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DETERMINANTS OF NON TRADITIONAL EXPORTS IN BOLIVIA: A SIMULTANEOUS APPROACH

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ACRONYMS AND ABBREVIATIONS

ACE: Spanish acronym for Agreement of Economic Complementation.

ADF: Augmented Dickey Fuller.

ALADI: Spanish acronym for Latin American Integration Association.

ATPDEA: Andean Trade Promotion and Drug Eradication Act.

CAN: Spanish acronym for Andean Community of Nations.

CEPROBOL: Spanish acronym for Promotion Center Bolivia.

CONEX: Spanish acronym for National Council of Exports.

CPI: Consumer Price Index.

DPE: Spanish acronym for General Bureau of Exports' Promotion.

ECM: Error Correction Model.

FIML: Full-Information Maximum Likelihood.

FOB: Free On Board.

GDP: Gross Domestic Product.

GLS: Generalized Least Squares.

GSP: Generalized System of Preferences.

IBCE: Spanish acronym for Bolivian Institute of International Commerce.

IFS: International Financial Statistics.

IMF: International Monetary Fund.

INE: Spanish acronym for National Institute of Statistics.

INPEX: Spanish acronym for National Institute of Exports Promotion.

IRF: Impulse Response Function.

ISI: Imports Substitution Industrialization.

I(1): Integrated of Order 1.

MERCOSUR: Spanish acronym for Common Market of the South.

NEP: New Economic Policy.

OLS: Ordinary Least Squares.

RER: Real Exchange Rate.

RITEX: Spanish acronym for Regimen of Temporal Internment of Exports.

SBEF: Spanish acronym for Banks and Financial Entities' Superintendence.

UDAPE: Spanish acronym for Unit of Social and Economic Policy Analysis.

USA: United States of America.

VAR: Vector Autoregressive.

WTO: World Trade Organization.

2SLS: Two Stages Least Squares.

3SLS: Three Stages Least Squares.

CHAPTER 1
INTRODUCTION

The estimation of trade elasticities has awakened the interest of researches not only in the academic area but also on policy-making institutions for a wide variety of reasons. Between the most relevant, it is believed that there is a close linkage between the current account –and hence the Balance of Payments- and the exchange rate performance, that has been tested empirically through the Marshall-Lerner condition which states that for a depreciation of the domestic currency to reduce the external deficit, the sum (in absolute values) of import and export price elasticities of demand must be greater than one[1]. In this sense, it is said that knowledge of these elasticities allows policy makers to predict the effects of exchange rate changes on a country's current account.

By the same way, in the case of exports, the underlying reason for such interest is to try to figure out what are the motives that can make a country a successful exporter in the long run. In relation to this, there are at least two currents: those who sustain that a nation can promote its exports making them competitive on the basis of price; and those who argue that in the cases where its demand is not sensitive to prices, a policy of pursuing competitive export prices (real exchange rates) may not work and thus exports of the country are either dependent on a boom in its trading partners' markets[2] or otherwise some policy measures towards inducing productivity increases are required.

Therefore, in this case it is also crucial to determine the degree of sensitivity of exports to changes in their determinants so that an appropriate policy can be carried out; however, this requires considering not only the demand-side determinants but also those that have an effect on the supply side. In other words, it is important to find out if exports are sensitive to prices and/or to non-price factors.

If exports' demand is not sensitive to changes in prices then the price elasticity of export supply is a crucial determinant of its behavior and needs to be known. On the other hand, if the demand for exports is found to be infinitely price elastic, the country is said

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[1] For further detail on this condition see: Murshed (1997), Ch 2, pp. 14-16
[2] This case is known as the 'elasticities pessimism' in the literature.

to be a price-taker in the world market and hence the most adequate policy can be related to the provision of incentives to domestic producers in order to make production for export markets more profitable when compared to the option of selling in the domestic market.

In this sense, cognizant that since the application of the New Economic Policy (NEP) in 1985 the Bolivian exports started to recover and diversify towards non traditional commodities –which are a more stable source of foreign reserves than their traditional counterparts- this paper endeavors to find the determinants of their behavior for the 1990-2004 period; however, it is not focused on the effect of exports on the economy itself since it takes for granted that they have an expansive effect on the economic activity.

Corresponding to this, the paper's main objectives are to find if the demand, the supply factors or both have determined the observed trend of the non traditional exports and through this conclude if the Bolivian policies intended to boost and support exports are based on their adequate determinants and consequently are the correct ones. Accordingly, the research questions of the investigation are: what are the main determinants of the non traditional exports' observed pattern of the 1990-2004's period? Are the policies implemented by the Bolivian government on the subject of this issue the appropriate ones?

In order to answer these questions the elasticities of supply and demand of the non traditional exports were estimated –under the imperfect substitutes model's framework, since the non traditional commodities can be regarded as differentiated goods- using quarterly data from 1990 to 2004 through Two Stages Least Squares (2SLS).

The main contribution of the paper is the consideration of the simultaneous interaction of supply and demand with the intention to resolve the simultaneity bias problem, contrary to what has been done in previous studies in which either the supply side was addressed by assumption as infinitely price elastic or –although not explicitly announced- export demand and export supply models were brought together into a single reduced form equation trying to solve the omitted variable bias. By the same token, an index of competitors' prices was calculated using data of the USA's (United

States of America) imports of jewelry lumber and its manufactures, and apparel articles and accessories[3] -which are the main exports of Bolivia to this market- and it was used instead of the classical consideration of the Real Exchange Rate (RER), which is calculated using trading partners and thus not reflecting adequately the cross elasticity of demand.

The main findings of the paper suggest that, when the interaction between supply and demand is neglected, the prosperity of the non traditional exports' markets is their main determinant and thus that there is no scope for price competition. However, once the simultaneous system is considered, the "small country" assumption could not be rejected -demand was found to be infinitely price elastic- and hence the supply-side factors are identified as the key determinants of the non traditional exports' behavior.

In this regard, being aware that not only the market but also the government are subject to failures[4], a combination of some extra measures destined to make exports a profitable business for exporters when compared to the option of selling on the domestic market and actions regarding discipline –in an adequate institutional framework- are necessary in order to fuel and support the exporter sector.

Additionally, it is important to highlight that the investigation has as its main limitation the use of aggregated data. Since we are working with the group of non traditional commodities, which consist of diverse products that go from raw materials to completely processed goods, it is said that the results could be biased downwards due to the fact that the former goods can display the largest variation in prices and therefore exert a dominant effect on the estimated aggregate price elasticity (Goldstein and Khan, 1985:1070). In this sense, better results and hence policy recommendations could have been derived if data would have been available at a more disaggregated level i.e. by product.

The organization of the paper is as follows: Chapter 2 provides the theoretical framework of the investigation and for that purpose revises the imperfect substitutes

[3] Although apparel articles and accessories are not one of the major exports to the USA they are benefited by the Andean Trade Promotion and Drug Eradication Act (ATPDEA).
[4] Such as externalities in the case of the market and corruption, rent-seeking, etc. in the case of the government.

model as well as the perfect substitutes model's assumptions and main characteristics. In addition, it presents in a shell nut a number of important considerations regarding the elasticities of supply and demand and finally highlights some non price factor determinants.

Furthermore, the context of the Bolivian non traditional exports behavior and their evolution are provided in Chapter 3, where not only the goods that are part of this group are specified but also their processed component is estimated and their principal markets of destination identified. Additionally, this chapter provides a snapshot of the possible explanations (exogenous, institutional or economic policies) for their behavior as well as the exporters' point of view regarding hindering factors and policies destined to boost their commodities.

Chapter 4 presents the econometric methods used in the literature for the estimation of simultaneous-equation models under the imperfect substitutes model's framework, derives the model specification for the Bolivian non traditional exports and remarks some limitations of the chosen method of estimation as well as some considerations that were done in this regard.

Details on the data used for the estimation and a review of previous investigations in Bolivia as well as the results obtained from estimating first a single-equation demand and then a simultaneous-equation model are presented and discussed in Chapter 5.

Chapter 6 develops the investigation's principal conclusions and recommendations and finally, in addition 5 annexes are provided in order to make available supporting information of the investigation.

CHAPTER 2
THEORETICAL FRAMEWORK

Most empirical literature on the determinants of export behavior is based on two models of trade: the imperfect substitutes model and the perfect substitutes model, as outlined by Goldstein and Khan (1985). That is why this chapter intends to briefly review in Sections 1 and 2 the assumptions as well as the main characteristics of both of them. Additionally, Section 3 remarks some important issues regarding the elasticities of demand and supply and Section 4 deals with non-price determinants.

2.1 THE IMPERFECT SUBSTITUTES MODEL[5]

This model is formulated under the assumption that neither imports nor exports are perfect substitutes for domestic goods. In this sense, the characteristics of the commodities differ –substantively or just cosmetically- according to their country of origin and therefore there is less chance of a common price for the good in question and the quantity sold by a particular country depends on price differentials between the different sources of supply. This assumption is quiet realistic and it is supported by at least two facts: first, imports and domestic output normally coexist in the same market and second, there are permanent price differences for the same good[6] between and within countries (the law of one price does not seem to hold).

