8 hold the same signs like in table 6.5, although there is a mild change in terms of the magnitude of coefficients. The error correction term reported in table 6.9 is 0.42; slightly higher than the one based on AIC criteria in table 6.6. Nonetheless, the speed of adjustment to long run equilibrium once the equation has been shocked is not fast enough.

6.5 Johansen Technique

We next employ an alternative technique in estimating the long run coefficients (i.e, Johansen Maximum Likelihood procedure). Basically, Johansen technique provides a unified framework for estimation and testing of cointegration relations in the context of (VAR) error correction models. We briefly outline the Johansen procedure before embarking on empirical implementation. Consider an unrestricted vector autoregressive (VAR) model of up to p lags

$$\mathbf{X_t} = \boldsymbol{\delta} + \boldsymbol{\Phi}_1 \mathbf{X_{t-1}} + \boldsymbol{\Phi}_2 \mathbf{X_{t-2}} + \ldots + \boldsymbol{\Phi}_p \mathbf{X_{t-p}} + \boldsymbol{\varepsilon}_t \qquad (6.2)$$

Where, $\boldsymbol{\varepsilon}_{\mathbf{t}}$ is a vector of white noise disturbances satisfying the following properties: $\mathbf{E}(\boldsymbol{\varepsilon}_{\mathbf{t}}) = \mathbf{0}$, $\mathbf{E}(\boldsymbol{\varepsilon}_{\mathbf{t}}\boldsymbol{\varepsilon}_{\mathbf{t}}') = \boldsymbol{\Sigma}$, $\mathbf{E}(\boldsymbol{\varepsilon}_{\mathbf{t}}\boldsymbol{\varepsilon}_{\mathbf{s}}') = \mathbf{0}, \mathbf{s} \neq \mathbf{t}$. That is, each element of $\boldsymbol{\varepsilon}_{\mathbf{t}}$ has a zero mean. Second, each element of $\boldsymbol{\varepsilon}_{\mathbf{t}}$ has the variance covariance matrix that is constant over time. Thirdly, each element of $\boldsymbol{\varepsilon}_{\mathbf{t}}$ has zero auto-covariance and zero cross-covariance over time. The above VAR can be expressed in error correction form as follows:

$$\boldsymbol{\Delta}\mathbf{X}_{\mathbf{t}} = \boldsymbol{\delta} + \boldsymbol{\Gamma}_{\mathbf{1}}\boldsymbol{\Delta}\mathbf{X}_{\mathbf{t-1}} + \mathbf{...} + \boldsymbol{\Gamma}_{\mathbf{p-1}}\boldsymbol{\Delta}\mathbf{X}_{\mathbf{t-p+1}} + \boldsymbol{\Pi}\mathbf{X}_{\mathbf{t-p}} + \boldsymbol{\varepsilon}_{\mathbf{t}} \tag{6.3}$$

Where, $\boldsymbol{\Gamma}_{\mathbf{i}} = -(\mathbf{I} - \boldsymbol{\Phi}_{\mathbf{1}} - \cdots - \boldsymbol{\Phi}_{\mathbf{i}})$, $(i = 1, \cdots, p-1)$ and $\boldsymbol{\Pi} = -(\mathbf{I} - \boldsymbol{\Phi}_{\mathbf{1}} - \cdots - \boldsymbol{\Phi}_{\mathbf{p}})$. The equation is expressed as a traditional first difference VAR model except for the term $\boldsymbol{\Pi}_{\mathbf{p}}\mathbf{X}_{\mathbf{t-p}}$. The coefficient matrix $\boldsymbol{\Pi}$ contains information about the long run relationship between the variables in the cointegrating vector. In general, the number of cointegrating relation among the set of p variables is unknown. We can use the rank of a matrix to determine the number of cointegrating vectors in the $\boldsymbol{\Pi}$ matrix. There are three possible cases. If the rank of $\boldsymbol{\Pi}$ equals to p, i.e., the matrix $\boldsymbol{\Pi}$ has a full rank, the vector process $\mathbf{X}_{\mathbf{t}}$ is stationary. If the rank of $\boldsymbol{\Pi}$ equals to zero, the matrix $\boldsymbol{\Pi}$ is a null matrix and the above equation is similar to a differenced vector time series model. Finally, if the rank of $\boldsymbol{\Pi}$ is r, such that $0 < r < p$, there exist r cointegrating vectors; in that case $\boldsymbol{\Pi} = \boldsymbol{\alpha}\boldsymbol{\beta}'$, where α and β are $p \times r$ matrices. The cointegrating vectors β have the property that $\beta' X_t$ is stationary even if X_t is non-stationary. In that case, equation (6.3) can be interpreted as an error correction model (ECM).

