Cameroon's Export Performance
The Role of Infrastructure, Output Capacity and Export Prices on Cameroon's Cocoa and Coffee Exports

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Declaration

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I, Che, Loveline, hereby declare that the above thesis is my own unaided work both in concept and execution, and that apart from the normal guidance from my supervisor,I have received no assistance.

The thesis has been presented by me for examination for the partial fulfillment of a degree of Master in Economics at the department of Economics, Commerce Faculty, University of Cape Town, 2007.

Signature

Date

Abstract

This paper explores the poor performance of Cameroon's cocoa and coffee exports using time series data on Cameroon over the period 1961-2000. To do this, export supply functions are estimated using a modified version of the perfect substitute model. The Johansen Juselius cointegration test is used to determine the existence of a long run relationship in these supply models.

The cointegration test results suggest that there exists a single long run relationship in these models. Evidence from this study shows that the declining export prices of cocoa and coffee are associated with declining quantities. This is supported by the low and significant price elasticities from the econometric estimations. Results of the present study suggest that the poor export performance of these commodities is as a result of the country's low output capacity, inadequate transport infrastructures and the negative effect of the international prices of these commodities. The implication of this study for Cameroon and other primary commodity dependent economies is to improve the supply environment.

Key words - Cameroon, cocoa, coffee, output capacity, export prices and infrastructure.

List of Tables

List of Figures

Section I

I.1 Introduction

For over three decades, the agricultural sector has continuously been the largest sector in Cameroon in terms of its contribution to gross domestic product (GDP) and total exports (Gbetnkom and Khan, 2002). For example, in 2001 this sector accounted for 34% of Cameroon's GDP and 65% of total exports (MINEFI, 2003). It is a major source of employment to the population of the country, employing 60% of the labor force (Amin, 2002). Although the agricultural sector is a major source of export earnings to the country, its performance principally depends on a limited number of commodities such as cocoa, coffee, cotton and bananas. Cocoa and coffee have been the leading non-oil export commodities for more than three decades. Though Cameroon has a high potential in exporting these two commodities, their share in total exports and world trade has declined since 1980. This deteriorating export performance of the agricultural sector particularly that of cocoa and coffee, during the 1980s and 1990s placed the country in difficulties. This lead to the adoption of some measures aimed at reversing the trend. For instance, in July 1988 the Cameroon government adopted within the framework of a structural adjustment program a series of trade reforms. Most important was the removal of quantitative restrictions on all imports, the abolishment of exit duties on exports by 1991/1992 and later the devaluation of the franc CFA in 1994 (Njikam, 2003). Reducing all forms of control on imports increased access to fertilizers and other farm inputs. These policies were also aimed at promoting export diversification, improving the performance of non traditional as well as traditional exports (Bamou, 2002).

After more than twenty years of implementation of these policies, Cameroon is still dependent on agricultural exports with cocoa and coffee dominating total exports. Moreover, export growth of these products remains poor. This highlights the need for an investigation of alternative ways of improving the export performance of these commodities. Because of the importance that coffee and cocoa have on Cameroon's export basket, this paper aims at investigating the determinants of their export performance. More specifically, this paper investigates the role of infrastructure, output capacity, and export prices on the poor performance of Cameroon's cocoa and coffee exports.

The paper is structured as follows: Firstly, the problem statement is discussed in the rest of this section: Secondly, Section II describes Cameroon's export structure from 1976 to 2004: Thirdly, Section III presents the literature review on determinants of export performance, export supply models and the theoretical specifications: Fourthly, econometric methodology and results are discussed in Section IV: Lastly is Section V with conclusions of the study and policy implications.

I.2 Problem statement and research question

It is generally accepted that the advantages of exporting manufactured commodities especially skill intensive products, exceed that of primary commodity exports (Ngaruko, 2003; Lall and Kraemer-Mbula, 2005 and UNCTAD, 2005). For instance, the former have high potential of increasing when global demand is rising (high income elasticities), high productivity potentials while the latter has low income elasticities, declining and volatile prices. Despite the problems associated with primary commodity exports, most Sub-Saharan African countries including Cameroon are still dependent on these products (UNCTAD, 2005; World Bank, 2000 and Collier, 2002).

It is often suggested that the most appropriate policy to apply so as to improve the export performance of Sub-Saharan countries is to diversify exports into manufacturing and non traditional exports (World Bank, 2000 and Collier, 2002). Others argue that African countries need to exploit their comparative advantage through an improvement of their export performance in primary products, alongside diversification (Wood and Mayer, 2001 and World Bank, 2000). Neither of these objectives is easily achievable as they are subject to many constraints.

Recently, there has been much discussion on factors constraining Africa's manufacturing export performance (Redding and Venables, 2002; Collier, 2002; Elbadawi, 2001 and Rodrik, 1997). An understanding of these discussions is that the importance of these factors varies across regions, countries and even sectors. For example, geographical position may be a major constrain to landlocked countries, whereas for others it may be the endowment of resources, high transaction costs and even competitive real exchange rates. On the other hand, Africa's poor performance in primary exports has been attributed to low and falling demand of importing countries, declining and volatile export prices, poor tropical soils, poor policies, low income and price elasticities as well as insufficient production. Although African countries are heavily dependent on primary commodity exports, they are still exporting below their potential (World Bank 2000). In other words they are not exploiting their comparative advantage in primary commodity exports especially in agriculture.

A glaring example is the case of Cameroon. For several years, Cameroon was unable to meet its quota of coffee and cocoa exports. For this reason, there is a need to address some of the issues responsible for the under-performance of Africa's primary export. Similar to manufacturing, the significance of these factors may vary across countries and even sectors. Because regional and aggregate studies mask some important differences, the present paper focuses on Cameroon's cocoa and coffee exports. It aims at answering the following questions:

- What factors determine Cameroon's export supply of cocoa and coffee?
- What explains the poor performance of Cameroon's coffee and cocoa exports?
- More specifically, how do infrastructure, output capacity and export prices influence cocoa and coffee exports in the case of Cameroon?
- What is the impact of roads, rails and electricity in stimulating Cameroon's cocoa and coffee exports?

An understanding of the factors that influence their exports and the extent to which these commodities respond to these factors will guide us on how these exports can be revamped. The starting point of this investigation will be to show the importance of the above mentioned products to Cameroon's exports. This is the purpose of the following section which presents an overview of Cameroon's export structure and performance from 1976 to 2005.

Section II An overview of Cameroon's export structure and performance

II.1 Evolution and performance of product groups

To assess Cameroon's export structure and performance, this paper draws on export data for Cameroon which are obtained from United Nation's Commodity Trade Statistics (UNCOMTRADE).

These data are available at a three digit level of the Standard International Trade Classification (SITC) revision 2 and are classified into product groups using Wood and Mayer's (1998) classification model. This classification is particularly useful in analyzing Cameroon's exports which are primary commodity intensive.

Table 1 presents some examples of these products in their different groupings. High skilled manufactures (NMH) compared to low skilled manufactures (NML) consist of products with high demand and productivity potentials. While the classification of broad primary into six categories depends on the income elasticity and nature of the products. These product groupings consist of processed and unprocessed dynamic products (PPD and NPD), processed and unprocessed static agricultural products (PPS and NPS). Minerals, metals and fuel are also subdivided into processed and unprocessed (PPM and NPM).

Classification	Examples
Narrow manufactured products	
NMH (High-skill narrow manufactures).	Chemicals and pharmaceutical products, computers and office equipment scientific instruments, watches and photographic equipment,
NML (Low skill narrow manufactures).	Leather and leather manufactures, rubber articles, iron and steel, textiles, clothing, travel goods and footwear, fabricated metal products, cork and wood manufactures, paper and paperboard
Processed Primary products	
PPS (Processed static agricultural products).	Milled rice wine, vermouth, beer, distilled alcoholic beverages, cigars, cigarettes and tobacco products pulpwood, pulp and waste paper.
PPD (Processed dynamic agricultural products).	butter cheese and curd, soya bean oil, fish oil, vegetables, prepared or preserved, sesame oil, castor oil, fruits, fresh or dried
PPM (Processed minerals, metals and fuels).	Petroleum products, refined, electric energy, Unwrought lead and lead alloys,
Unprocessed primary products	
NPS (Unprocessed static agricultural products).	Unmilled cereals, milled rice, coffee beans raw or roasted, tobacco leave cocoa beans raw or roasted, raw sugar, soya beans, natural rubber, fuelwood, vegetable materials, cotton lint, manila fibre
NPD (Unprocessed dynamic agricultural products).	Milk and cream, eggs fish fresh, chilled or frozen, vegetables, fresh nuts fresh, spices, coconuts,
NPM (Unprocessed minerals, metals and fuels)	Crude petroleum , iron ore and concentrates, copper ore and concentrates

Table1: Classification of exports into primary products and manufactures.