Having said this, the framework of the imperfect substitutes model of country's *i* exports to the rest of the world can be given by the following system of equations:

Demand Function:	$X_i^d = f(Y^* e, PX_i, P^* e)$,	$f_1, f_3 > 0, f_2 < 0$
Supply Function:	$X_i^s = g[PX_i (1+S_i), P_i]$,	$g_1 > 0, g_2 < 0$
Equilibrium Condition:	$X_i^d = X_i^s$	

These equations determine the quantity of exports supplied by country *i* to the rest of the world (X_i^s), the quantity of country's *i* exports demanded by the rest of the world (X_i^d), as well as the domestic currency prices received by exporters (PX_i). The

[5] Based on Goldstein and Khan (1985).
[6] Except for standard commodities.

exogenous variables of the system are: the level of nominal income in the rest of the world (Y^*), the price of goods produced domestically (P_i), the subsidy rate applied to exports (S_i) and the exchange rate (e). The advantage of this formulation is that it clearly shows that the relation between prices and quantities is, at least in theory, simultaneous.

2.1.1 DEMAND FUNCTION

According to the theory of demand, consumers will maximize utility by allocating their income among different consumable commodities (these can be goods produced domestically or imported), hence the optimal choice of the consumer -holding tastes constant- depends on three things: the prices of the good in question, the prices of its substitutes and/or complements, and his/her disposable income.

Following the law of demand, which states that the quantity purchased of a good per unit of time is inversely related to its price, a decrease in the imported commodity's price –*ceteris paribus*- will make it more attractive for the consumer. In this sense, the price elasticity of demand is expected to be negative.

However, if the price of the commodity has changed and it has quite close substitutes whose prices remained unchanged, this will produce "quite substantial substitution -a fall in price leading consumers to buy more of the commodity in question and a rise in price leading consumers to buy more of the substitutes" (Lipsey, 1975:107). By the same way, if the good has complements a change in its price will not only affect its own demand but also the demand of the complementary goods, or vice versa. Nevertheless, under the demand functions for exports the possibilities of complements are typically excluded and hence it is assumed that the cross elasticity of demand is always positive.

When the third determinant of the demand is analyzed, it is said that the higher the disposable income of the importing country the more consumers will like to consume a particular good and hence its demand will increase. The underlying assumptions in this case are that the expansion in the claimant country's income (due to economic growth) will be used in imported commodities instead of increasing its own productive capacity,

that the goods demanded are normal ones and that the demand is not residual[7], thus that the income elasticity of demand is positive.

One extra assumption that is made is that consumers have no "money illusion" so that a doubling of money income and all prices leaves demand unaffected ($f_1+f_2+f_3=0$). To test this assumption, no distinction is made between transitory and permanent income or between secular and cyclical income movements, which can be seen as a deficiency.

2.1.2 SUPPLY FUNCTION

In total agreement with the theory of the firm, "all else being equal, the more goods and services will be produced for export the higher the real return on exporting, relative to returns from other uses for the resources used in exporting" (Smith, 2000:5).

The return on exporting can be maximized, *ceteris paribus,* through two instances. First, increasing the price of the exported good (maximizing revenue) and second, minimizing the costs of production.

As exporting firms are free to supply their commodities either on the domestic market or abroad, they allocate their output on both markets based on the price signals received. However, when we think about the increase in export prices or changes in the demand conditions, we should take into consideration that due to physical constraints (such as inputs of capital and labor) as well as the existence of pre-arranged contractual obligations exporters may not be able to respond in the short run, but their response can take place in the medium or long run[8]. Additionally, it is important to mention that the relevant own price in the export supply function is the price actually received by the exporter, which may include subsidies or any other incentives or penalties for exporting.

On the other hand, for a given level of export price the return of foreign sales increases as the costs of the exporting firm declines. Under the framework of the imperfect

[7] A demand is said to be residual when it is just the difference between world production and consumption of importables.
[8] That is why, in the empirical ground, the consideration of lags is very important.

substitutes model the domestic prices can also act as a *proxy* for the factor costs since their movements are said to be linked.

Additionally, the costs' minimization can be achieved through the so called economies of scale, where lower costs are associated with output expansions that can occur due to economic growth at home -which in turn translates into growth in the economy's production capacity- and can boost the exporting sector when the country can sell some of its increased production to the world market[9] but if it only translates into lower prices the benefits will be passed to the foreigners.

Nevertheless, if this growth disproportionately expands a country's production possibilities in the direction of the good it exports[10], it is said that for any given relative price of the commodity its output will increase relative to that of the other goods and this situation can worsen the country's terms of trade, since the world supply of the commodity will increase and hence its relative price will fall. This is true for "large countries" that can affect the world supply and hence can be considered as price-setters, whereas for those to whom the prices are given and only have a small share in the market there are more possibilities of expansion without falling terms of trade.

Finally, it is worth mentioning that "as exporters compete with producers of non-tradables for a finite stock of capital, labor and other resources and as non-tradables may well be produced with different factor intensities than exportables, there is a cost in increasing export supply even in the long run[11]. This gives rise to an upward-sloping export supply curve and the claim that the increase in exports depends on the strength of the export price increase" (Strauβ, 2002: 7-8). Hence, there is no *a priori* reason to assume that a country's supply of exports passively responds to changes in the level of foreign demand and thus that the supply of exports is infinitely price-elastic as the bulk of empirical works does.

[9] When the country has a small market share and hence does not affect the export's price.
[10] Known as export biased growth in the literature.
[11] This can be weakened by an increase in the productive capacity of the economy.

2.2 THE PERFECT SUBSTITUTES MODEL[12]

Although the imperfect substitutes model is the most used in the empirical literature, there are at least three reasons that support the formulation and the study of the perfect substitutes model. First, there are homogeneous or nearly homogeneous commodities which are traded at a common price (once the effects of transportation costs and trade barriers have been accounted for) on organized international markets that require a framework where demand and supply are independent on price differentials. Second, if the observed dissimilar international prices for a given commodity or bundle of commodities are the result of differences in the methodology used for the construction of price statistics their true degree of substitutability could be understated. Third, when goods are assumed to be imperfect substitutes some insights about income and price elasticities may be lost.

The perfect substitutes model of trade for a representative country *i* can be formulated as:

$$D_i = h(P_i, Y_i) \qquad h_1<0, h_2>0$$

$$S_i = j(P_i, F_i) \qquad j_1>0, j_2<0$$

$$I_i = D_i - S_i$$

$$X_i = S_i - D_i$$

$$PI_i = P_i = PX_i = eP_w$$

$$D_w = \sum_{i=1}^{m} D_i$$

$$S_w = \sum_{i=1}^{m} S_i$$

$$D_w = S_w$$

Where, D_i (S_i) is the total quantity of traded goods demanded (produced) in country *i*, I_i (X_i) is country's *i* imports (exports), D_w (S_w) is the world demand (supply) of traded goods, PI_i, PX_i, P_i and P_w are the import, export, domestic and world prices of traded goods, Y_i and F_i are money income and factor costs in country *i*.

[12] This section is based on Goldstein and Khan (1985).

Under this framework, contrary to the one of the imperfect substitutes model, there are no separate functions for import demand or export supply and hence the demand for imports represents the excess demand for domestic goods whereas the supply of exports stands for the excess supply of domestic goods. By the same way, it is the interaction of world supply and world demand which determines the unique traded goods price; in this sense, only if the country is large enough to alter either world demand or world supply it will be able to affect the world price.

2.3 SOME IMPORTANT ISSUES REGARDING THE ELASTICITIES OF DEMAND AND SUPPLY

- The size of the price elasticity of demand depends on two factors: 1. the available number of closer substitutes of the commodity and 2. the period given to consumers to adjust their choices once the price of the commodity has changed. In this sense, the price elasticity of demand will be larger when 1. the commodity has closer and abundant available substitutes since consumers will stop consuming the more expensive good and shift to its cheaper substitutes, and 2. when consumers have a longer period of time to adjust their choices to a change in the commodity's price; that is why, in the empirical ground, the long run elasticity is most of the time larger than the short run elasticity[13].

- When we deal with exports we should take into consideration that the price in the importing country not only depends on prices set in the exporting countries (expressed in foreign currency for the importing country) but also on the exchange rate between their currencies. Nevertheless, regardless of the motive that has produced the change in the price of country's exports we can still measure the increase in quantity of its exports resulting from a fall in their (local currency) price through the price elasticity of demand.

- The cross elasticity of demand allows to know if market share is being lost at expenses of competitors. As mentioned by Behar and Edwards (2004: 4), "within a certain industry, trade theory predicts that the products a country imports from a

[13] If price elasticity is low even in the long run is because consumers may not still be able to find suitable substitutes for the commodity.

variety of sources are distinct in some way from the products it produces domestically. Therefore, the products exported to a country by two or more rival exporters should be closer substitutes for each other than for products produced by the importing country". In this regard, if the prices of the commodities that substitute our exports decrease –due to whatever reason- then foreigners will shift consumption away from our exports and towards the substitutes, implying an increase in the market size of our competitors in detriment of ours.

- Following Lipsey (1975), supply elasticity depends to a great extent on the behavior of costs once output changes. If costs per unit of production rise quickly as output rises then there is no incentive to expand production even if the price has increased, in this case supply can be said to be rather inelastic. On the other hand, if costs per unit of product rise slowly (or not at all) when output increases, an increment in price that raises profits will lead to an increase in the quantity supplied before the rise in costs stops the output expansion. In this case supply can be considered as rather elastic.

2.4 NON-PRICE FACTORS

We should also take into consideration that the existence of some market failures such as the "informational externalities", "coordination externalities" and "labor training externalities", call for a rigorous government strategy intended to foster the exports' sector as a whole and at the same time to support and stimulate a productive transformation of its base when the country requires it, which is the case in most developing countries that are mainly concentrated on production and export of primary commodities.

In this sense, not only prices, but also non-price factors such as institutional or those regarding economic policies can fuel or jeopardize the take off of exports. Ideally, a country should seek not only to export more but also to export goods with higher value added. Hence, if the intention is to find a country's productive potential and to foster the higher-productivity activities, the role played by the government as well as the institutional framework of the country can be seen as important exports' determinants.