Johansen and Jusellius (1990) derived the likelihood ratio test for the hypothesis of r cointegrating vectors (i.e., $\boldsymbol{\Pi} = \boldsymbol{\alpha}\boldsymbol{\beta}'$). The first step in the Johansen approach entails testing the hypotheses about the rank of the long run matrix $\boldsymbol{\Pi}$, or equivalently the number of columns in β. For a given a r, it can be shown that the maximum likelihood (ML) estimate for β equals the matrix containing the r eigenvectors corresponding to the r largest estimated eigenvalues. Let us denote the (theoretical) eigenvalues in decreasing order as $\lambda_1 \geq \lambda_2 ... \geq \lambda_p$.

If there are r cointegrating relationships (and $\mathbf{\Pi}$ has a rank of r) it must be the case that $\log(1-\lambda_j)=0$ for the smallest $p-r$ eigenvalues, that is, for $j=r+1, r+2,..., p$. We can use the (estimated) eigenvalues $\hat{\lambda}_1 \geq \hat{\lambda}_2 ... \geq \hat{\lambda}_p$ to test the hypotheses about the rank of $\mathbf{\Pi}$ as follows: $H_0 : r \leq r_0$ against $H_1 : r_0 < r \leq p$ using the trace test, which is given as:

$$\lambda_{trace}(r_0) = -T \sum_{j=r_0+1}^{k} \log(1-\hat{\lambda}_j) \qquad (6.4)$$

The test checks whether the smallest $p-r_0$ eigenvalues are significantly different from zero. The maximum eigenvalues test gives the likelihood ratio test static for the null hypothesis that $H_0 : r \leq r_0$ against $H_1 : r = r_0 + 1$ using:

$$\lambda_{\max}(r_0) = -T \log(1-\hat{\lambda}_{r_0+1}). \qquad (6.5)$$

The next step is to investigate whether all variables in the equation can be modelled in the long run equilibrium relationship. This done by testing linear restrictions on the cointegrating vectors after they have been normalised. The hypothesis of long run exclusion of each variable is tested using a likelihood ratio test, which is asymptotically distributed as χ^2 with degree of freedom equals to the number of restrictions tested. If the test statistics exceeds the 95 percent critical value then those coefficients are significant, implying that the concerned variables should enter into the long run equilibrium relationship

6.5.1 Cointegration Results: The Johansen Technique

The first stage in the analysis is to ascertain the order of integration of the variables using the Augmented Dickey Fuller (ADF) test. However, as reported in table 6.1, it is clear that our variables are integrated in the first order. The second stage involves the selection in the order of VAR model. In this stage, the lag length has to be chosen in a manner that the residuals from the individual equation in the VAR do not suffer from serial correlation, non-normality, etc. This is done by looking at the Akaike information criterion (AIC) and Swartz Bayesian Criterion (SBC). The maximum lags that we chose are 2. Table 6.10 reports the results. Both the Schwartz Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC) suggests a VAR of order of 2. Moreover, we also checked for the presence of autocorrelation and non-normality in the individual equations in the VAR in order to ensure that the residuals are indeed uncorrelated and Gaussian. Table 6.11 shows that both serial correlation and normality are not problems in the current application.

In the third stage, we are required to identify the nature of deterministic variables such as intercept and trends in the underlying VAR. This involves performing the likelihood ratio (LR) test of deletion of deterministic variable in the VAR model. The restriction test as reported in table 6.12 rejected the exclusion of deterministic variables. The next step is estimate the number of cointegrating vector using the whole sample and set the order of the VAR to 2. We estimate an unrestricted VAR with intercepts and restricted trends because two variables are trending (i.e, LEDU, and LPOP).

Table 6.13 shows that the maximum eigenvalue statistics strongly reject the null hypothesis that there is no cointegration (r=0), but do not reject the hypothesis that there is one cointegrating relation between these variables (i.e., r=1). A similar result also follows from the trace test. In practice, these two methods can results in conflicting conclusions, and decisions concerning the choice of the number of cointegrating relations must be made in view of economic theory (Pesaran *et al,* 1997). Alternatively, Cheung and Lai (1993) show that trace statistic is more robust to both skewness and excess kurtosis in the residual than the maximum eigen value test. Thus, whenever a conflict that is not backed by economic theory arises the researcher is guided by the trace statistics. The fourth stage entails resolving the identification problem of the long run relations that arises when the number of cointegrating relations is greater than unity. However, this turns out not to be the case in the current application since we have a unique cointegration vector. The results for the cointegrating vectors are reported in table 6.14.