Source: Wood and Mayer (1998).

Figure 1 reveals that Cameroon's export earnings from the manufacturing product groupings remained below 20 million US dollars since 1976. This poor performance in manufacturing is equally illustrated in Figure 2. Excluding the period 1983-1989, manufacturing accounted for less than 10% of Cameroon's exports since 1976. Of course, this weak manufacturing export performance is consistent with that of Sub-Saharan African countries whose share in world manufactured exports fell from 0.3% in 1981 to 0.2% in 2000 (Lall and Kraemer-Mbula, 2005). Though many developing regions such as East and South Asia have succeeded in upgrading their export structures - that is increasing their exports of high and medium skill intensive manufactures (Lall and Kraemer-Mbula, 2005), most Sub-Saharan African countries particularly Cameroon still lag behind with old and static export structures of the 1970s.

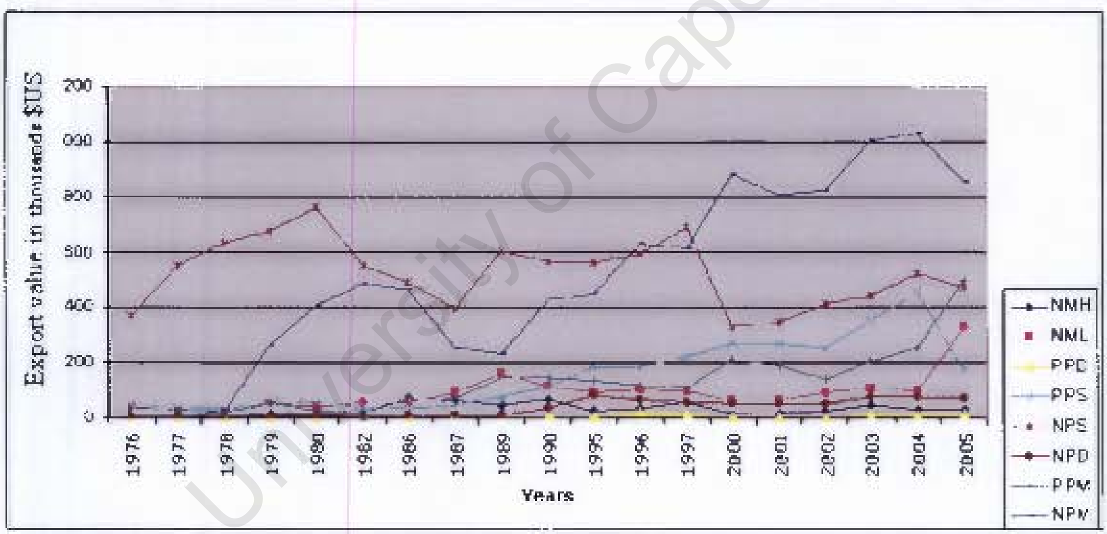

Figure 1: Contribution of the various product categories to export earnings.
Source: COMTRADE and own calculations.

Looking at the primary product category, it is evident that primary exports are a major source of the country's export earnings. Most important, within the primary sector, earnings are concentrated on NPS, PPS and NPM (Figure 1).

Turning to the importance of mineral products in Cameroon's export structure, Figure 2 presents the share of mineral, agriculture and manufacture exports in the country's total exports for the period 1976-2005.

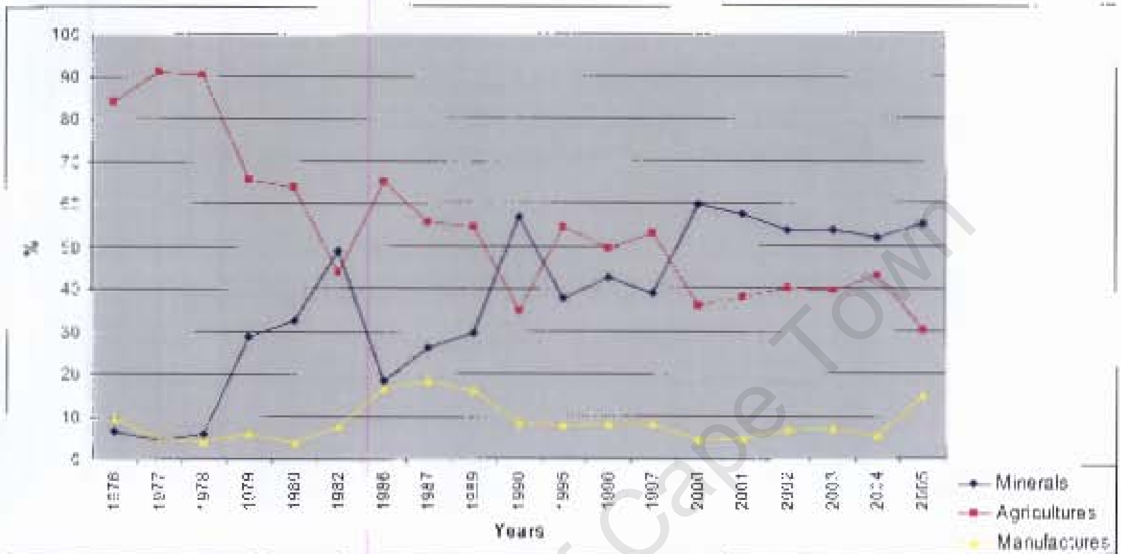

Figure 2: Share of agricultural, minerals and manufactures in Cameroon's exports, 1976-2005.

Source: COMTRADE and own calculations.

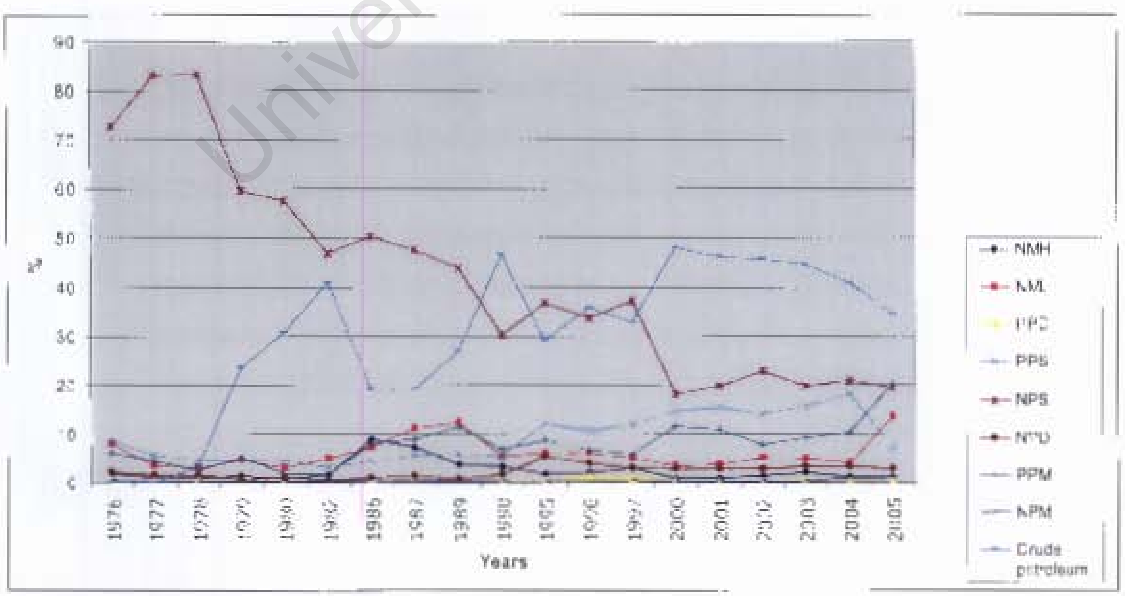

Figure 3: Detailed evolution of Cameroon's export composition, 1976-2005.

Source: COMTRADE and own calculations.

Figure 3 shows that the share of minerals in total exports sharply increased from 7% in 1978 to 49% in 1986. In recent years the share has been stable between 50% and 60%. It is worth noting that this huge contribution of minerals to the country's exports is largely due to oil, specifically crude petroleum exports. As shown in Figure 3, once petroleum is excluded from the NPM category the share of non petroleum minerals falls to less than 5.1%. This implies that crude petroleum exports are responsible for the trend in mineral exports shown in Figure 3.