As mentioned by Piana (2001: 3-4) among the factors that can affect the exports performance we can refer to: 1. **non-price competitiveness**, arising from branding, technology, product quality, high productivity, etc; **2. level of hindering factors** such as lack of information, trade barriers, transport costs, etc; **3. levels of services provided by complementary players,** like international banks, guarantee funds, consulting firms, etc. **4. historical links** with certain target countries and **5. economic integration.**

According to Rodrik and Hausmann[14] (pp. 7-9) "any entrepreneur who innovates by investing in a new activity bears the full cost of his failure when the project is a flop, but reaps only a portion of the gains when it is successful" given that any successful project will attract emulators. By the same way, "individual projects are likely to be profitable if complementary investments are made, but no otherwise" due to the lumpy nature of the investment required. And as "most labor training takes place on the job, and the most significant forms of inter-firm technological spillovers occur through labor mobility among firms", a trade off arises since on the one hand, adequate labor turnover is required in order to disseminate new technologies and productive capabilities among firms and on the other hand, this labor turnover undermines the incentive of firms to invest in on-the-job training.

All these arguments provide a reason for government's intervention. For instance, by providing subsidies to the fixed costs of entrants in the new industries, informational externalities can be addressed. In the same line, government can provide a subsidy to the firms that offer on-the-job training for general skills in order to solve the labor training externalities. However, we should not fail to remember that not only the market but also the government is prone to failures such as rent-seeking, corruption, etc. and thus the strategy requires the recognition of both types of failures and hence a balance between discipline and incentives. Corresponding to this issue, there should be an appropriate institutional framework and a well defined strategy of incentives, in such a way that they are provided to activities that for instance pay off and can crowd in other activities, complementary investment as well as/or generate technological or informational externalities.

[14] Forthcoming, preliminary version available from:
ksghome.harvard.edu/~.rhausma.cid.ksg/ elsvdr/Chapter%202%20self-discovery%20wbib.pdf

CHAPTER 3
DESCRIPTION OF THE CONTEXT: THE BOLIVIAN NON TRADITIONAL EXPORTS

This chapter presents a description of the Bolivian exports, focusing on the non traditional components, their share on the total, their evolution, their market concentration and their processed component, in order to have a better understanding of their determinants, which may help in the interpretation of the results obtained in Chapter 5. In addition, some possible explanations of the non traditional exports' behavior as well as the exporters' point of view are offered.

3.1. EVOLUTION OF THE BOLIVIAN EXPORTS

Starting on the 60's and until the early 80's the Bolivian economy was following the imports substitution industrialization (ISI) strategy; however, as some authors sustain[15] these protective measures were not perceived as transitory by the private sector and hence the emergence of a competitive industry did not take place. Moreover, the different mechanisms of income transfer (incentives of production) from the public sector to the private sector were considered as one of the reasons of the 80's crisis when the disposable income of the State shrunk.

According to Morales (2000), the economic crisis of the 80's had its origins in the crisis of the external sector[16] manifested by: exhaustion of the reserve fields, decline in the prices of the main exporting commodities, increment in the debt service, shrinkage of the terms of the payments of the external debt and increased difficulty in obtaining new credits. The combination of all these factors, led to an increasing fiscal deficit and hence to an expansion of the monetary base (in order to finance it) that ended up in a hyperinflation process[17].

[15] Escobar and Kruse (2005), Jemio (1993).
[16] According to this author, two thirds of the national budget came from the external sector.
[17] To get a schematic view of the events of the 70's and 80's see Annex A.

In order to solve this, the Bolivian government enacted a stabilization plan known as the NEP[18] which among other things[19] included the liberalization of the current and the capital accounts and gave place to a market-oriented economy replacing the model characterized by the preponderant role of the State in the production activity.

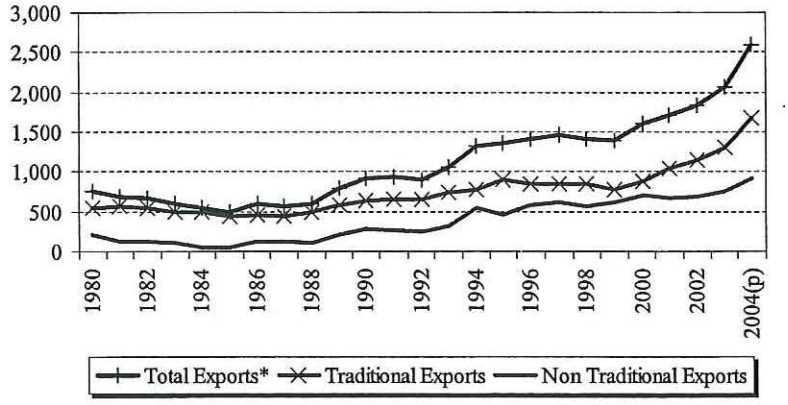
During those years, the State exploded and commercialized the production of the mining and hydrocarbons sectors (known nowadays as the traditional exports) and thus its source of foreign exchange –required in order to undertake imports and investment activities- was vulnerable to constant crises, recessions and decline in the international prices as pointed out by the Prebisch-Singer hypothesis[20].

In relation to this, it can be seen from GRAPH 1 that during the years of the crisis (1980-1985) the Bolivian total exports had a very poor performance showing a declining tendency the whole period. Throughout this episode 83% of the total exports were, on average, traditional products.

GRAPH 1

BOLIVIAN EXPORTS*

(Million $us of 1990)



(p) preliminary data
* Does not include personal effects and re-exports.
Source: UDAPE, INE
Author's elaboration

[18] Through Supreme Decree 21060 of August 29th of 1985

[19] For further details refer to Morales (2000) and to Jemio (1993).

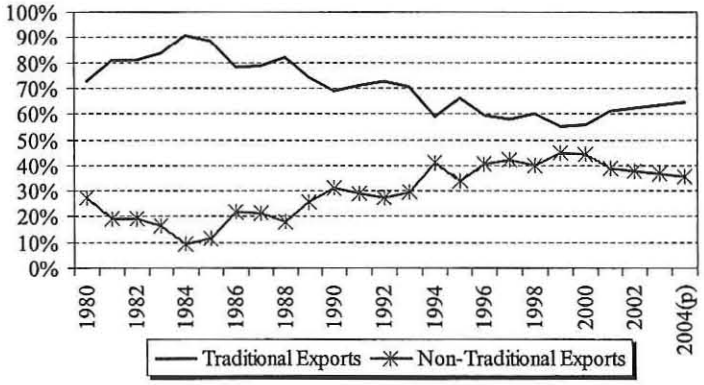
[20] Relative prices of primary products would decline in the long run and therefore developing countries - that were led by comparative advantage to specialize in them- would find their prospects for development diminished <http://www-personal.umich.edu/~alandear/glossary/p.html>

However, it is also possible to appreciate that after the application of the NEP the non traditional exports started their take off[21] and nowadays still continue, on average, with a positive trend. Just as an exemplification of this behavior, it is worth mentioning that from 1985 to 1986 the non traditional exports grew by 123.06% and for the period of analysis of the investigation (1990-2004), the rate of growth was as high as 219.25%. Additionally, it was not the case that the traditional exports started a negative trend (in fact, they also grew from 1990-2004[22]) but they reduced their share in the total exports[23], as can be seen from GRAPH 2, favoring the diversification of the Bolivian export base towards non traditional commodities, which can be seen as very positive since these products have at least some degree of elaboration and their prices are less volatile than those of the traditional commodities and hence constitute a more stable source of foreign exchange.

GRAPH 2

TOTAL EXPORTS' COMPOSITION*

(%)



(p) preliminary data
* Does not include re-exports and personal effects (Million $us of 1990)
Source: UDAPE, INE
Author's elaboration

Now, we have reached a point in which three things are of interest: First, what is the composition and level of processing of the non traditional exports? Second, what are the major markets of these goods? And third, what factors can be determining their behavior? The rest of this chapter will analyze these concerns.

[21] Representing, on average, 34% of the total for the period 1986-2004 and 37% for the period 1990-2004.
[22] The rate of growth for this period was 164.78%.
[23] New contracts for natural gas' exports were signed with Brazil in 1999 and with Argentina in 2004.

3.2 NON TRADITIONAL EXPORTS' COMPOSITION

The non traditional exports, those commodities that were originally being produced and exported by the private sector, consist of a variety of goods that have different levels of processing going from raw products to highly processed commodities.

TABLE 1 shows the average product concentration of the non traditional exports, and it is worth mentioning that there are three categories that added together represent more than the 50%. These goods are: soja and derivatives -which mainly are soja oil, soja flour and soja cake[24]-, jewelry, and lumber and its manufactures.

TABLE 1

NON TRADITIONAL EXPORTS

AVERAGE PARTICIPATION OF PRODUCTS*

(%)

Non-traditional Exports	Average Participation 1990-2004(p)
Soja and derivatives	38.89%
Coffee in grain	2.19%
Cacao	0.22%
Sugar	4.23%
Beverages in general	1.36%
Lumber and lumber's manufactures	11.52%
Leather and leather's manufactures	3.27%
Rubber	0.05%
Chestnut	4.86%
Cotton	2.82%
Jewelry	12.65%
Others**	20.77%

* Since export price indexes are not available for each good, this average participation was calcualted from the data on Current Million Dollars.

** Cereals, tubers, oleaginous, fibers, fodder, tobacco, vegetables, flowers, fruits, spices, tea, coca, livestock, birds, fresh and elaborated meat, milky products, bakery products, candies, food products, spun and fabrics, textiles, leather and its products, lumber and its products, paper and its products, substances and chemical products, etc.