Engle and Granger, (1987) assert that if a set of variables is cointegrated, then there exists a valid error correction representation of the data. This leads us to the estimation of error correction term. In particular, the coefficient of error correction term for growth equation is (-0.48684) which suggest that it takes a moderate time for growth equation to return to its long run equilibrium once it has been shocked. The above analysis is also supplemented by an examination of short run dynamic properties, by considering the effect of variable specific and system wide shocks on the long run relations with the help of impulse response analysis and persistent profiles. The plot of persistent profile is shown in figures 6.45; and clearly shows the strong tendency to converge to its equilibrium; and the speed of convergence is reasonably fast. To see the effect of equation specific shocks on the cointegrating vector, we plot the orthogonalized and generalized impulse response function. These are plotted as figures 6.5 and 6.6. From these plots, it is clear that the effects of shocks on cointegrating vector die out over time.

6.6 Discussion of Results

This section discusses why the estimated coefficients of openness indicator in various specifications bear negative relationship with economic growth in Tanzania. First it is imperative to note that Tanzania is a net exporter of primary commodities and net importer of manufactured goods and other consumables. However, the largest proportion of imports is ploughed into sectors where the country does not have a comparative advantage. This is reflected in the fact that import of both intermediate goods necessary for growth is very low compared to the combined imports of food and other consumer goods. The adverse effect of the share of trade in GDP on economic growth is further supported by the fact that agricultural production in traditional exports has been affected by low input use, increased incidence of diseases and low returns to producers in the face of escalating cost of production

Secondly, the reason why the share of exports and imports in total output (i.e., openness) is negatively correlated with growth could be connected to the fact that export crops have undergone through a turbulent period of volatile prices. Prebisch (1950) and Singer (1950) argue that countries, which specialize in raw materials and natural resources, are adversely affected in their terms of trade with the rest of the world because the prices of raw materials are more volatile than the price of manufactured goods. The secular deterioration in the terms of trade constrains the availability of funds required for capital formation and growth.

Third, an equally important factor that warrants an examination is the smallness of manufacturing sector in the economy. If exports of manufactures are an important engine of growth—as the literature suggests (e.g., Grossman and Helpman, 1991) and if specialization in agriculture tends to squeeze manufacturing sector as documented elsewhere (e.g., Auty, 2001), then the negative association between openness and growth is a self-fulfilling prophecy. Indeed, primary exports are characterized by diminishing returns, perfect competition and fewer synergies. The recurring motif under these lines of arguments underlines lack of positive externalities emanating from agricultural sector, in contrast to manufacturing towards economic growth. (Hirschman, 1958) maintains that manufacturing sector is characterized by strong forward and backward inter-industry linkages, which are virtually absent in agriculture. More importantly, the most important contribution of manufacturing is not only its effect on the other industries and its intermediate products, but also its effects on the general level of skills, innovations, store of technology and creation of new demands. Manufacturing as opposed to primary commodities leads to a complex division of labour and hence to higher productivity.

Sachs and Warner (1995) developed a model in which the economy consists of two factors of production (i.e, labour and capital) and three sectors: a tradeable natural resource sector, a tradable (non-resource) manufacturing sector, and non-traded sector. The greater the natural resource endowment, the higher is the demand for non-tradeable goods and consequently the smaller is the allocation of labour and capital to the manufacturing sector. When natural resources are abundant, tradeable production is concentrated in natural resources rather than manufacturing, and capital and labour that otherwise might be employed in manufacturing are pulled into the non-tradeable. The prediction of this model is that an economy with larger resource sector will grow slower. Sachs and Warner (1997) are among the first to document the negative relationship between natural resources (i.e., agriculture, minerals and fuels) and along the lines of Dutch disease literature on the basis of world wide, comparative study of growth. In brief, the empirical findings confirm that economies with high a ratio of natural resources to GDP in 1970 (base year) tended to grow slowly during the subsequent 20-years period (i.e., 1970-1990). This negative relationship continues to hold even after controlling for many variables found to be important for growth.

6.7: Concluding Remarks.

This chapter has examined the effect of openness on economic growth in Tanzania over the last four decades. We have used both the ordinary least square and the Autoregressive Distributed Lag (ARDL) and Johansen cointegration technique as estimation methods. Our results suggest that openness has exerted negative impact on economic growth.

The findings from this chapter should be taken as a support for the general proposition that the position in the world trading system is an important determinant of economic destiny of nations. The degree to which countries specialize in the export of raw materials does have significant negative effects on their economic growth. The fact that this effect is important and persistent is further supported by both the short run and long run empirical results. Admittedly, unsound domestic policies and the overall level of economic development are important factors in explaining the sluggish growth. However, it is perhaps implausible to pose these as competing explanations in this chapter since they are not part of our empirical specification.