II.2 Evolution of shares of top ten export commodities

Table 2 shows that the share of total exports accounted for by Cameroon's top ten export commodities declined from 94% in 1980 to 63.9% in 2005. This is largely due oil but also due to the poor performance of the other products that make up this group. As demonstrated in Table 2, Cameroon's top ten export commodities are mainly composed of primary products. Diversification into other exports has been very limited. This poses a big challenge to the country given the many disadvantages such as fluctuations of export earnings and falling world demand associated with primary commodity exports mentioned earlier.

Commodity Description	1980	1990	2000	2005
Crude petroleum	30.62	49.73	48.03	34.40
Coffee	23.07	8.39	5.18	4.58
Cocoa	20.70	8.10	5.66	6.05
Other wood in the rough or roughly squared	8.39	6.38	3.33	3.03
Cotton	3.24	6.34	3.74	3.52
Wood, simply worked, and railway sleepers of wood	2.52	3.76	12.77	3.43
Aluminum	1.74	2.71	5.56	3.07
Veneers, plywood, "improved" wood and other wood, worked, es	1.63	1.26	1.98	2.76
Chocolate and other preparations containing cocoa, nes	1.34	0.06	0.05	2.08
Cotton fabrics, woven (not including narrow or special fabrics)	0.88	0.64	0.19	1.03
Total share	94.13	87.37	86.47	63.95

Table 2: Top ten export commodities ranked according to shares in 1980 total exports.

Source: COMTRADE and own calculations.

To illustrate the importance of cocoa and coffee in the country's total exports, an analysis is carried out on the contribution of individual products to total exports. As shown in Table 2, the share of total exports accounted for by cocoa and coffee decreased from 43.7% in 1980 to 16.5% in 1990. By 2005 cocoa and coffee exports as a share of total exports had fallen to 10.6%. The collapse of the share of these products in total exports could be associated to diversification and growth of exports into other sectors. But this is not the case as it is diversification through contraction (Table 2). Given the severe consequences that this decline might have on the country's export earnings, balance of payments, employment, and poverty, it is important to understand the sources of these changes in the performance of these commodities.

This study examines whether these exports are constrained by external factors such as international prices or domestic factors such as infrastructure, input cost and the overall performance of the economy. Thus any meaningful policy to improve the performance of these commodities and even that of other primary commodity exports and total exports requires an understanding of what drives these exports. The next section of the paper reviews some export determinants and export supply models.

Section III Determinants of export performance

This section firstly considers the theoretical and empirical studies relating to Africa's weak export performance. Secondly, an overview of some of the models used in estimating export supply functions and specification of Cameroon's cocoa and coffee models are presented.

III.1 Theoretical and empirical literature

One of the most famous international trade theories is the Heckscher-Ohlin (H-O) theory developed in 1920 by Eli Heckscher and Bertil Ohlin. According to this theory, trade between countries is driven by differences in factor endowments and also by the fact that different products have different factor requirements. While some products require more capital (capital intensive), others require more labor (labor intensive). Also, some products need more skilled labor relative to unskilled labor. With these differences, the H-O theory predicts that, the country as a whole will gain if it specializes in producing and exporting the good which uses its abundant factor intensively. For instance, labor abundant countries would be expected to have a comparative advantage in labor intensive products and capital abundant in capital intensive products. This will consequently lead to a flow of capital intensive exports to labor abundant countries and vice versa. However, the increase in volumes of trade between countries with similar factor endowments and goods of the same factor intensity, adding to some of the empirical controversies surrounding the H-O led to its improvement and the development of new trade theories.

Wood and Mayer (2001) used the H-O theory to explain Africa's export structure in comparison to that of Asia. They argued that Africa's comparative advantage in natural resource endowments constrained diversification into manufacturing exports. These authors further added that the continent's high dependency on traditional export commodities is mainly due to its abundant natural resources and low levels of human capital. In fact, African countries do not have the right resource endowments for manufactured exports.

Alongside the H-O model is the "Dutch Disease" theory which predicts the negative effects of a booming natural resource sector such as oil on other export sectors of the economy such as manufacturing. Stijns (2002) refers to "Dutch Disease" as a situation in which a boom in an export sector leads to a shift of production factors towards the booming sector and an increase in the prices of non-tradable goods and services, thus hurting the other tradable sectors. The core model of the "Dutch Disease" is found in the seminar work of Corden and Neary (1982). In this model they distinguished three basic sectors in the economy- the non-tradable sector, the lagging and booming export sectors. Assuming capital to be a sector specific factor and labor to be mobile, Cordon and Neary (1982) predict that a natural resource boom can trigger "de-industrialization" through resource movements and spending effects.

Resource movement effects occur when an exogenous increase in the value of a booming sector increases the marginal product of labor of this sector, causing labor to move from the other tradable sector to the booming export sector. This factor movement results in an increase in the price of non-tradable goods and services, a fall in the production and exports of the lagging export sector.

Increased earnings from the booming sector increases income and demand for all goods in the economy. Because prices of tradable goods are set on the world market, increase spending increases the relative prices of non-tradable products causing an appreciation of real exchange rate. This makes the lagging export sectors less profitable and less competitive vis a vise foreign producers.

Evidence of the "Dutch Disease" has been found in a number of African Countries. A study by Benjamin and Devarajan (1985) in Cameroon shows that country's agricultural exports such as cocoa and coffee are vulnerable to" Dutch Disease caused by the country's oil resources.

Olusi and Olangunju (2005) in their analysis of Nigeria's primary sector using vector autoregressive models show that the agricultural sector in Nigeria suffers from the "Dutch Disease".

Although Africa's abundant natural resources and low levels of human capital play an important role in explaining its high concentration in unprocessed exports and difficulties in exporting manufactured goods, there are other factors adversely affecting all sorts of exports.

Firstly, contrary to the above evidence it is argued that high transaction costs are the major determinant of Africa's poor manufactured exports (Collier and Gunning, 1999). Africa is not only seen as a high risk region but also as a region with poor transport, electricity and telecommunication networks. The public sector is large, but unfortunately characterized by poor service delivery. Poor governance, institutions, and contract enforcement influence the production environment, consequently affecting exports. As a result of high transaction costs, African countries have difficulties exporting manufactured exports which are transaction cost intensive (Collier, 2002). To support this argument, Elbadawi (2001) examined the role of endowments, transaction costs and real exchange rates in determining Africa's manufacturing exports. He used the number of fax machines, kilometers of paved roads and a corruption index as measures of transaction cost. His findings supported transaction costs as a main determinant of Africa's poor performance in manufacture exports.

Furthermore, Limao and Venables (2001) points to the fact that, "The real cost of trade – transport cost and other cost of doing business internationally- are important determinants of a country's ability to participate fully in the world economy. Remoteness and poor transport and communication infrastructure isolate countries, inhibiting their participation in global production networks". They provide evidence showing that Sub Saharan African countries suffer from high transport costs and that their poor trade performance is explained by their poor level of infrastructure.

Another study by Francois and Manchin (2006) investigates the role of institutions, and infrastructure on bilateral trade patterns. Using panel data and a gravity model, their results suggest that export level as well as a country's ability to export depends on the quality of institutions and infrastructure. Generally, Sub-Saharan African countries' exports are greatly affected by transport costs and poor infrastructure. This places Africa in a disadvantageous position relative to its competitors (Amjadi and Yeats, 1995).

The above mentioned studies make several important points on why Africa's trade in general and manufactured exports in particular is low. In fact, levels of infrastructural development are generally believed to be related to manufacture exports. Nevertheless, some primary commodities (cocoa, coffee, bananas) and mineral exports (coal, cobalt uranium) potentially require good infrastructure particularly transport infrastructure. This is because of their bulky nature. This study adds to the literature of export performance through its investigation of the role of infrastructure on Cameroon's coffee and cocoa exports. That is, it tests the responsiveness of these commodities to increases in infrastructural investment.

Secondly, the real exchange rate has been identified as a key determinant of both primary and manufacturing exports. An overvalued currency is likely to erode the export price competitiveness of exporting countries. Moreover, the sensitivity of exports to the real exchange rate depends on the factor content of the product being exported. Capital intensive manufactures are less sensitive to real exchange movements when compared to primary commodities and other labor intensive exports. The reason is that, highly differentiated capital intensive exports may face less aggressive competitors compared to perfectly homogenous commodities.