(p) preliminary data
Source: UDAPE, INE.
Author's elaboration

The predominance of soja is a fact that has occurred since 1991 were its share was about 27%, and has increased through the years representing since 2001 almost the 50% of the non traditional exports.

[24] Solid residual.

On the other hand, the jewelry started to acquire importance in the non traditional share in an abrupt manner, given the fact that during the 80's it was compulsory to give all the gold to the Mining Bank and its commercialization in the external market was not allowed. These restrictions remained until the early 90's but then the market liberalized and in 1992 this commodity represented 12% of the total and reached values as high as 30% in 1994.

Additionally, by crossing information provided by the National Institute of Statistics of Bolivia (INE) of two different classifications of exports (one that divides them among traditional and non traditional goods and the Standard International Industrial Classification), we can know the share of non traditional exports which has at least some degree of processing.

TABLE 2

NON TRADITIONAL COMMODITIES

(% of processing)

Commodity	Processed Non Traditional							
	1990	1991	1992	1993	1994	1995	1996	1997
Chestnuts	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Coffe	0.00%	0.00%	8.76%	3.95%	1.22%	0.66%	0.02%	0.02%
Cacao	55.52%	67.08%	77.22%	61.66%	31.94%	46.22%	58.50%	55.54%
Sugar	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Beverages	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Rubber	0.00%	0.21%	5.19%	0.26%	1.59%	25.17%	20.03%	100.00%
Leather	99.11%	99.66%	99.82%	96.92%	100.00%	99.98%	100.00%	99.04%
Lumber	99.90%	99.39%	100.00%	100.00%	100.00%	99.64%	98.90%	98.94%
Cotton	49.38%	30.50%	29.97%	13.97%	10.72%	0.58%	4.57%	3.60%
Soja	62.91%	62.87%	72.26%	75.49%	63.57%	67.11%	67.70%	74.60%
Jewerly	-	-	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Other NT	26.21%	32.83%	73.01%	83.04%	72.56%	83.27%	86.08%	83.54%
TOTAL	**57.97%**	**64.38%**	**79.30%**	**82.43%**	**80.44%**	**73.98%**	**73.87%**	**72.81%**

Commodity	Processed Non Traditional							
	1998	1999	2000	2001	2002	2003	2004	Average 90-04
Chestnuts	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Coffe	0.03%	0.04%	0.15%	0.09%	0.20%	0.77%	0.83%	0.82%
Cacao	60.03%	68.85%	60.98%	74.86%	69.73%	67.38%	62.80%	61.18%
Sugar	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Beverages	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Rubber	100.00%	100.00%	100.00%	100.00%	100.00%	-	-	2.61%
Leather	99.90%	99.35%	100.00%	99.69%	96.53%	100.00%	99.71%	99.23%
Lumber	99.84%	99.90%	99.92%	99.73%	99.99%	99.28%	99.58%	99.63%
Cotton	79.59%	5.45%	9.54%	41.89%	39.13%	49.06%	22.98%	47.75%
Soja	100.00%	82.00%	84.47%	100.00%	98.17%	93.11%	94.55%	83.82%
Jewerly	8.16%	100.00%	100.00%	99.41%	100.00%	100.00%	100.00%	95.20%
Other NT	87.89%	87.64%	92.19%	89.74%	85.19%	84.99%	79.75%	78.90%
TOTAL	**78.54%**	**78.46%**	**82.50%**	**90.82%**	**90.23%**	**86.91%**	**85.08%**	**80.17%**

Source: INE

Author's elaboration

It can be seen that, on the one hand there are goods such as the chestnuts and coffee that either are not processed at all or are only slightly processed, and on the other hand there are completely processed commodities such as sugar and beverages. What it is important here is to note that the goods that were identified in the previous analysis as the main components of the non traditional exports (soja, jewelry and lumber) are highly processed and hence it is possible to state that not only the Bolivian exports have diversified towards non traditional products but also that they are trying to move up in the value added chain.

Now that we have identified Bolivia's main non traditional export-products and their degree of processing, the next step is to figure out what are their markets of destination.

3.2.1. NON TRADITIONAL EXPORTS AND THEIR MARKETS OF DESTINATION

It is of interest to analyze the market of destination of the non traditional exports since it will allow us to further examine some possible determinants of their behavior, for instance, issues such as: are there any special preferences for these products on that market? and what are our potential competitors in those markets? can give us some light on the subject of this issue.

TABLE 3

NON TRADITIONAL EXPORTS' MARKETS OF DESTINATION

(%)

Economic Region or Market	1990	1991	1992	1993	1994	1995	1996	1997
ALADI*	39.65%	36.26%	22.59%	18.32%	18.43%	15.58%	20.34%	29.87%
CAN	19.37%	31.24%	36.68%	35.66%	31.67%	39.33%	38.56%	35.47%
United States	21.48%	21.80%	27.71%	36.83%	42.28%	32.73%	30.45%	21.88%
European Union	13.65%	7.56%	7.59%	5.98%	6.00%	8.16%	7.78%	9.36%
Rest of the World	5.85%	3.14%	5.43%	3.21%	1.61%	4.20%	2.87%	3.42%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Economic Region or Market	1998	1999	2000	2001	2002	2003	2004	Average
ALADI*	28.22%	25.24%	19.20%	9.90%	8.58%	9.46%	10.72%	18.99%
CAN	38.27%	38.64%	46.40%	58.30%	58.81%	56.63%	53.61%	43.76%
United States	20.97%	22.97%	21.86%	19.54%	20.69%	20.57%	20.13%	24.72%
European Union	8.68%	9.00%	9.05%	8.48%	8.47%	9.40%	9.96%	8.69%
Rest of the World	3.87%	4.14%	3.50%	3.79%	3.45%	3.94%	5.58%	3.84%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

*Excluding CAN

ALADI countries: Argentina, Brazil, Chile, México, Paraguay, Uruguay, Colombia, Ecuador, Perú and Venezuela

CAN countries: Colombia, Ecuador, Perú and Venezuela

European Union countries: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary,Ireland, Italy, Latvia, Luxembourg, Malta, Poland, Portugal, Slovenia, Spain, Sweeden, The Netherlands, United Kingdom.

Source: INE

Author's elaboration

According to TABLE 3, there are two main markets for the non traditional exports for the 1990-2004 period: the Andean Community of Nations (CAN: Colombia, Ecuador, Peru and Venezuela), which on average import 44% of our non traditional commodities and the USA, which purchase 25% of the Bolivian non traditional exports. Additionally, the Latin American Integration Association (ALADI) –deducting the Andean countries- also represents an important market (19%).

But, what are the main non traditional products in these markets? Through TABLES 4 and 5 we can observe that the Andean countries mainly import soja from Bolivia, whereas USA imports principally jewelry and lumber.

TABLE 4

NON TRADITIONAL EXPORTS TO THE ANDEAN COUNTRIES

	1990	1991	1992	1993	1994	1995	1996	1997
Sugar	20.65%	17.51%	25.04%	14.67%	17.97%	5.51%	6.86%	6.64%
Coffee	0.00%	0.07%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%
Soja	30.00%	65.52%	55.64%	57.85%	58.38%	63.23%	71.17%	64.45%
Chestnuts	1.39%	0.26%	0.35%	0.24%	0.47%	0.21%	0.27%	0.34%
Rubber	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%
Livestock	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lumber	12.85%	3.20%	2.62%	2.90%	0.48%	0.53%	0.87%	0.61%
Leather	7.24%	2.47%	3.27%	5.06%	3.35%	3.44%	2.58%	1.42%
Jewerly	0.00%	0.00%	0.00%	0.53%	0.00%	0.17%	0.00%	0.09%
Cotton	0.00%	0.95%	7.64%	8.03%	8.03%	15.61%	7.10%	15.20%
Beverages	1.76%	1.96%	2.37%	2.79%	1.97%	1.36%	1.35%	0.99%
Others	26.11%	8.06%	3.06%	7.92%	9.35%	9.93%	9.79%	10.26%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

	1998	1999	2000	2001	2002	2003	2004	Average
Sugar	7.70%	2.63%	1.25%	1.96%	3.28%	4.97%	4.81%	6.42%
Coffee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Soja	65.53%	60.65%	74.72%	75.77%	80.42%	82.26%	79.24%	71.19%
Chestnuts	0.37%	0.40%	0.29%	0.22%	0.18%	0.19%	0.20%	0.28%
Rubber	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Livestock	0.01%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%
Lumber	0.61%	0.49%	0.18%	0.30%	0.26%	0.30%	0.31%	0.80%
Leather	1.81%	1.24%	0.67%	0.91%	0.51%	0.24%	0.20%	1.48%
Jewerly	0.06%	0.00%	0.01%	0.09%	0.01%	0.00%	0.00%	0.05%
Cotton	6.60%	7.79%	3.15%	0.89%	0.63%	0.55%	0.90%	4.70%
Beverages	1.36%	1.70%	0.76%	0.56%	0.48%	0.49%	0.37%	1.02%
Others	15.94%	25.09%	18.93%	19.30%	14.24%	10.98%	13.97%	14.07%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