APPENDIX 6.0

Table 6.1: Augmented Dickey Fuller (ADF) tests

Variable	Level (1)				First difference (2)				Order of integration
	Without trend		With trend		Without trend		With trend		
	t-statistic	Lags	t-statistic	Lags	t-statistic	Lags	t-statistic	Lags	
Log GDP	-0.6142	1	-0.8050	1	-4.4434	1	-4.7232	1	I(1)
Log EDU	0.1256	2	-2.8453	2	-3.6697	1	-3.7149	1	I(1)
Log POP	-1.7222	3	3.2257	2	-2.1961	1	-3.9694	1	I(1)
Log OPEN	-2.4801	1	-2.3874	1	-3.7972	1	-3.7306	1	I(1)

Notes: (1) 95% critical value for the augmented Dickey-Fuller statistics is –2.9665 without a trend and -3.5731 with a trend in levels

(2) 95% critical value for augmented Dickey-Fuller statistics is -2.9627 without a trend and -3.5671 with a trend in first difference

Table 6.2: OLS Estimates—Dependent variable is Δlog GDP

33 observations used for estimation from 1971 to 2003

Regressor	**Coefficient**	**Standard error**	**t-ratio [p-value]**
Constant	0.2473	0.0871	2.8403[.008]
Δlog EDU	-0.4892	0.2972	-0.1646[.870]
Δlog POP	-7.9791	2.8041	-2.8455[.008]
Δlog OPEN	-0.3551	0.0818	-4.3399[.000]

Adjusted R^2=. 45

F-stat. F (3,29) 9.8694[.000]

Akaike Info. Criterion 40.2161

Schwarz Bayesian Criterion 37.2231

Diagnostic Tests

Test Statistics	LM version	F Version
Serial Correlation	CHSQ(1)= .14373[.705]	F(1, 28)= .12248[.729]
Functional Form	CHSQ(1)= 1.1612[.281]	F(1, 28)= 1.0212[.321]
Normality	CHSQ(2)= .94240[.624]	Not applicable
Heteroscedasticity	CHSQ(1)= .40425[.525	F(1, 31)= .38446[.540]

Table 6.3: OLS Estimates—Dependent variable is Δlog GDP

33 observations used for estimation from 1971 to 2003

Regressor	Coefficient	Standard error	t-ratio [p-value]
Constant	0.2102	0.0651	3.2297[.003]
Δlog EDU	0.1165	0.2269	0.5134[.612]
Δlog POP	-6.8983	2.0896	-3.3013[.003]
Δlog OPEN	-0.3519	0.0607	-5.7987[.000]
Oil Shock Dummy	-0.1605	0.0511	-3.1400[.004]
Adjustment Dummy	-0.1441	0.0364	-3.9526[.001]

Adjusted R^2=. 70

F-stat. F (5,27) 15.9297[.000]

Akaike Info. Criterion 49.2732

Schwarz Bayesian Criterion 44.7837

Diagnostic Tests

Test Statistics	LM version	F Version
Serial Correlation	CHSQ(1)= .042614[.836]	F(1, 26)= .033618[.856]
Functional Form	CHSQ(1)= 1.7494[.186]	F(1, 26)= 1.4555[.239]
Normality	CHSQ(2)= 1.8635[.394]	Not applicable
Heteroscedasticity	CHSQ(1)= .91053[.340]	F(1, 31)= .87961[.356]

Table 6.4: ARDL Estimates—Dependent Variable is log GDP

30 observations used for estimation from 1972 to 2001

Regressor	Coefficient	Standard error	t-ratio [p-value]
Constant	12.1879	2.2625	5.3869[.000]
log GDP(-1)	0.6025	0.0796	7.5685[.000]
log OPEN	-0.6111	0.1460	-4.1851[.000]
log EDU	-0.0897	0.3046	-0.2946[.771]
log EDU (-1)	-2.2626	0.4831	-5.5435[.593]
log EDU (-2)	1.1784	0.2739	4.3008[.000]
log POP	-14.6744	4.1961	-3.4972[.002]
log POP(-1)	26.1502	8.9044	2.9368[.008]
log POP(-2)	-13.1879	6.7200	-1.9570[.064]

Adjusted R^2=. 92

F-stat. F (8,21) 47.1344[.000]

Akaike Info. Criterion 40.2685

Schwarz Bayesian Criterion 33.9631

Diagnostic Tests

Test Statistics	LM version	F Version
Serial Correlation	CHSQ(1)= .027124[.869]	F(1, 20)= .018099[.894]
Functional Form	CHSQ(1)= 1.9076[.167]	F(1, 20)= 1.3581[.258]
Normality	CHSQ(2)= 2.2127[.331]	Not applicable
Heteroscedasticity	CHSQ(1)= .45703[.499]	F(1, 28)= .43316[.516]

Table 6.5 Long Run Coefficients using ARDL Approach

ARDL (1,0,2,2) Selected Based on SBC

Dependent Variable is log GDP

30 observations used for estimation from 1972 to 2001

Regressor	Coefficient	Standard error	t-ratio [p-value]
Constant	30.6585	4.7457	6.4603[.000]
Log OPEN	-1.5372	0.3346	4.4656[.000]
Log EDU	2.0779	0.4653	-4.5302[.000]
Log POP	-4.2146	0.9303	-4.5302[.000]