Thirdly, Sub-Saharan African countries' poor performance in agricultural exports has been attributed to the low price elasticities of these products (Collier and Gunning 1999). This price behavior has stirred debate on the responsiveness of agricultural exports to export prices. Deaton (1992) argues that suppliers respond to long term price fluctuations by increasing supply when prices are low in order to stabilize their export earnings. This view is supported by Morrissey and Mold (2006) in their investigation of the response of agricultural exports to export prices using pooled data for 33 sub- Saharan countries, for the period 1980 to 2002. They found that exporters increase exports when the export price falls.

Contrary to the above, Ngaruko (2003) in his study of Africa's agricultural export performance found that these products do not react in conformity with the above evidence. He argues that the degree of responsiveness of agricultural exports to price differs across regions, countries and products. Agricultural exports in Africa are more responsive to prices compared to those of Asia. Coffee and cocoa have price elasticities close to 0.7 while products like sisal are at the lower end with price elasticities of approximately 0.1. This is equally supported by Cameron et al. (2005) in their study of the response of Uganda's primary commodity export to export prices. They found that Uganda's agricultural and coffee exports in particular respond positively to relative export prices with price elasticities ranging from 0.5 to 1 under a fixed exchange rate regime and 1.21 to 2.4 a under floating exchange regime. These studies provide some relevant information on export supply elasticities of these products, forming a base for comparison with other countries.

This study adds to the existing literature by investigating how Cameroon's cocoa and coffee exports respond to prices. The study will test if cocoa and coffee exporters respond to declining export prices by cutting down their volumes of exports. Supplementing this hypothesis will be the price elasticities which are relevant in explaining the importance of export prices in export supply behavior of the commodities under study.

However, primary commodity price variability and low demand elasticities are not the only reasons for Africa's poor agricultural performance. Akiyama and Larson (1989; page 6) argue that, "The major reason for Africa's declining market shares in primary commodities is not due to an unfavorable composition of commodity exports but rather is due to a failure of Africa's production to competively meet growing world demand." This indicates that Africa's exports are constrained by supply factors and not necessarily the absorption capacity of importing countries. This also contradicts the view that Africa's poor performance in primary commodity export is due to falling world demand for these products. In line with Akiyama and Larson (1989), Rodrik (1997; page 5) points to the fact that "Africa's marginalization in world trade is primarily due to the continent's lagging performance in terms of output growth". The understanding here is that, given the income levels of most African countries, their low export performance is justified. Rodrik (1997) concludes that paying more attention to economic growth fundamentals such as investment in infrastructure, good governance and macro economic stability will increase the country's output and eventually exports. Nevertheless, the extent to which exports respond to economic performance variables such as output capacity supports the argument on concentrating in increasing output. This paper considers testing the degree of responsiveness of Cameroon's main exports to changes in output capacity.

III. 2 Export supply models and specifications

III. 2.1 Export supply models

Amongst the models used to estimate export supply functions is the imperfect substitute model. This model appears to be frequently used in the international trade literature in modeling trade relations both at aggregate, sector and product levels. "The main assumption of this model is that neither imports nor exports are to be considered perfect substitutes for domestic products. The model stems from the basic consumer and production theory where differences in relative prices and the search for profit maximization drives import and export behavior. Thus the decision to produce exports depends on the profitability of this activity which is inversely related to factor cost (Goldstein and Khan, 1985). *Ceteris paribus* profitability of producing exports falls with an increase in the cost of production. Though the theory of export supply is still very much contested (Goldstein and Khan, 1985), producing highly differentiated manufactured export products as well as perfectly homogeneous commodities theoretically depends on export prices as well as factors that affect cost of production.

Alongside the above mentioned model, there is the perfect substitute model suitable for studying the export and import behavior of perfectly homogeneous products. Firstly, this model assumes a common international price after tariffs and transport costs have been catered for. Secondly, exports only take place after domestic demand has been satisfied. In other words exports are excess domestic supply over domestic demand while import demand is only needed to meet up domestic supply shortages. Finally, given that there is a single price for the product traded in this model, the ability of an individual country to influence the price depends on its share of world imports and exports. Following this model, which is well elaborated in Goldstein and Khan (1985), domestic demand for coffee and cocoa are functions of their respective prices and income given by:

$$D_{cof\,i} = g(p_{cof_i}, y_i) \qquad (1.1) \qquad\qquad D_{coc\,i} = g(P_{coc\,i}, y_i) \qquad (1.2)$$

$$S_{cof\,i} = f(P_{cof_i}, C_i) \qquad (2.1) \qquad\qquad S_{coc\,i} = f(P_{coc_i}, C_i) \qquad (2.2)$$

$I_{cof_i} = D_{cof_i} - S_{cofi}$ (3.1) $I_{coci} = D_{coci} - S_{coci}$ (3.1)

$X_{cof_i} = S_{cofi} - D_{cofi}$ (4.1) $X_{coci} = S_{coci} - D_{coci}$ (4.2)

Where D_{cof_i} and D_{coci} are domestic demand for coffee and cocoa respectively, S_{cof_i} and S_{coci} domestic supplies, P_{cof_i} and P_{coc_i} their respective prices, I_{cof_i} and I_{coci} quantities imported, X_{cof_i} and X_{coci} represent quantities exported and finally C_i is a measure of production cost.

In this model the domestic demand of these commodities are expected to be inversely related to their respective prices and positively related to domestic income while supply should decrease with an increase in the cost the of production and move in the same direction as prices. Import demand and export supply are expected to be an outcome or residual from domestic demand and supply.

III. 2 .2 Empirical literature

From empirical evidence, export supply behavior relative to export demand is difficult to capture empirically. As noted before, relatively few studies on export supply were found compared to export demand (Haynes and Stone, 1983), but recently the literature on determinants of export has been supply has been increasing.

Examples of recent studies include Prasad (2000) who uses single equation estimation techniques to model Fuji's aggregate export supply function. Using relative prices, output capacity and trading partner's income as determinants of Fuji exports, he finds that trading partner's income drives Fuji's exports in the long run while relative prices and output capacity are responsible for short term dynamics.

Ahmed (2000) in his investigation of the impact of the real effective exchange rate on Bangladesh merchandise exports using cointegration and an error correction model concludes that the real effective exchange rate is an important determinant of Bangladesh aggregate supply.

Edwards and Alves (2006), in their empirical study of the determinants of South Africa's manufacturing export performance, for the period 1970 to 2002 find amongst other variables, relative prices measured by the real effective exchange and infrastructure as determinants of South Africa's manufacturing exports.

As for primary commodities, recent empirical evidence uses the imperfect substitute model (Cameron et al., 2005; and Gbetnkom and Khan, 2002). Cameron et al., (2005) use the imperfect substitute model to investigate the response of Uganda's primary commodity export to relative export prices. In their study, they estimate Uganda's coffee export supply function based on the imperfect substitute model. The same model is used by Gbetnkom and Khan (2002), in their study of the determinants of Cameroon's, cocoa and coffee exports. Both studies are based on an inappropriate model. In addition to using an incorrect model, the Gbetnkom and Khan (2002) study carries a time series analysis for the period 1971 to 1996. A time series analysis with barely 26 observations is likely to be subject to small sample bias.

III. 2 .3 Specification of cocoa and coffee export supply functions

The specification used in this paper extends and addresses some of the issues encountered in the literature in the following ways.

Firstly, this paper advances the literature of export supply functions by investigating determinants of primary commodity exports which, relative to manufactured exports are often neglected in the literature. Secondly, the issue of estimating export supply functions of primary commodities using the imperfect substitute model is addressed by using a perfect substitute model. Thirdly, this paper modifies this model to suit the case of Cameroon's coffee and cocoa exports. In the case of Cameroon, a negligible quantity of its cocoa and coffee production is demanded by the home market. This leads to a modified version of the perfect substitute model which assumes a zero domestic demand. This assumption leaves us with export supply (Equations 4.1 and 4.2) to be equal to domestic supply expressed as follows:

$$X_{cof_i} = S_{cofi}(P_{cofi}, C_i) \quad (5.1) \qquad\qquad X_{coci} = S_{coci}(P_{coci}, C_i) \quad (5.2)$$

Contrary to the perfect substitute model, this study assumes that domestic demand is zero. The specifications above are in a restricted form as most variables such as output capacity, capacity utilization and infrastructure considered to be important for exports are not included in the above export supply functions. This model is thus augmented with the following variables. Firstly, an output capacity variable is introduced in these functions to account for the effect of economic performance on export supply. According to Goldstein and Khan (1985: 1060) changes in the level of aggregate real output are accompanied by advances in factor supplies, infrastructure and total factor productivity which increase export supply at a given export price level. Alternatively increases in the country's output capacity are expected to positively affect exports. Secondly, an infrastructural measure is added to these functions to capture the effect of supply side factors on export. These specifications are level relationships, thus an increase in the level of infrastructure is expected to affect the level of exports positively. This leads to the following specification:

$$X_{cof_i} = w(P_{cofi}, C_i, Rgdp, \inf) \quad (6.1) \qquad X_{coci} = v(P_{coci}, C_i, Rgdp, \inf) \quad (6.2)$$

Instead of using a single infrastructure measure, three different infrastructural measures are separately added to the above model to capture their specific effects on exports.