CAN countries: Colombia, Ecuador, Perú and Venezuela

Source: INE

Author's elaboration

TABLE 5

NON TRADITIONAL EXPORTS TO USA

	1990	1991	1992	1993	1994	1995	1996	1997
Sugar	16.23%	16.32%	5.47%	0.00%	3.06%	2.26%	5.22%	2.55%
Coffee	1.92%	0.00%	0.06%	0.09%	0.01%	0.00%	0.16%	1.81%
Soja	0.35%	0.53%	0.26%	1.70%	0.00%	0.00%	3.31%	0.26%
Chestnuts	12.15%	9.35%	9.71%	6.06%	2.91%	3.93%	5.08%	6.00%
Rubber	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Livestock	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lumber	43.33%	39.91%	22.61%	17.97%	15.37%	24.78%	19.97%	22.28%
Leather	4.29%	2.71%	3.08%	1.65%	0.50%	1.03%	1.03%	1.44%
Jewerly	0.00%	0.00%	43.24%	63.28%	71.03%	57.86%	49.21%	52.03%
Cotton	0.44%	10.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Beverages	0.67%	0.12%	0.20%	0.04%	0.03%	0.05%	0.02%	0.02%
Others*	20.62%	20.86%	15.38%	9.22%	7.09%	10.10%	16.00%	13.61%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

	1998	1999	2000	2001	2002	2003	2004	Average
Sugar	4.31%	1.76%	2.03%	2.72%	2.57%	1.90%	1.73%	3.47%
Coffee	0.79%	0.97%	0.76%	0.86%	1.62%	1.30%	1.50%	0.76%
Soja	1.73%	0.00%	0.00%	0.00%	0.00%	0.00%	0.73%	0.96%
Chestnuts	8.22%	7.10%	8.57%	9.43%	7.50%	9.29%	10.47%	6.59%
Rubber	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Livestock	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lumber	19.78%	21.47%	26.96%	21.73%	18.55%	17.89%	17.17%	19.79%
Leather	1.07%	0.98%	0.68%	0.91%	0.85%	0.64%	0.60%	1.05%
Jewerly	39.69%	36.20%	31.98%	34.31%	44.10%	36.13%	34.85%	47.02%
Cotton	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	1.05%
Beverages	0.04%	0.04%	0.09%	0.11%	0.10%	0.09%	0.05%	0.07%
Others*	24.37%	31.49%	28.94%	29.92%	24.71%	32.77%	32.90%	19.24%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

* Cacao, cereals, tubers, oleaginous, fibers, fodder, tobacco, vegetables, flowers, fruits, spices, tea, coca, livestock, birds, fresh and elaborated meat, milky products, bakery products, candies, food products, spun and fabrics, textiles, leather and its products, lumber and its products, paper and its products, substances and chemical products, etc.

Source: INE

Author's elaboration

Two themes are worth mentioning. First, the main buyers of Bolivian soja are Colombia and Venezuela[25] and second, the consideration of the principal commodities that Bolivia exports to USA (jewelry, lumber and its products[26]) permitted us to identify in a broad sense our potential competitors. The criteria used for this purpose was to look for those countries that, on average, had the same market share as Bolivia and more weight was given to those that were neighbors and/or had stage of development similar to Bolivia. The data used for this purpose was obtained from TradeStat[27] and the countries identified were: Peru, Indonesia, France, Colombia, Brazil, Argentina and Ecuador.

The issue of special preferences on the markets will be developed later on this chapter. For now and from all the above, we can draw some preliminary conclusions:

[25] Which has been acquiring importance over the last years and replacing Peru (see Annex B)

[26] Apparel articles and accessories were also considered but only because they are benefited by the ATPDEA.

[27] <http://tse.export.gov>

- There was a significant increase in the Bolivian exports that was accompanied by a greater diversification of the exported commodities and was mainly driven by the behavior of the non traditional exports.

- Although the Bolivian exports are not heavily concentrated on traditional exports anymore, they still remain concentrated on certain non traditional branches namely: soja and its derivatives, lumber and its manufactures, and jewelry.

- The bulk of non traditional exports have at least some degree of processing.

- There is an evident market concentration of the Bolivian non traditional exports, with the Andean countries and USA as the main destinations.

In this sense, the key question in this point of the investigation is: how can we explain this behavior? According to Antelo *et al* (1993), three possible explanations exist: institutional factors, economic policies (exchange rate policy and policies regarding duties and taxes) and exogenous factors.

3.2.2 POSSIBLE EXPLANATIONS OF THE NON TRADITIONAL EXPORTS' BEHAVIOR

Institutional factors:

It is said that the development of institutions, not only public but also private, intended to provide useful commercial information in the opportune moment, to promote internationally the tradable production and to make available programs intended to support the exportable products among other issues, could be one of the forces that has driven the behavior of the non traditional exports in the recent period. There are several institutions such as the Promotion Center Bolivia (CEPROBOL)[28], Bolivia Exporta, Bolivian Institute of International Commerce (IBCE), Regional Chambers of Exports and the National Chamber of Exports that were created with these purposes.

[28] Which replaced the National Institute of Exports Promotion (INPEX) and the General Bureau of Exports' Promotion (DPE) in 1998.

Another relevant institutional factor was the promulgation of the "Exports' Law" that established among other things, the tax neutrality for the exports through the refund of domestic taxes and of duties paid for the imported inputs used in the production of exports. Additionally, in April 1993 the National Council of Exports (CONEX) was set up in order to promote policies, programs and strategies for successful exports. By the same way, through the Supreme Decree Nº 250223, it was allowed to participate in the elaboration of policies.

By the same way, an additional way to expand the international market is through bilateral and multilateral treaties which ensure an easier and more profitable market access for the benefited commodities. In this regard, it is important to remark that Bolivia, under the normative of the World Trade Organization (WTO) has subscribed treaties of regional scope ALADI, is part of the CAN -which conform a customs union-, has also created some free commerce zones with the MERCOSUR (Common Market of the South) and Peru, has subscribed a free commerce treaty with Mexico and Agreements of Economic Complementation (ACE) with Chile and Cuba. By the same token, it is beneficiary of the Generalized System of Preferences (GSP) of USA, European Union and Japan.

TABLE 6, provides more detail on each of these international treaties:

TABLE 6

GENERALIZED SYSTEM OF PREFERENCES

Country	Beneficiary Country	Effective until	Received preferences
United States*	Bolivia, Ecuador, Colombia and Peru	December 31, 2006	Bolivia has more than 6500 duty-free products (almost the totality of the exportable goods).
European Union	Bolivia, Ecuador, Colombia, Peru and Venezuela	2015	100% of duties exemptions for almost all industrial products and some agricultural and fishing commodities.
Japan	Bolivia and all developing countries	2011	100% of duties exemption for industrial products and preferences from 20% to 100% for eligible agricultural products.

* Includes the Andean Trade Promotion and Drug Erradication Act (ATPDEA).

Source: Exporter's Guide (2001-2002), www.comunidadandina.org, Development Ministery of Bolivia (www.desarrollo.gov.bo), www.proexport.com.co

COMMERCIAL TREATIES SUBSCRIBED BY BOLIVIA

Treatie	Members	Date of Signature	Effective since	Duration and Legal Reference	Measures
Andean Community	Bolivia, Colombia, Ecuador, Peru and Venezuela.	May 26, 1969	1969	Indefinite, Cartagena Agreement[1]	Establishment of a free commerce zone.
Latin American Integration Association	Argentina, Bolivia, Brazil, Chile, Colombia, Cuba[2], Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela.	August 12, 1980	March 18, 1981	Indefinite, Montevideo Treatie	Signature of 4 Economic Complementation Treaties (ACE 22, ACE 31, ACE 36 and ACE 47)
Economic Complementation Treatie (ACE 22)	Bolivia and Chile	April 6, 1993	July 1, 1993	Indefinite with revisions every 5 years, Supreme Decree N° 23538 (June 30, 1993)	Duty-preferences are provided according to a program of duties removal wich contains 4 annexes that list the commodities and the negotiated duties. The products can be extended through further negotiations and (mostly) have 100% of duties exemptions.
Free Trade Treaty (ACE 31)	Bolivia and Mexico	September 10, 1994	January 1, 1995	Indefinite Supreme Decree N° 23933 (December 12, 1994)	Free commerce zone has to be established within 10 years with excemptions of 12 and 15 years for the sensitive products.
Economic Complementation Treatie Bolivia - MERCOSUR (ACE 36)	Bolivia, Argentina, Brasil, Paraguay and Uruguay	December 17, 1996	March 2, 1997	Indefinite Supreme Decree N° 24503 (February 21, 1997)	Free commerce zone has to be established within 10 years with excemptions of 15 years for the sensitive products. Bolivia will liberalize in 18 years its duties for a list of 28 goods that are very sensitive (sugar and products of the oleaginous chain).
Economic Complementation Treatie (ACE 47)	Bolivia and Cuba	May 8, 2000	2001	Indefinite Supreme Decree N° 26287 (August 22, 2001)	100% duties exemptions in products of interest of each country.

[1] The sigantors of the Cartagena Agreement were: Bolivia, Colombia, Chile, Ecuador and Peru. Through the Trujillo Protocol (March 1996), the Andean Community of Nations is created, Chile excluded from the members and Venezuela included as new member.

[2] Cuba is incorporated in August 26th, 1999

Source: Exporter's Guide (2001-2002), www.sice.oas.org/Trade/bol_s.ASP, www.aladi.org, www.proexport.com.co

Economic Policy:

Two main policies need to be considered:

- **Exchange rate policy**

The Bolivian exchange rate policy has as its main objective to preserve the internal and external equilibria. However, given the fact that the Bolivian economy is highly dollarized and that according to some investigations[29] there is a high pass-trough effect, the Bolivian authorities should be very cautious with this policy.