Table 6.6 ECM Representation for ARDL (1,0,2,2) selected based on SBC
Dependent variable is ΔLGDP
30 observations used for estimation from 1972 to 2001

Regressor	Coefficient	Standard error	t-ratio [p-value]
Constant	12.1879	2.2625	5.3869[.000]
Δlog EDU	-0.0889	0.3046	-0.2946[.771]
Δlog EDU (-1)	-1.1784	0.2740	-4.3008[.000]
Δlog POP	-14.6744	4.1961	-3.4972[.002]
Δlog POP(-1)	13.1512	6.7200	1.9570[.063]
Δlog OPEN	-0.6111	0.1460	-4.1851[.000]
ECM (-1)	-0.3975	0.7960	-4.9941[.000]
Adjusted R^2=. 64			
F-stat. F (6,23) 10.0699[.000]			
Akaike Info. Criterion 49.2685			
Schwarz Bayesian Criterion 40.2685			

Table 6.7: ARDL (1,0,2,2) selected based on AIC
Dependent Variable is log GDP
30 observations used for estimation from 1972 to 2001

Regressor	Coefficient	Standard error	t-ratio [p-value]
Constant	12.6263	2.2398	5.6506[.000]
log GDP(-1)	0.7702	0.1438	5.3555[.000]
log GDP(-2)	-0.1963	0.1415	-1.3875[.181]
log OPEN	-0.6382	0.1442	-4.4247[.000]
log EDU	0.0324	0.3108	0.1044[.918]
log EDU (-1)	-0.4553	0.4927	-0.9239[.367]
log EDU (-2)	1.2714	0.2763	4.5999[.000]
log POP	-13.7741	4.1575	-3.3130[.003]
log POP(-1)	27.1074	8.7418	3.1009[.006]
log POP(-2)	-15.6563	6.7193	-2.2416[.000]

Adjusted R^2=. 93

F-stat. F (9,20) 43.9572[.000]

Akaike Info. Criterion 40.6471

Schwarz Bayesian Criterion 33.6411

Diagnostic Tests

Test Statistics	LM version	F Version
Serial Correlation	CHSQ(1)= .48517[.486]	F(1, 19)= .31232[.583]
Functional Form	CHSQ(1)= 1.4536[.228]	F(1, 19)= .96746[.338]
Normality	CHSQ(2)= .72980[.694]	Not applicable
Heteroscedasticity	CHSQ(1)= .75814[.384]	F(1, 28)= .72594[.401]

Table 6.8 Long Run Coefficients using ARDL Approach
ARDL (2,0,2,2) Selected Based on AIC
Dependent Variable is log GDP
30 observations used for estimation from 1972 to 2001

Regressor	Coefficient	Standard error	t-ratio [p-value]
Constant	29.7003	4.3005	6.9063[.000]
Log OPEN	-1.4976	0.3042	-4.7258[.000]
Log EDU	1.9912	0.4213	4.7258[.000]
Log POP	-4.0565	0.8428	-4.8131[.000]

Table 6.9 ECM Representation for ARDL (1,0,2,2) selected based on SBC
Dependent variable is ΔLGDP
30 observations used for estimation from 1972 to 2001

Regressor	Coefficient	Standard error	t-ratio [p-value]
Constant	12.6563	2.2398	5.6506[.000]
Δlog GDP(-1)	0.1963	0.1415	1.3875[.179]
Δlog OPEN	-0.6382	0.1442	-4.4247[.000]
Δlog EDU	0.0325	0.3108	0.1044[.918]
Δlog EDU (-1)	-1.2714	0.2763	-4.5999[.000]
Δlog POP	-13.7741	4.1575	-3.3130[.003]
Δlog POP(-1)	15.0620	6.7193	2.2416[.035]
ECM (-1)	-0.4261	0.0806	-5.2881[.000]

Adjusted R^2=. 66

F-stat. F (7,22) 9.2867[.000]

Akaike Info. Criterion 40.6471

Schwarz Bayesian Criterion 33.6411

Table 6.10 Criteria for Selecting the Order of the VAR Model

Order	AIC	SBC	Adjusted LR test
2	271.3562	244.9729	--
1	256.6123	241.9550	44.1943[.000]
0	47.5114	44.5799	367.7769[.000]

Table 6.11: Autocorrelation and Normality tests for VAR equations

	Autocorrelation	Normality
logGDP	F (1, 22)= 1.4266[.245]	CHSQ(2)= .87487[.646]
log OPEN	F (1, 22)= 1.9294[.179]	CHSQ(2)= 2.8089[.246]
log EDU	F (1, 22)= .010930[.918]	CHSQ(2)= .70372[.703]
log POP	F(1, 22)= .35697[.556]	CHSQ(2)= .70672[.401]