Section IV Econometric methodology, data and results

IV.1 Data sources

This study uses annual data for the period 1961 to 2000. Choice of the period is made according to the availability of data on all variables. The quantity of cocoa (Xcoc) and coffee (Xcof) exports are expressed in tons, their foreign prices (pxcoc, pxcof) in US dollars. The former is obtained from the Food and Agricultural Organization Statistics (FAOSTAT) while the latter is from the International Financial Statistics. The measure of output capacity used in both supply functions is real GDP (RGDP). The reason for using this variable as a proxy for output capacity is that, it is a measure of the country's economic performance and thus expected to positively influence exports. The domestic price deflator (DPI) is used as a measure of production cost. As infrastructure measures paved road (Prdl) in kilometers, electricity generated in kilowatts (Elec) and kilometers of rail route (Rail). The data on RGDP and the domestic price deflator are taken from the World Development Indicators (WDI) and infrastructure from Canning (1998) updated with data from WDI. All variables are expressed in a natural logarithm form such that estimates give us long run elasticities.

IV.2 Background analysis of data

The first step of this empirical investigation consists of a graphical analysis of the data. This is useful as it has some bearing in interpreting the results of econometric estimations. Figures 4 and 5, give us a time series plot of export prices and quantities of cocoa and coffee exported. Figure 4 suggests that the quantity of cocoa exported and the export price move together. Increases in the export price of cocoa between 1961 and 1978 are associated with increases in the export supply of cocoa.

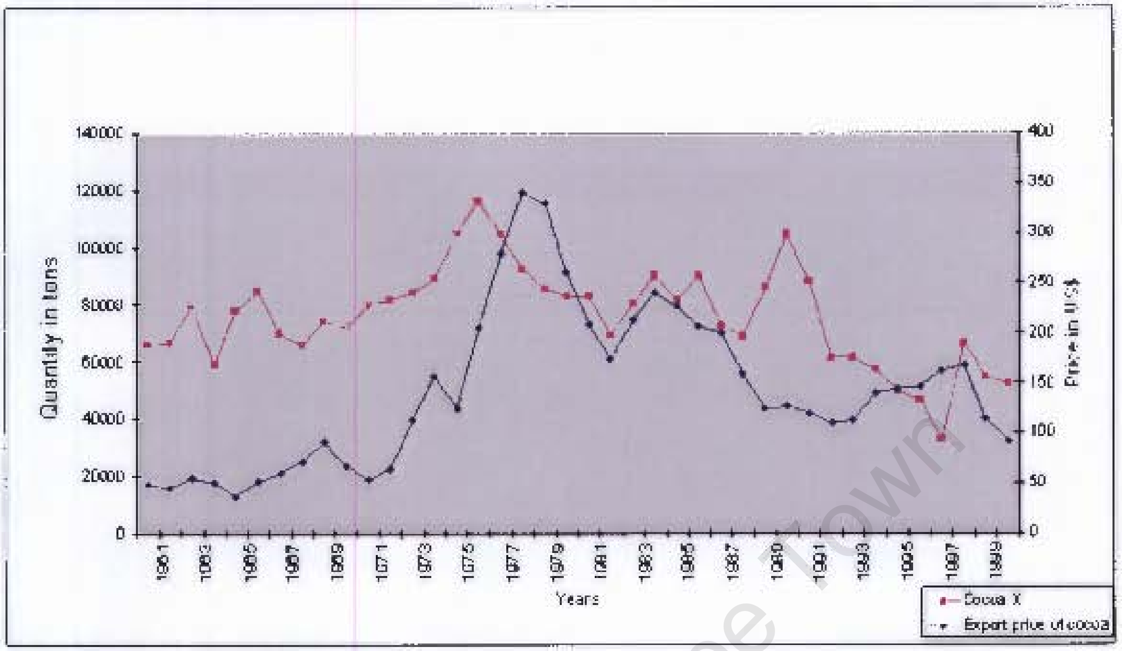

Figure 4: The trend of Cameroon's cocoa exports and foreign export prices.

Similarly to Figure 4, Figure 5 also suggests a positive relationship between the export supply of coffee and its export price. Declines in their price are associated with decreases in quantities and vice versa. The period from 1980 to 2000 is characterized by fluctuating prices and quantities of these commodities but with a noticeable downward trend. The overall view shows that the two series in Figure 4 and 5 move together but diverge in both cases in the late 1980s to early 1990s. As shown in Figures 4 and 5 the international prices of these two commodities are a major problem to increasing exports. Therefore the volatility and the downward trend of these export prices are amongst some of the key factors underlying the poor export performance of these commodities.

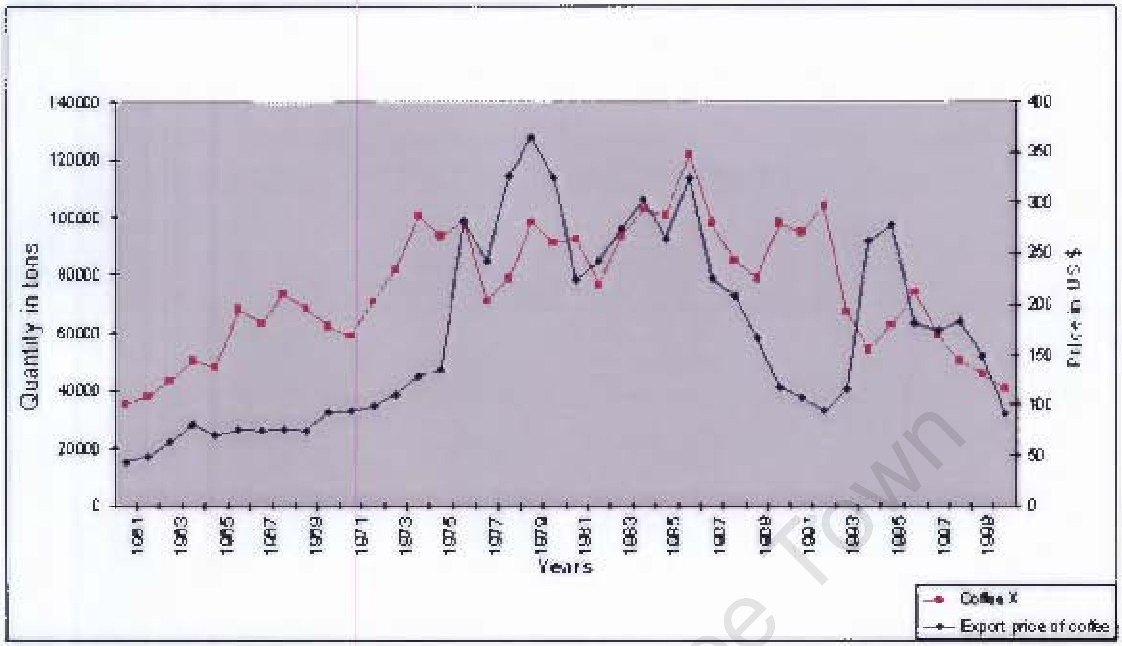

Figure 5: The trend of Cameroon's coffee export and foreign export prices.

The effect of international prices for cocoa and coffee on poor export performance can also be seen in relationship to their cost of production. High input costs coupled with poor policies limit the incentives to produce and export these commodities. The combined effect of falling export prices and increasing costs of production lowered the profitability of producing and exporting these commodities. Figure 6 shows the declining trend of the export prices of cocoa and coffee expressed as a ratio to the GDP deflator.