Additionally, if the guideline used by the policy in order to promote exports is the RER, a deeper analysis of its construction is required since it is not directly observable and is usually calculated as an index requiring a number of important decisions such as:

[29] See for instance: Aguilar M.A. (2000) *La Política Cambiaria Boliviana en el Debate Actual Sobre Regímenes Cambiarios.* Banco Central de Bolivia. Documentos de Trabajo N°1. La Paz, Bolivia. As cited in Zambrana (2000).

currencies to include, appropriate weighting scheme, price measures to use and selection of a suitable base year.

Theoretically, if the exchange rate is intended to support and foster domestic industries that are competing against foreign imports in both international and local markets, then the RER calculations should use currencies of the competitor countries and some measure of producer prices or costs rather than consumer prices[30]. Unfortunately, the Bolivian monetary authorities are currently using the International Monetary Fund's (IMF) formula –which considers trading partners and consumer price index- to calculate the RER hence it is possible that it is not accurately reflecting competitiveness.

- **Policies regarding duties and taxes**

According to the Bolivian Exporter Guide (2001-2002), these policies seek the tax neutrality of exports in order to guarantee their competitiveness. This tax neutrality is achieved through the refund of the domestic taxes and/or duties paid for the purchase of capital goods, fixed assets, inputs, services and other necessary expenses that are required for the production of the export commodities.

The taxes that are refunded are: Value Added Tax (a maximum amount of 13% of the FOB value), Tax to the Specific Consumption (total refund). On the other hand, the devolution of duties can be done through two different procedures: an automatic (4% of the FOB value if the duty subgroups are new or have reached an export value smaller than one million dollars and 2% if the duty subgroups have an export value equal or larger than one million dollars but smaller than three million dollars) and a determinative (it is applied for the duty subgroups which had an export value of at least three million dollars, their structure of costs is considered and coefficients of refund are calculated annually).

Additionally, there is an alternative mechanism, called RITEX (Regimen of Temporal Internment of Exports) that allows the internment of imported inputs to be used in the production of exportable goods without the payment of duties or taxes.

[30] Nicholas (2004).

Exogenous Factors:

Business cycles of the world activity, fluctuations of the prices in world markets as well as the appearance of substitutes in the international market have important effects on the export activity. This issue was already developed in Chapter 2 and will be empirically estimated in Chapter 5.

Finally, the design of policies intended to boost the exports requires a deep understanding of the sector; that is why the next section will summarize some findings of the 1992's survey that UDAPE[31] carried out with the intention to know not only what are the main productive problems that this sector faces but also what are, from the point of view of the bidder, the most appreciated measures taken by the government.

3.3 EXPORTERS' POINT OF VIEW

The survey was done to 70 exporting enterprises whose selection was based on two criteria. On the one hand, those that were producing the more representative non traditional products were considered and among them, and in order to have a representative sample, enterprises of different size and magnitude of operation were selected.

The results, regarding the productive problems faced by the firms, in a general way were: in relation to the costs of the inputs of production –labor and capital- enterprises found that the only problem that they have to face with labor –which is really cheap- is its low productivity. However, this problem was more acute for the smaller firms since the larger could train their manpower and also have a low rotation.

On the other hand, the financing of the capital goods as well as of the operative costs was considered a strong limitation. First of all due to the elevated capital costs expressed in high interest rates and in addition due to the requirement of collaterals, both having a more negative impact on the smaller enterprises since the larger can sometimes auto-finance themselves and use their assets as collaterals.

[31] Unit of Social and Economic Policy Analysis.

Other issues that were considered were the services provided to exports by the private and public institutions, namely the opportune delivery of useful commercial information, the international promotion of the tradable production and the programs intended to support the packing, design and adaptation of the exportable products. All of them were considered by the enterprises as insufficient; however, regarding the former both, the larger the enterprise the smaller the limitation since they can be considered as part of a consolidated sector which already has its contacts to reach the international markets. Nevertheless, the latter topic was judged as necessary independent of the size of the firm. Relative to this, it is important to remark that the "Exports' Law" was promulgated a year later and that maybe since its implementation this perception could have changed.

Finally, in the field of the external factors, all firms (the larger ones in less degree) considered that the non-trade barriers represent a strong limitation to their activity.

When the topic of international treaties was taken into account, now considering the measures that were positively valued by the sector, the larger firms were really pleased with was has been achieved by the Bolivian government and considered those negotiations as truly helpful for their activity. On the other hand, the smaller firms said that most of the time due to the little diffusion of these agreements they did not actually use them.

CHAPTER 4

THE ECONOMETRIC METHODS AND MODEL SPECIFICATION

> *In an equilibrium situation, asking which of the equations determines the quantity and which of them determines the price is similar to ask which of the blades of a scissor is cutting a sheet of paper. (A. Marshall)*[32]

Trying to find the determinants of the volume of exports has led to a variety of model formulations. However, not all countries can be measured with the same yard and issues specific to their contexts should be considered. In this regard, the present chapter is intended to present a review of the exports demand and supply models used in the literature in Section 1. The second section will formulate the model for the Bolivian economy, given the considerations highlighted in Chapter 3. Section 3 will then present some limitations and considerations on the selected method of estimation of this investigation.

4.1 REVIEW OF ECONOMETRIC MODELS

According to Goldstein and Khan (1985), there are a number of factors that are decisive in the selection of an appropriate model of time-series behavior of exports, among them we have: the type of good being traded (is it a standard or a differentiated product?), the final use of that commodity (will it be used as an input or for final consumption?), the institutional framework under which trade takes place (are there price controls in the allocation of resources?), the purpose of the modeling exercise (is it for forecast?) and sometimes the availability of data.

However, as mentioned in Chapter 2, most of the existing empirical work on the determinants of exports is based on the imperfect substitutes model and formulations employed have evolved from relatively simple demand equations to more complex simultaneous-equation and two regime approaches (King, 1997:81).[33]

The single-equation export demand models concentrate on the demand-side determinants of exports stating that a country's supply of exports passively responds to

[32] As cited by Pollock (no year specification).
[33] The rest of this section is based on King (1997).

changes in the level of foreign demand, which is equivalent to assume that the price elasticity of supply tends to infinity. According to Goldstein and Khan (1985), this assumption does not seem reasonable *a priori* in the case of the supply of exports of an individual country. However, as mentioned by King (1997) possible reasons for making this assumption could include the presence of idle productive capacity or that the industry in question can count on constant or increasing returns to scale to enable it to meet increases in demand that can not be satisfied by inventories. Additionally, Riedel (1988), states that it is due to the difficulty of modeling properly the supply equation that this assumption is made.

On the other hand, it is said that the supply equation can be safely estimated under the "small country" assumption, which is equivalent to assume that the demand for exports is perfectly price-elastic.

In any case, single-equation estimates can produce biased[34] as well as inconsistent estimators and hence in an attempt to deal with these problems export determination models and simultaneous-equation models were considered.

Trying to solve the omitted variable bias problem, the export determination models are a mixture of an export demand and an export supply models into a single reduced form equation assuming that the markets involved are oligopolistic and thus that prices are either sticky in the short run or fixed prior to quantity.

On the other hand, when the main concern is the simultaneity bias, researchers have made use of the simultaneous-equation models in which current export volumes and prices are considered interdependent. Because of this and following the imperfect substitutes model formulation of Goldstein and Khan (1985), exports are considered a function of a system of export demand and export supply equations. This type of model formulation is the one considered in this investigation.

[34] There are two types of biases: omitted variable bias and simultaneity bias.

4.1.1 SIMULTANEOUS-EQUATION MODELS USED IN THE LITERATURE

Two characteristics are worth mentioning: first, there is a wide variety of techniques used for the estimation of simultaneous-equation models; and second, there is some debate regarding the appropriate specification of such models, especially with respect to the supply equation.

This section will present some of the papers that have used simultaneous-equation models under the imperfect substitutes' framework, with the objective to find the exports' determinants.

Goldstein and Khan (1978) used two models: the equilibrium model and the disequilibrium model with the assumptions of instantaneous and delayed adjustments respectively. The system estimated for the disequilibrium model was:

$$\log X_t^d = c_0 + c_1 \log (PX/PXW)_t + c_2 \log YW_t + c_3 \log X_{t-1}$$
$$\log PX_t = d_0 + d_1 \log X_t + d_2 \log P_t + d_3 \log Y_t^* + d_4 \log PX_{t-1}$$
$$(c_1<0;\ c_2>0;\ c_3>0;\ d_1>0;\ d_2>0;\ d_3<0;\ d_4>0)$$

Where: X^d, quantity of exports demanded; PX: price of exports; PXW: weighted average of the export prices of the country's trading partners; YW: weighted average of the real incomes of the country's trading partners; P: domestic price index; Y^*: logarithm of an index of domestic capacity. This normalization –using an inverse supply function- implied that "the quantity of exports adjusts to conditions of excess demand in the rest of the world, and therefore, the price of exports is determined in the exporting country" (pp.277). The estimator used was the Full-Information Maximum Likelihood (FIML).

By the same way, Riedel (1988) estimated through 2SLS the following system of log-linear equations:

$$Q_t = b_0 + b_1 P_t + b_2 PM_{t-1} + b_3 W_{t-1} + b_4 T + b_5 Q_{t-1}$$
$$P_t = c'_0 + c'_1 Q_t + c'_2 (P^*_t + E_t) + c'_3 Y^*_t + c'_4 P_{t-1}$$
$$W_t = d_0 + d_1 PC_t + d_2 Q_{t+1} + d_3 T$$
$$(b_1>0;\ b_2<0;\ b_3<0;\ b_4>0;\ b_5<1;\ c'_1<0;\ c'_2>0;\ c'_3>0;\ c'_4<1;\ d_1>0;\ d_2>0;\ d_3>0)$$

Where: Q and P are indexes of export volume and price, PM is an index of material input prices, W is an index of nominal wage in manufacturing, T is a trend variable used as *proxy* for capacity growth and productivity change[35], P^* is the foreign currency price of competing goods, E is the nominal exchange rate, Y^* is the level of economic activity in export markets and PC is the consumer price index. Riedel's preferred normalization –estimating and inverse demand equation and a volume-determined supply- is intended to test the "small country" hypothesis ($c'_1=0$). This estimation of the inverse form of the demand equation was debated by a lot of researchers in different grounds; see for instance Nguyen (1989) and Muscatelli *et al* (1992).