Table 6.12: Test of Deletion of Deterministic/Exogenous Variables in the VAR

Based on 32 observations from 1972 to 2003. Order of VAR = 2
List of variables included in the unrestricted VAR:
LGDP LOPEN LEDU LPOP
List of deterministic and/or exogenous variables:
CON
Maximized value of log-likelihood = 307.3562

List of variables included in the restricted VAR:
LGDP LOPEN LEDU LPOP
Maximized value of log-likelihood = 294.4981

LR test of restrictions, CHSQ (4)= 25.7162[.000]

Table 6.13 Cointegration with unrestricted intercepts and restricted trends

Likelihood Ratio Test Based on Maximal Eigenvalue of the Stochastic Matrix				
Null	Alternative	Statistic	95% Critical Value	90%Critical Value
r = 0	r = 1	51.9737	31.7900	29.1300
r<= 1	r = 2	20.9879	25.4200	23.1000
r<= 2	r = 3	10.6153	19.2200	17.1800
r<= 3	r = 4	3.8814	12.3900	10.5500
Likelihood Ratio Test Based on Trace test of the Stochastic Matrix				
Null	Alternative	Statistic	95% Critical Value	90%Critical Value
r = 0	r>= 1	87.4583	63.0000	59.1600
r<= 1	r>= 2	35.4846	42.3400	39.3400
r<= 2	r>= 3	14.4967	25.7700	23.0800
r<= 3	r= 4	3.8814	12.3900	10.5500

Table 6.14:Estimated Cointegrated Vector in Johansen Estimation

32 observations from 1972 to 2003. Order of VAR = 2, chosen r =1.

Variable	Cointegration with unrestricted intercepts and restricted trends in the VAR	
	CV	Normalized
LGDP	-1.6530	-1.0000
LOPEN	-1.6045	-.97067
LEDU	1.5914	.96272
LPOP	-27.2553	-16.4886
Trend	.72024	.43572