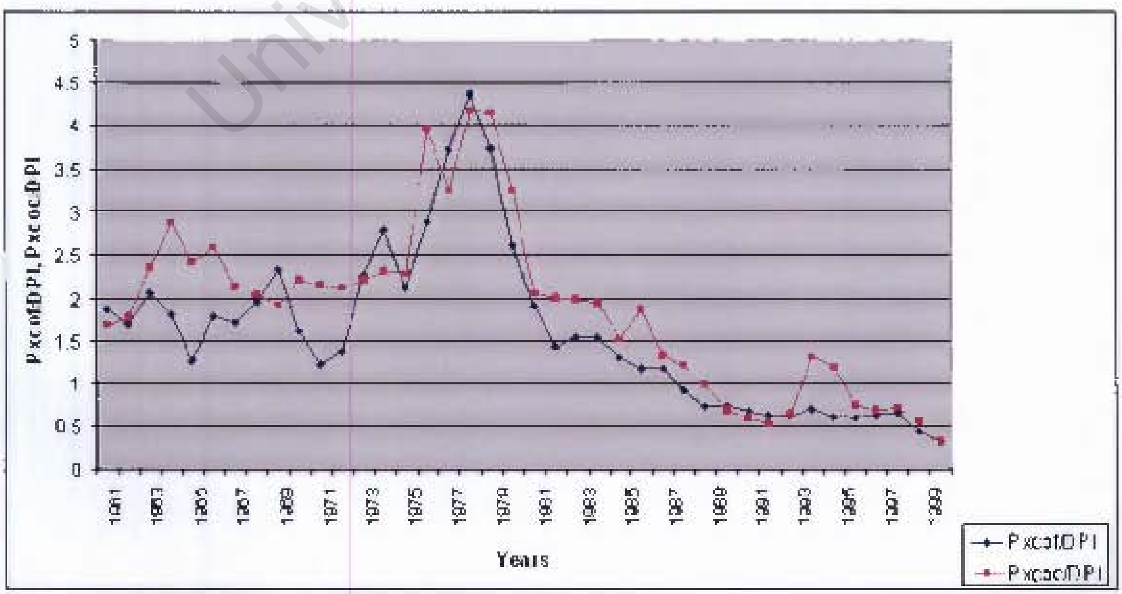

Figure 6: Profitability of exporting cocoa and coffee.

From 1980 these ratios declined steadily indicating a fall in the profitability of producing and exporting these products. Thus the poor export performance of these two products is linked to falling profits.

It is also important to show the trends in Cameroon's physical stock of infrastructure since 1961. To illustrate this, Figure 7 presents the trends of rail and road in kilometers. Considering the entire period (1961 to 2000) it is noted that kilometers of paved roads have grown steadily with the exception of the period 1995-2000 where they remained constant at 4321.752 kilometers. As for rail it has been characterized by sudden jumps. The number of kilometers of rail went up from 532km in the 1960s to 1134km in the 1980 and later fell to 1006km in the 1990s. Most striking in these figures is that the periods of shortfall in rail and road investment corresponds to that of declining cocoa and coffee exports.

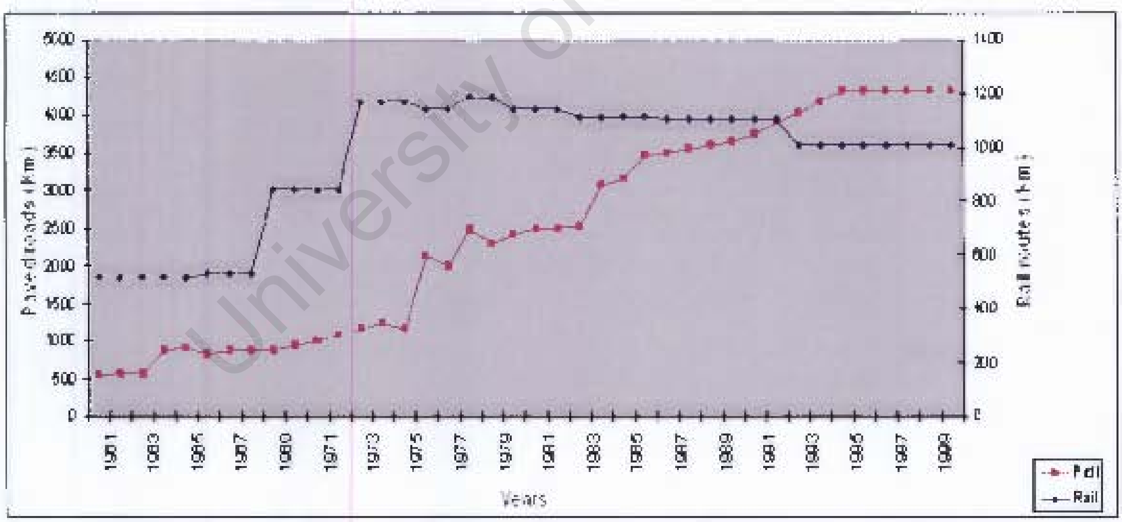

Figure 7: Trend of Cameroon's rail and road infrastructure, 1961-2000.

Contrary to the level representation, Figures 8 and 9 present the trend of rail road and electricity expressed as a ratio of the country's GDP. It is important to note that Cameroon's exports are constrained by declining growth in infrastructure especially rail infrastructure (Figure 8).

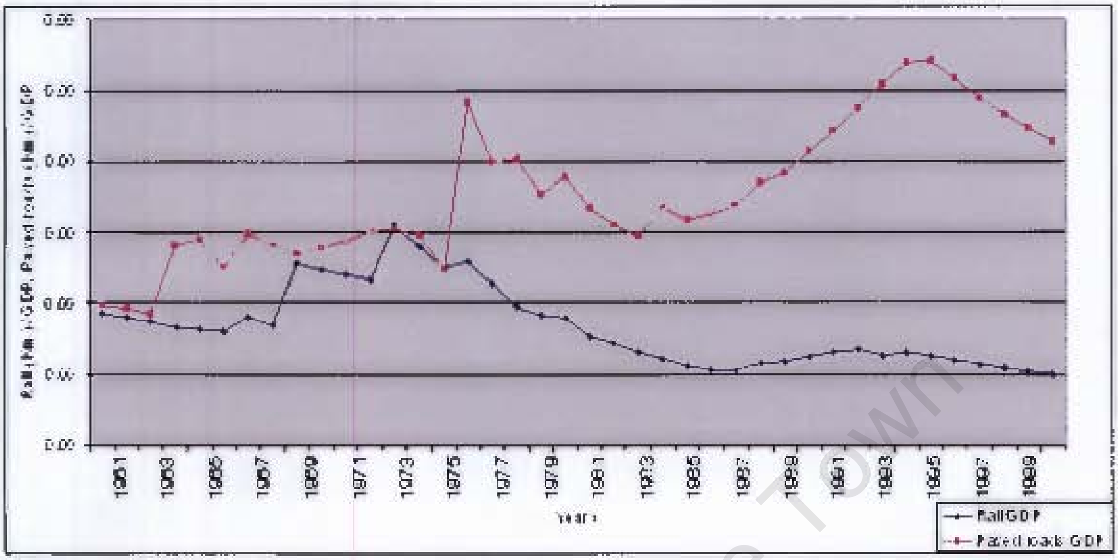

Figure 8: Transport infrastructure to GDP.

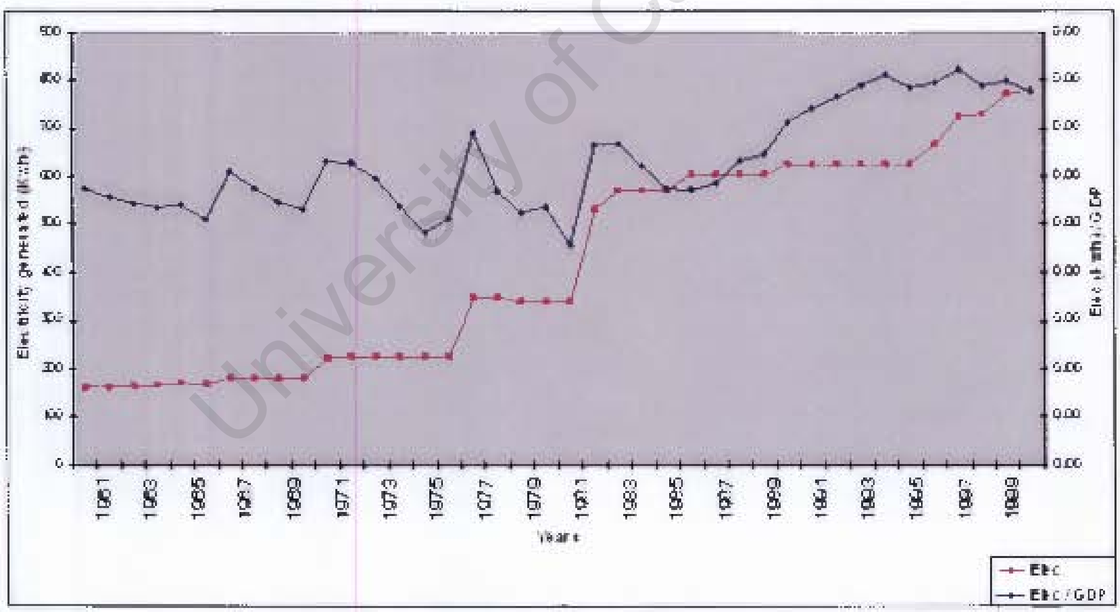

Figure 9: Trend of electricity infrastructure.