The paper of Muscatelli *et al* (1992) is a follow-up of Riedel's investigation. Using his data to be able to compare results directly, they estimated the following system of equations:

$$X^d = \alpha_0 - \alpha_1 P^x + \alpha_2 P^w + \alpha_3 Y^w$$
$$X^s = \beta_0 + \beta_1 P^x - \beta_2 P^m - \beta_3 W + \beta_4 T$$
$$(\alpha_i>0;\ \beta_i>0)$$

Where: X stands for the volume of export goods, P^x are the prices of export goods of the country in question, P^w are competitor's prices in the country's export markets, Y^w is a scale variable intended to capture world demand conditions, P^m is the price of raw material inputs, W is an index of nominal wages in manufacturing (used instead of modeling the behavior of wages as Riedel (1988) did) and T is a time trend utilized to capture capacity growth and improvements in productivity.

For the estimation purposes they first used a system estimation method as an alternative to the single-equation method (2SLS) and then constructed a generalized error correction model (ECM) to account for the effects of excess demand and excess supply in the evolution of export prices and volumes in the short run[36]. According to the author's these two developments solve the normalization problem; however, they estimated the supply equation as a price-adjustment equation and the demand equation

[35] Not in logarithms.
[36] Modified Ordinary Least Squares (OLS) estimator proposed by Phillips and Hansen (1990) as cited in Muscatelli *et al* (1992).

as a volume-adjustment equation and claimed that the reverse normalization produced the same results.

Following this line, Saikat (2002) also used a simultaneous error-correction approach to estimate the log-linear model:

$$X_t^d = \alpha_0 + \alpha_1 REER_t + \alpha_2 W_t + \mu_t$$
$$X_t^s = \beta_0 + \beta_1 RP_t + \beta_2 Y_t + \nu_t$$
$$(\alpha_1<0;\ \alpha_2>0;\ \beta_1>0;\ \beta_2>0)$$

In which REER = P^x/eP^w and RP = P^x/P^d, X is real merchandise exports, P^x is price of exports, eP^w exchange rate multiplied by world prices, W is total world demand and Y is Gross Domestic Product (GDP). The modified OLS method of Philips and Hansen was used for the estimation.

On the other hand, using a structural cointegrating Vector Autoregressive (VAR) approach, Abbot and de Vita (2002) estimated a system in which export demand is normalized as the quantity equation and export supply is normalized on export price:

$$q_t^x = \alpha_{10} + \beta_{21}(P_t^x - P_t^w) + \beta_{31} log\ Y_t^w + \epsilon_t$$
$$P_t^x = \alpha_{20} + \beta_{12} q_t^x + \beta_{52} P_t^m + \beta_{62} w_t + \mu_t$$
$$(\beta_{21}<0,\ \beta_{31}>0,\ \beta_{12}<0,\ \beta_{52}>0,\ \beta_{62}>0)$$

Where q_t^x is the log of the exports' volume, P_t^x is the log of the price of exports in domestic currency, P_t^w is the log of a trade-weighted index of competitor's prices (converted to domestic currency terms), Y_t^w is the log of a trade-weighted index of real GDP, P_t^m is the log of a weighted price index of imported raw material inputs, and w_t is the log of an index of nominal wages in manufacturing.

These authors argued that "although the modeling and estimation of the final ECM is clearly a development of Riedel's study, the estimation technique employed by Muscatelli *et al* (1992) cannot be used to test whether the long-run structural restrictions implied by economic theory are supported by the data and [...] in the absence of structural restrictions no meaningful economic interpretation can be given to estimated multiple cointegrating vectors since they will not be identified". In this sense, they used

the identification theory provided by Pesaran and Shin (1997)[37] which overcomes the abovementioned limitation.

It is important to highlight that given the expected negative sign of the exports volume in the supply equation the normalization implied that the country was able to alter world supply and hence the international price.

Finally, Behar and Edwards (2004) using the aforesaid methodology estimated:

$$\begin{pmatrix} \Delta X \\ \Delta p^e \\ \Delta p^d \\ \Delta CU \\ \Delta y^p \\ \Delta p^c \end{pmatrix}_t = \begin{pmatrix} a_{01} \\ a_{02} \\ a_{03} \\ a_{04} \\ a_{05} \\ a_{06} \end{pmatrix} + \begin{pmatrix} a_{11} & a_{21} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{32} \\ \alpha_{41} & \alpha_{42} \\ \alpha_{51} & \alpha_{52} \\ \alpha_{61} & \alpha_{62} \end{pmatrix} \begin{pmatrix} 1 & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} & 0 & 0 & 0 \\ 1 & \beta_{22} & 0 & 0 & 0 & \beta_{26} & \beta_{27} & \beta_{28} \end{pmatrix} \begin{pmatrix} X \\ p^e \\ p^d \\ CU \\ y^p \\ p^e \\ p^f \\ y^f \end{pmatrix}_{t-1} + \begin{pmatrix} \Gamma_{21} & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \Gamma_{68} \end{pmatrix} \begin{pmatrix} \Delta X \\ \Delta p^e \\ \Delta p^d \\ \Delta CU \\ \Delta y^p \\ \Delta p^e \\ \Delta p^f \\ \Delta y^f \end{pmatrix}_{t-1}$$

Where X is the volume of exports, P^e is the exports' price, P^d is the domestic price, CU is capacity utilization (not in logarithms), Y^p is the potential GDP (these last two used alternatively, to test the robustness of the results, as a measure of income capacity or capacity utilization in the exporting country), P^f is the foreign price, P^c are the competitors' prices and Y^f is the foreign income.

It is important to remark that although most of the papers mentioned above used the competitors' prices as an explanatory variable in the formulation of their demand equation all of them with exception of the last one utilized the prices of the trading partners for their estimation, which is not very accurate.

By the same way, although trade policy stance dummy variables are widely used in cross country studies their use in time series analysis turns to be infeasible since they can be considered as time invariant. Additionally, if they are intended to capture policies that produce changes in the relative prices these can be directly captured in time-series studies through the series of export, domestic and competitor's prices that are used as explanatory variables in their formulations. On the other hand, they could also be used to represent changes in the non-price factors, such as technological

[37] As cited in Abbott and de Vita (2002).

transfers, institutional framework, etc. and in these cases they are useful in cross country studies where different policies across countries at a given moment in time are important determinants' of exports behavior.

In this sense, based on the theories of Chapter 2, knowing the Bolivian context through Chapter 3 and having revised the model specifications of empirical studies, the present investigation will deal with the problem of simultaneity bias and thus it will estimate a system of equations under the imperfect substitutes framework using the 2SLS method.

4.2 MODEL SPECIFICATION

Following Riedel (1988), this research will first estimate a single-equation demand function under the assumption of an infinitely price elastic supply and where the demand function is also assumed to be homogeneous of degree zero in prices[38]. Additionally, through a simple first-order partial adjustment, correction towards the long-run equilibrium will be allowed.

The log-linear model to be estimated, using quarterly data from 1990 to 2004 is:

$$LEX_t = \gamma_0 + \gamma_1 (LEP\text{-}LCP)_t + \gamma_2 LUSI_t + \gamma_3 LEX_{t-1}$$
$$(\gamma_1<0;\ \gamma_2>0;\ \gamma_3<1)$$

Where: LEX is the exports' volume, LEP is the export's price, LCP are the competitors' prices and LUSI is the level of economic activity in the exporting markets. By the same way, γ_1 and γ_2 are, respectively, the short run price and income elasticities of demand and $[\gamma_i/(1-\gamma_3)]$[39] is used to obtain the respective long run demand elasticities.

However, cognizant that the Bolivian non traditional exports are likely to be price elastic and due to the simultaneity bias problem that might be present in the previous specification, it is believed that the most appropriate formulation is the one that estimates a simultaneous interaction of supply and demand.

[38] A doubling in all prices leaves demand unaffected.
[39] For i = 1,2

For such purpose, the demand equation was normalized for prices in order to test the "small country" assumption that export demand is infinitely elastic with respect to price and the supply equation was estimated as a volume-adjustment equation. This normalization is supported by the fact that Bolivia can be considered as a price-taker and not as a price-setter in the world market of its non traditional commodities.

As in the case of a single-equation framework, the possibility that adjustment of actual to equilibrium values may take place with some delay was considered and allowance was made for a simple correction mechanism.