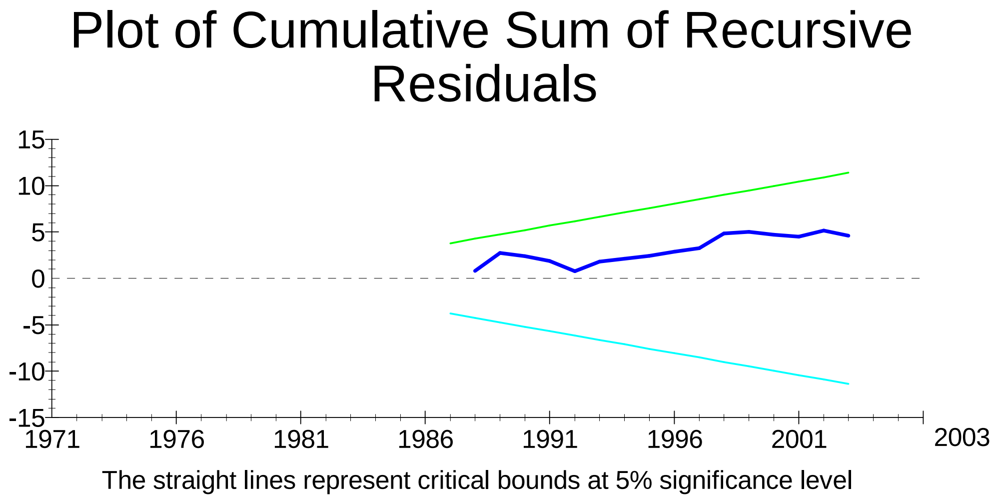

Figure 6.2: Cumulative sum of Recursive Residual

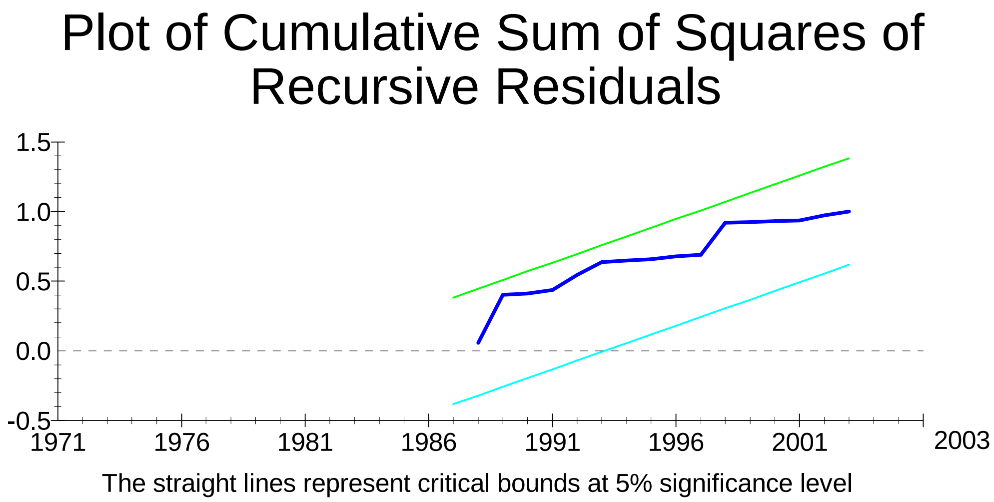

Figure 6.3: Cumulative sum of Squares of Recursive Residual

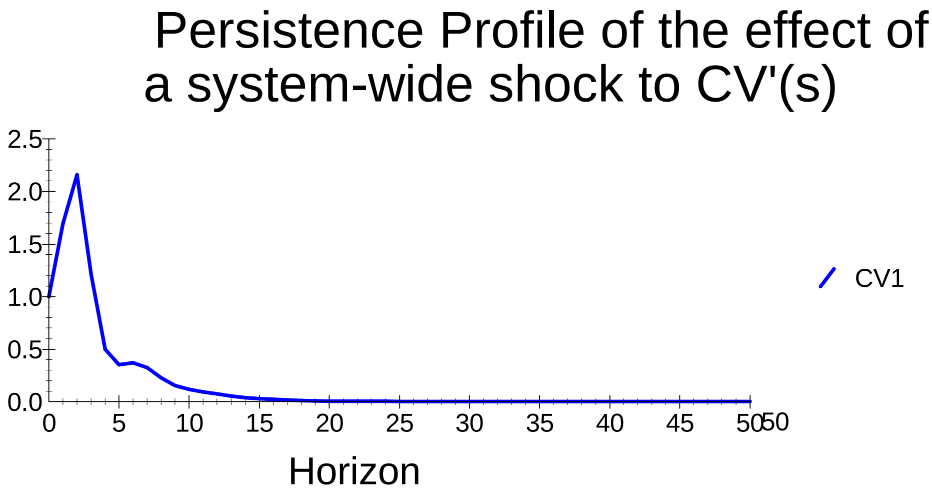

Figure 6.4: Persistence Profile of the Effect of a System Wide Shock

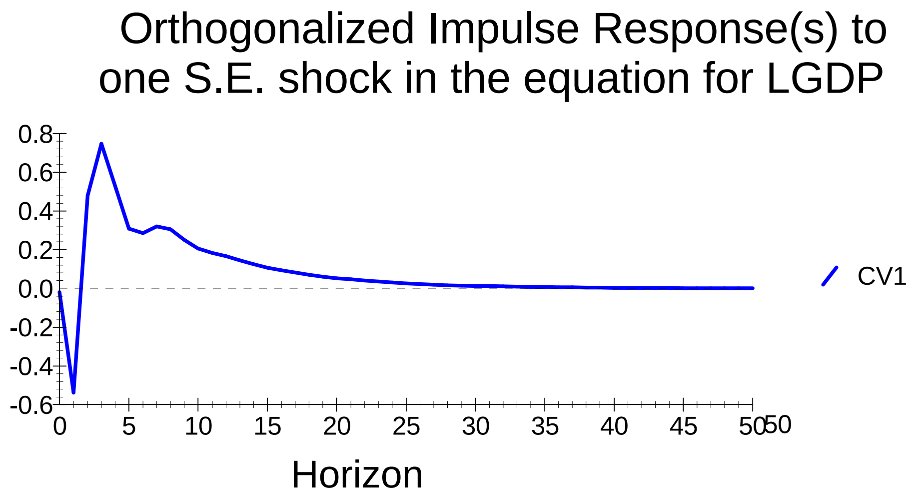

Figure 6.5: Orthogonalized Impulse Response in the LGDP equation

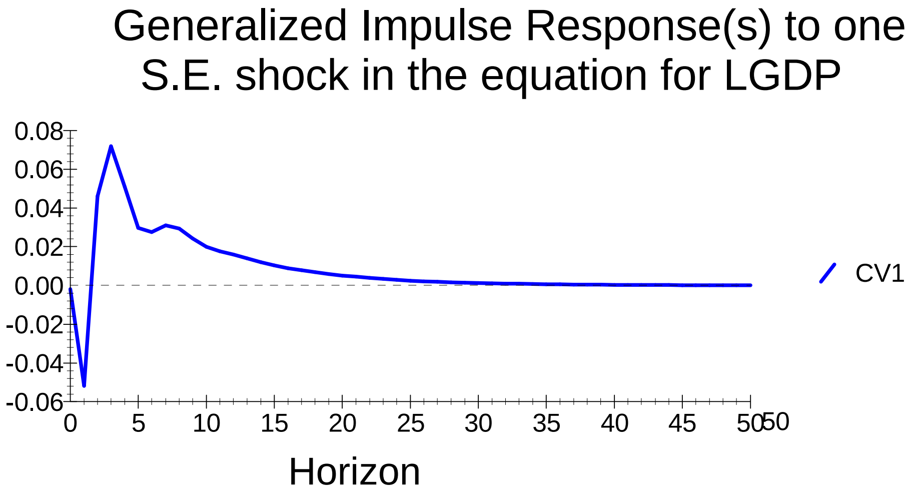

Figure 6.6: Generalized Impulse Response in the LGDP equation

CHAPTER SEVEN
CONCLUSION, RESEARCH FINDINGS AND POLICY IMPLICATION

This chapter concludes our study and it is divided into four major sections. In section 7.1 we summarize the main findings emanating from different chapters in this study. The contribution to the literature is provided in section 7.2. In section 7.3, we delineate policy implications. In section 7.4, we point out the limitations of the study and suggest possible avenues for further direction of research.

7.1 Major Research Findings

This study has carried out an in-depth investigation on the consequences of trade liberalization in Tanzanian economy. In doing so, both descriptive and econometric analyses have been used. The following are the major findings:

First, the effectiveness of trade liberalization in Tanzanian economy remains weak. In particular, despite the marked variation in the composition of traditional exports especially during the late 1990s; largely from coffee and cotton to cashewnuts and tobacco, the contribution trade liberalization in fostering export growth is rather tenuous. Second, although the volume of food crops during the post reform period is much higher than before the reforms, there are no symptoms of increased growth overtime. These observations are supported by both parametric and non-parametric tests.

Second, although agriculture accounts for more than 80% of the labour force, it remains unproductive and trade liberalization has not only failed to increase productivity of export crops' farms (i.e., land productivity), but it also failed to contain diminishing returns to land. This finding is supported empirically. The existence of diminishing returns to land in Tanzania is a by-product of backward technology, low use of modern inputs and poor linkages with other domestic sectors. Contrary to the conventional wisdom, the most important issue retarding agricultural development in Tanzania is not land size, but the presence of diminishing returns associated with traditional peasant-based subsistence farming.

Fourth, it is clear that increases in the productivity of primary commodities alone, will not be sufficient to build the Tanzanian economy. Even if Tanzania's agriculture is transformed into a high value/high productivity sector, it will not, on its own, become a satisfactory engine of growth. Once again, this finding is supported empirically. In particular, our results show that the share of trade in total output is negatively correlated with economic growth. This finding should be taken as a support for the general proposition that the position in the world trading system is an important determinant of economic destiny. The degree to which countries specialize in the export of raw materials in international trade does have significant adverse effects on their economic growth.