Lastly real GDP and GDP deflator are graphed in Figure 10. Both series show an upward trend. The period of Cameroon's economic crises between 1986 and 1994 is seen by a decline in output.

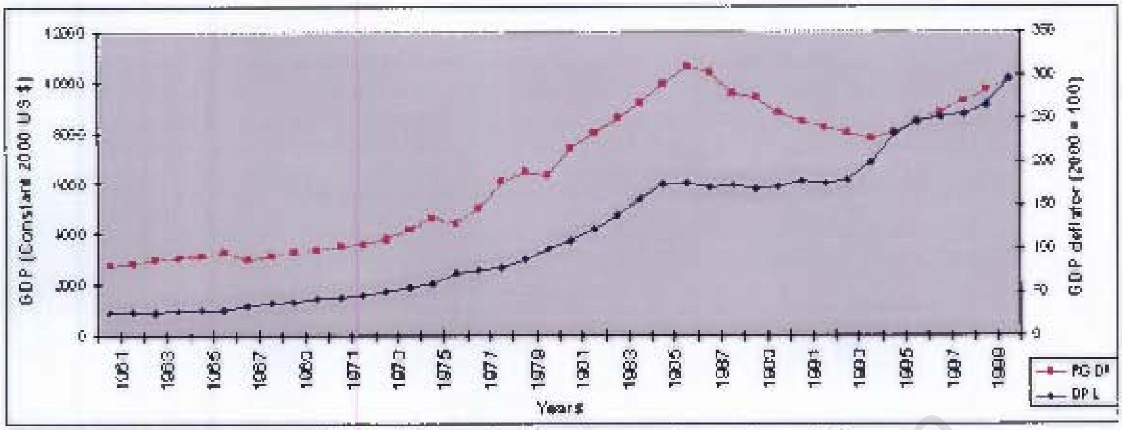

Figure 10: Gross domestic product and gross domestic product deflator.

IV.3 Stationarity tests

To test for stationarity, the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests are applied. Testing the presence of a unit root in the time series data consists of estimating the following equations.

$$\Delta y_t = \alpha + (\rho - 1)y_{t-1} + \sum \theta_i \Delta y_{t-i} + e_t \tag{6.3}$$

$$\Delta y_t = \alpha + \beta t + (\rho - 1)y_{t-1} + \sum \theta_i y_{t-i} + e_t \tag{6.4}$$

$$\Delta y_t = \alpha + \rho y_{t-1} + e_t \ldots \tag{6.5}$$

Equations (6.3) and (6.4) are estimated to obtain the test statistics for ADF while (6.5) gives the test statistic for PP. y_t is natural log of the variable being tested , α is the intercept θ_i are the coefficients and βt time trend. An advantage of using the ADF is that it allows for the correction of autocorrelation of the residuals. The number of the lags is based on the AIC. The unit root hypothesis of $(\rho - 1) = 0$ is tested against $(\rho - 1) < 0$.

IV.4 Cointegration Test

The next step in this empirical analysis consists of testing for cointegration. The essence of the cointegration test is to establish whether there exists a long run relationship between the variables in the model. Two methods are often used in the literature to test for cointegration. The first is the Engle and Granger (1987) two step approach. This approach consists of testing the time series characteristics of the residuals obtained from the Ordinary Least Squares (OLS) regression. In other words, residuals from the estimation of the structural equations are tested for stationarity. If these residuals are stationary at levels (integrated of order zero), then we conclude that the variables are cointegrated. The second method is that of Johansen and Juselius (1990). This approach calculates the trace and maximum eigenvalues of the model. This paper uses the latter approach for the following reasons: (1) unlike the Engle and Granger (EG) approach, the Johansen and Juselius approach (JJ) accounts for the possibility of more than one cointegrating relationship. (2) Practically the JJ test of cointegration is invariant to the choice of variable selected for normalization whereas EG is likely to vary if the order of the variable is changed (Dash, 2005). (3) The JJ approach provides an appropriate estimation framework for estimating multiple as well as single cointegrating vectors.

After the cointegration test is conducted the model is estimated and the significance of the long run coefficients and general significance of the model are tested.

IV.5 Results and discussion

Results of ADF and PP test are reported in Tables 3 and 4. These results indicate that all the variables are non stationary in levels. This means that the null hypothesis of a unit root is not rejected for all variables.

Variable	τ_τ	τ_μ	PP
Lncoc	-1.87	-1.43	-1.32 [0.82]
Lxcof	-2.67	-1.93	-3.43 [0.001]
Lpxcoc	-2.15	-1.71	-2.13 [0.39]
Lpxcof	-0.85	-1.44	-1.76 [0.08]
Ldpi	-1.59	-1.18	-1.07 [.29]
Lrgdp	2.03	-1.26	-1.07 [.29]
Lprdl	-0.70	-1.11	-1.77 [.09]
Lelec	-1.78	-.91	-1.43 [0.18]
Lrail	-1.97	-2.87	-1.34 [0.18]

Table 3: ADF and PP test of stationarity.

Variable	τ_τ	τ_μ	PP
dLncoc	-4.1	-7.61	10.24 [0.00]
dLxcof	-5.40	-5.31	-9.92 [0.00]
dLpxcoc	-4.05	-4.02	8.00 [0.00]
dLpxcof	-3.37	-3.24	14.92 [0.00]
dLdpi	-3.76	-3.43	-3.83 [.00]
dLrgdp	-3.27	-3.24	-4.24 [.00]
dLprdl	-4.88	-4.81	10.66 [.00]
dLelec	-4.91	-4.91	10.79 [0.00]
dLrail	-5.18	-4.21	-30.94 [0.00]

Table 4: First difference: ADF and PP test of stationarity.

95% critical value for the Augmented Dickey-Fuller statistic = -3.54, both intercept and trend. 95% critical value for the Augmented Dickey-Fuller statistic = -2.95, intercept.

Since all the variables are integrated of the same order, a JJ cointegration test is then applied. This test requires a determination of the number of lags. Based on the Akaike Information Criterion (AIC) and sample size lag lengths of one and two are chosen for cocoa and coffee supply models respectively. Subsequently, the JJ cointegration test is conducted imposing exogeneity on export prices. Theoretically, export supply and demand functions do not exist in isolation. To estimate independent supply functions for these commodities, this study considers a small country assumption.

The cointegration test results are reported in Table 5.

Cocoa export function (road)			
NH	AH	ME	TS
r = 0	r >= 1	50.8* (30.7)	81.1* (58.6)
r <= 1	r >= 2	20.2 (25)	30.5 (39)
r <= 2	r >= 3	8.8 (18.3)	10.3 (23.3)
r <= 3	r = 4	1.5 (11.6)	1.5 (11.5)
Cocoa export function (rail)			
NH	AH	ME	TS
r = 0	r >= 1	54.99 *(30.71)	81. 52 *(58.63)
r <= 1	r >= 2	19.79 (24.59)	26.52 (38.93)
r <= 2	r >= 3	5.57 (18.06)	6.74 (23.32)
r <= 3	r = 4	1.15 (11.47)	1.15 (11.47)
cocoa export function (electricity)			
NH	AH	ME	TS
r = 0	r >= 1	48.73 *(30.71)	87.22* (58.63)
r <= 1	r >= 2	21.25 (24.59)	38.48 (38/.93)
r <= 2	r >= 3	15.80 (18.06)	17.23 (23.32)
r <= 3	r = 4	1.44 (11.47)	1.43 (11.47)
Coffee export function (road)			
NH	AH	ME	TS
r = 0	r >= 1	43.08 *(33.64)	86.47* (66.23)
r <= 1	r >= 2	17.66 (27.42)	43.39 (48.88)
r <= 2	r >= 3	14.55 (21.12)	25.74 (31.54)
r <= 3	r = 4	7.25 (14.88)	11.21 (17.86)
Coffee export function (rail)			
NH	AH	ME	TS
r = 0	r >= 1	43.58 *(30.70)	84. 79 *(72.10)
r <= 1	r >= 2	23.86 (28.72)	41.12 (49.36)
r <= 2	r >= 3	8.83 (22.16)	17.26 (30.77)
r <= 3	r = 4	8.45 (15.44)	8.43 (15.44)
Coffee export function (electricity)			
NH	AH	ME	TS
r = 0	r >= 1	48.58* (33.14)	84. 79 *(69.21)
r <= 1	r >= 2	20.86 (30.51)	41.12 (36.51)
r <= 2	r >= 3	6.83 (24.16)	17.26 (28.42)
r <= 3	r = 4	5.45 (13.03)	8.45 (17.22)

Table 5: Johansen cointegration test. NH = Null hypothesis, AH = Alternative hypothesis, ME = Maximum Eigenvalue, and TS = Trace statistics.

These results show evidence of a single cointegrating long run relationship. According to the maximum eigenvalue and trace statistics, the null hypothesis of no cointegrating vector is rejected in favor of one cointegrating relationship in both supply functions, and for all the different infrastructure measures used.

To estimate the long run elasticities, the single cointegrating vector is normalized on quantities of cocoa and coffee exported. Tables 6 and 7 give a summary of results of this normalization. Testing the individual significance of these long run estimates is done by calculating maximum likelihood statistics subject to over-identifying restrictions.

Output capacity

The importance of output capacity neglected in the Gbetnkom and Khan (2002) study, and the perfect substitute model appears to be an important determinant of Cameroon's cocoa and coffee exports.

Variable	Coefficient	Likelihood test
Lxcoc	1	
Ldpl	-0.07	1.15 (0.522)
Lprdl	0.58	11.38 * (0.002)
lrgdp	1.73	10.1* (0.001)
Lpxcoc	0.34	8.1* (0.004)
Ecm	-0.42	-3.41* [.002]

Variable	Coefficient	Likelihood test
Lxcoc	1	
Ldpl	-0.21	3.30** (0.06)
Lrail	0.38	10.06* (0.01)
lrgdp	1.98	16.29* (0.00)
Lpxcoc	0.41	11.37* (0.00)
Ecm	-0.44	-3.45*[.002]

Variable	Coefficient	Likelihood test
Lxcoc	1	
Ldpl	-0.39	2.32 (0.13)
Lelec	-0.19	0.38 (0.54)
lrgdp	1.03	5.8*(0.03)
Lpxcoc	0.29	6.04* (0.01)
Ecm	-0.28	3.42*[.002]

Table 6: Estimated long run coefficients for cocoa model.

In both supply functions, the coefficient of output capacity is statistically significant with the expected positive effect. The long run output capacity elasticities range from 0.98 to 1.98, depending on the infrastructure measure used.

For both commodities long run elasticities of value greater that one implies that Cameroon's output capacity plays a major role in coffee and cocoa exports. In other words high elasticities show that a small change in the country's output capacity has a relatively high impact on the export of these commodities. For this reason, the poor export performance of these commodities over the past decades can be attributed to the country's slow growth in output.

Variable	**Coefficient**	**Likelihood test**
Lxcof	1	
Ldpl	-0.52	15.43* (0.00)
Lprdl	0.56	6.02* (0.01)
lrgdp	1.56	18.32* (0.00)
Lpxcof	0.41	3.22** (0.07)
Ecm	-0.48	-3.66* [0.001]
Variable	**Coefficient**	**Likelihood test**
Lxcof	1	
Ldpl	-0.21	0.74 (0.39)
Lrail	0.66	11.10* (0.00)
lrgdp	1.02	6.15* (0.01)
Lpxcof	0.92	19.01* (0.00)
Ecm	-0.35	-2.35[0.015]
Variable	**Coefficient**	**Likelihood test**
Lxcof	1	
Ldpl	-2.25	3. 55 **(0.05)
Lelec	-1.02	1.48 (0.58)
lrgdp	0.98	6.36* (0.00)
Lpxcof	0.38	10.54* (0.00)
Ecm	-0.27	-2.19 [0.04]

Table 7: Estimated long run coefficients for coffee.

* denotes 5% level of significance** denotes 10% level of significance Figures in brackets denote probabilities.

Infrastructure

The estimated coefficients of the infrastructure measures reflect the differential effect of alternative forms of infrastructure on the export of these commodities. As shown in Tables 6 and 7 the coefficient on the electricity variable is statistically insignificant in both coffee and cocoa models. A possible explanation for this may be that production and packaging of these commodities for export is done mostly in the rural areas of the country where electricity is almost completely absent. Unlike electricity, road and rail infrastructure are needed to transport these commodities from the interior parts of the country where they are produced to the ports for export. For both commodities, kilometers of paved roads infrastructure has positive sign and is statistically significant. Their long run elasticities exceed those (0.58 against 0.19, 0.66 against 0.14) of Gbetnkom and Khan (2002). These differences might be as a result of the different measures used. Similarly to road infrastructure, rail infrastructure proves to be consistently positive and significant for both commodities.

Though the elasticities of cocoa and coffee export with respect to road and rail infrastructure are inelastic (suggesting a low response of cocoa and coffee exports to changes in infrastructure), evidence from graphical analysis suggest that Cameroon's poor performance in exports could possibly be due to inadequate investment in road and rail infrastructure.

Price sensitivity

The estimated supply price elasticities in Tables 6 and 7 conform to the theoretical as well as the evidence provided in Cameron et al (2005) and Ngaruko (2003). It contradicts Deaton`s (1992) view that agricultural exports respond positively to increasing as well as declining prices to stabilize export revenue. The supply price elasticities of these commodities range between 0.29 to 0.41 for cocoa and 0.38 and 0.98 reflecting the volatile and declining nature of the prices of these commodities. The volatility of these commodity prices and their low price elasticities are major constraints to the expansion of these exports.

Factor cost

The proxy measure of factor costs in the cocoa and coffee supply functions has consistently proven to be negative and marginally significant. It is difficult to explain why this variable is only significant at 10 % and in some cases insignificant. A possible explanation maybe that domestic price deflator is not a good proxy for production cost.

The error correction model is estimated for both functions and different infrastructure variables. The coefficient on the error correction term suggests the existence of a valid long run equilibrium relationship in all models. This coefficient is significant at 5% in all the specifications considered but with different rates of adjustment. The highest adjustment rate of 48% is recorded for the coffee model with paved road infrastructure measure and the lowest is 27% when electricity is considered. This suggests that the system corrects previous disequilibrium by 48% and 27% in each period. Alternatively this suggests quick response to equilibrium.

V Conclusion and policy implications

This study has analyzed Cameroon's export structure and the role of infrastructure, export prices and output capacity in explaining the poor performance of coffee and cocoa exports. It has been shown that the share of cocoa and coffee in total exports dropped from 43.7% in 1980 to barely 10.8% in 2005. This decline is not due to expansion into other export sectors but rather an increased concentration on primary exports. Results from this study show that both external and internal constraints are responsible for the poor performance of Cameroon's coffee and cocoa exports. The declining and volatile export prices combined with low elasticities greatly affected the performance of these commodities. Because the commodity price effect is external, there is very little that the government can do to control these prices. The risk associated with the exports of these commodities can be reduced by making them more competitive and also by diversifying exports into manufacturing. These objectives can only be achieved if the necccessary supply conditions are put in place. To improve the export performance of Cameroon's coffee and cocoa exports as well as other primary and manufacturing exports, the government needs to improve the country's infrastructure and output capacity. This means that the government needs to invest more in infrastructure, especially transport infrastructure. On the basis of these results, there is an urgent need to create a conducive supply environment for production and exports. This can be achieved by improving contract enforcement and providing quality institutions. An overall reduction in transaction costs will improve the competitiveness of the country's primary exports as well as facilitate diversification into other export sectors.

However, the study was sensitive to changes in specifications and sample period. Also domestic price deflator used is not a good proxy for the measure of production cost for cocoa and coffee. Preferable, cost of farm inputs such as fertilizers and farm equipments are better measures of production cost but due to data constraints this study could only use domestic price deflator. Also variables such foreign incomes, availability of credit to cocoa and coffee farmers were not considered. These variables can be considered in future research. Finally the short run effects were also left out. Future research may want to consider the short run elasticities.

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