7.2 Contribution to the Literature

This study contributes to the empirical and theoretical literature in different ways. Empirically, we contribute to the existing literature by showing that the effect of trade liberalization on land productivity in Tanzania is much more important than growth since land is not only the means to growth, but it is also the means to poverty reduction, taking into account that more than 80% of population depend on land based activities. However, the fact that land is a means to growth, yet unproductive, means that specialization in primary commodities may not be a desirable development strategy since it steers the country into unsustainable growth path. Another contribution is in terms of methodology. Most previous works on export and growth are plagued by simultaneity bias. We have deal with this issue by employing the cointegration technique within the context of VAR.

7.3 Policy Implications

The findings from this study have important implications on the trade and growth debate in Tanzania and in development discourse. First, this study underscores that trade liberalization policies are counterproductive unless diminishing returns to land is effectively addressed. This calls for renewed intervention in the agricultural sector in order to ease the accessibility of farming inputs, credit market, production technology and reliable output market. Secondly, the existence of diminishing returns to land contradicts a simple prediction of the theory of comparative advantage. Third, diminishing returns means that as production increases with international specialization, every additional unit of commodity produced would be more expensive to produce. Fourth, the persistence of diminishing returns to land is incompatible with poverty reduction. Arguably, without addressing diminishing returns in Tanzanian agriculture, poverty is likely to remain unabated.

7.4 Limitations and Area for further Research.

There are several limitations in this study. First, the regression results in chapter 4 display the short run relationships since we have used first difference in our estimation. Although this procedure is innocuous in terms of economic theory, at least for the present analysis, the problem of using the first difference is that we are loosing valuable long run dynamics. In order to resolve this problem, the inclusion of an error correction term is recommended. The simplest way to perform this exercise involves a test for unit root in the residual from static regression. The absence of unit root implies that the lagged value of the residual must be included in the relevant regression as an error correction term. In this study, however, the residuals from static regression were non-stationary. Hence, we could not include the error correction mechanism.[48] The second limitation hinges on the paucity of control variables. Certainly, land productivity is affected by many factors—input prices, pests and diseases, etc. Further research entails the inclusion of additional covariates in order to ascertain the validity and accuracy of econometric results.

[48] A researcher might as well use the Johansen maximum likelihood in the context of VAR model. There is, nonetheless, little theoretical justification to perform this method in this study.

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