In this sense, the log-linear model to be estimated is:

$$LEX_t = \theta_0 + \theta_1 LEP_t + \theta_2 LDP_t + \theta_3 LGDPBOL_t + \theta_4 LWAGE_{t-1} + \theta_5 INTEREST_{t-1} + \theta_6 LEX_{t-1} \quad (1)$$

$$LEP_t = \gamma_0 + \gamma_1 LEX_t + \gamma_2 LCP_t + \gamma_3 LUSI_t + \gamma_4 LEP_{t-1} \quad (2)$$

$$(\theta 1>0,\ \theta_2<0,\ \theta_3>0,\ \theta_4<0,\ \theta_5<0,\ \gamma_1<0,\ \gamma_2>0,\ \gamma_3>0)$$

In which, LEX is the volume of exports, LEP is the exports' price, LDP is the domestic price, LGDPBOL is used as a *proxy* for capacity utilization and productivity change, LWAGE is the cost of labor, INTEREST is the cost of capital, LCP are the competitors' prices and LUSI is the level of economic activity in the exporting markets. The costs' variables are lagged one quarter to account for the time lag between production and export. The quarterly mean adjustment lag for the supply equation is given by $[1/(1-\theta_6)]$ whereas the one for the price can be calculated from $[1/(1-\gamma_4)]$. If the demand function is homogeneous of degree zero in prices in the long run, the null hypothesis: $\gamma_2 + \gamma_4 = 1$ can not be rejected. Additionally, the parameter of the price elasticity of demand can be obtained from (2) by calculating $(\gamma_1)^{-1}$ and hence as γ_1 tends to zero, the parameter of price elasticity will tend to infinity.

The period of estimation is from 1990.1 to 2004.4 and further detail on data definitions and sources can be found on Annex C.

4.3 2SLS AND ITS LIMITATIONS

According to Pleli and Tankovic[40], there are three approaches that can be used to estimate a simultaneous linear equation model[41]: the naïve approach, the limited-information approach and the full-information approach. The former ignores the information of endogenous and exogenous variables and estimates a single equation using the OLS method, thus the estimators obtained are biased and inconsistent.

The limited-information approach considers one equation at a time and estimates it differentiating among endogenous and exogenous variables and hence allowing to know which variables should be included in the other equations of the model but excluded from the equation been estimated. The 2SLS method is within this group.

Finally, the full-information approach estimates all the equations in the model simultaneously using all the available information in each equation of the system. The Three Stages Least Squares (3SLS) method is part of this approach.

Having said this and based on the previous investigations done in the field of interest, there are three major identifiable limitations of the 2SLS methodology: First, according to some authors[42] it is a method of estimation in which the results are sensitive to the variable chosen for normalization; second, given the fact that the method estimates one equation at a time it is said that it does not use the information to the full extent and hence its estimators are not efficient and third, although dealing with time series data there is no consideration of non stationarity of the variables.

4.3.1 CONSIDERATIONS OF THE LIMITATIONS

Regarding the second limitation –issue of efficiency- and according to Harvey (1990), the fact that the limited information estimator takes no account of any *a priori* restrictions on the other equations within the system can be seen as a virtue in the cases where there is some uncertainty surrounding the specification of the model, thus a

[40] Year not specified.
[41] However, we are aware that the estimation techniques have evolved as it was previously seen in Section 4.1.1
[42] See for instance: Nguyen (1989), Muscatelli *et al* (1992).

contrast between full information and limited information methods essentially involves a trade-off between robustness and efficiency.

Additionally, considering the normalization problem and following Maddala (1988: 317), normalization should be determined in practice by the way the economic theories are formulated and in the Bolivian case, the most appropriate normalization seems to be the one adopted in this investigation for the reasons explained in previous sections. In this regard, Riedel (1989:468) stated "deciding which variable should go on the left-hand-side and which on the right-hand-side of a regression equation is a matter of economics not statistics. If the hypothesis to be tested is the 'small country assumption' then the inverse export demand function is the most appropriate formulation. [...] At issue is whether quantity affects price" and the small country assumption suggests that it does not.

Finally, as mentioned by Johnston and Dinardo (1997:317)[43], even if the variables in an equation system are found to be non stationary and cointegrated, the 2SLS method is considered valid for the purposes of estimation or statistical inference procedures because a structural model building exercise has to only take into account issues of identification and simultaneity bias.

From all the above, we can say that although the simplest way to arrive at estimates of simultaneous-equation system -2SLS method- has some limitations, it can be used to solve the problem of endogeneity bias (get rid of the correlation between the error term and the stochastic endogenous explanatory variables) and to provide guidance in the determinants of export volumes if the system of equations is found to be identified[44].

In relation to this, a system of equations is found to be identified if the order and the rank conditions are satisfied. The order condition, although of easier implementation, is just a necessary condition for the identification of an equation and states that the number of variables missing from the equation should be greater than or equal to the number of endogenous variables in the equation minus one. On the other hand, the rank

[43] Referring to: Cheng Hsiao (1994) *Statistical Properties of Two Stage Least Squares Estimator under Cointegration*. Working Paper. University of Southern California. Los Angeles.
[44] More precisely, the system should be over-identified.

condition –which is considered not only a necessary but also a sufficient condition- establishes that, an equation that pertains to a system containing B equations and B endogenous variables is said to be identified if and only if at least one nonzero determinant of order (B-1)(B-1) can be constructed from the coefficients of the variables (both endogenous and predetermined) excluded from that particular equation but included in the other equations of the system (Gujarati, 2003).

CHAPTER 5
THE ESTIMATES AND RESULTS: UNDERSTANDING THE GROWTH OF NON TRADITIONAL EXPORTS

This chapter has as its main objectives to report the data issues, to review the previous investigations that have been done in Bolivia, to present the results obtained through the application of the econometric techniques, to evaluate them by means of the diagnostic tests, and finally to analyze them given the Bolivian context. For these purposes, it has 4 more sections following this introduction.

5.1 DATA ISSUES

The models of this investigation used quarterly data covering the period 1990.1 to 2004.4. Data on exports' quantum index, exports' price index, GDP and domestic price index was obtained from INE. Data on effective interest rate for loans ($us) came from the Banks and Financial Entities' Superintendence (SBEF) and data on Industrial Production Index of USA was obtained from the International Financial Statistics (IFS) of the IMF (2004). The data on competitors' price index was constructed, using data from TradeStat[45] which permitted to identify the competitor countries of Bolivian jewelry, lumber and articles of lumber, and apparel articles and accessories in the USA's market; the criteria used was to consider those countries with similar market share and more weight was given to neighbor countries as well as to those with stage of development similar to Bolivia. The Consumer Price Indexes (CPI) of the chosen competitors (Peru, Indonesia, France, Colombia, Brazil, Argentina and Ecuador) were obtained from the IFS of the IMF (2004). By the same way, the available yearly data on wage index of the public sector[46] from INE was transformed into quarterly data for the period 1990.1 to 1995.4 following Mahía (2001); the data for the period 1996.1 to 2004.4 came also from INE. All index numbers have as their base year 2000. For a more detailed explanation on sources and construction of the data, see Annex C.

[45] <http://tse.export.gov>

[46] Although the most appropriate wage was the one of the private sector, its series was not available for 2004 at the moment of this investigation.

It is important to mention that for the estimation procedure all the variables were expressed in dollars of 2000 -using the official exchange rate as published by the Central Bank of Bolivia- and transformed into logarithms (with exception of the interest rate). Summary statistics of the data used in the estimations is provided in TABLE 7.

TABLE 7

SUMMARY STATISTICS OF THE DATA

Variable	Obs	Mean	Std. Dev.	Min	Max
lex	60	4.1640	0.6769	2.8501	5.3246
lep	60	4.5085	0.2551	4.0140	4.9484
lcp	60	4.6017	0.4825	3.7262	5.5220
lusi	60	4.4237	0.1560	4.1761	4.6176
ldp	60	4.2071	0.5558	2.9740	4.9860
lwage	60	4.4615	0.3414	3.8557	5.0843
lgdpbol	60	7.7244	0.1304	7.4486	8.0022
interest	60	16.0875	3.6184	8.7200	23.9500

LEX: Volume of Exports, **LEP:** Exports' Price, **LCP:** competitors' prices, **LUSI:** level of economic activity in the exporting markets, **LDP:** domestic price, **LWAGE:** cost of labor, **LGDPBOL:** proxy for capacity utilization and productivity change, **INTEREST:** capital cost.

Following the usual convention we have tested for unit-roots in our variables; the criteria used for the selection of the deterministic components for the Augmented Dickey Fuller (ADF) test is shown in Annex D. The tests were performed both in level and first differences and the results are shown in TABLE 8.

TABLE 8

ADF'S UNIT ROOT TESTS

Variable	Level	Critical Value (5%)	Breusch-Godfrey p-value	First Difference	Critical Value (5%)	Breusch-Godfrey p-value	Conclusion	Lags levels	Lags first difference	Information criteria
lcp	2.8188	3.4892	0.1025	5.3826	2.9135	0.5147	I(1)	1	1	Akaike
ldp	3.4165	3.4953	0.6010	3.6644	2.9200	0.9742	I(1)	5	7	Akaike
lep	1.5506	3.4878	0.3229	6.5787	2.9126	0.5219	I(1)	0	0	Akaike
lex	1.2571	2.9212	0.1810	2.9531	2.9212	0.2179	I(1)	9	8	Akaike
interest	2.4277	3.4907	0.1802	9.4738	2.9126	0.2157	I(1)	2	0	Akaike
lusi	2.6391	3.5005	0.7683	1.6947	2.9212	0.7438	?	8	8	Akaike
lwage	1.3440	3.4878	0.1872	6.5220	2.9126	0.5809	I(1)	0	0	Akaike
lgdpbol	1.1646	2.9166	0.8038	1.6624	2.9166	0.6106	?	5	4	Akaike

LEX: Volume of Exports, **LEP:** Exports' Price, **LCP:** competitors' prices, **LUSI:** level of economic activity in the exporting markets, **LDP:** domestic price, **LWAGE:** cost of labor, **LGDPBOL:** proxy for capacity utilization and productivity change, **INTEREST:** capital cost.

All variables in their first differences, except the logarithm of the Bolivian GDP and the logarithm of the industrial production index of USA, reject the null hypothesis of existence of a unit root at the 5% level of significance, indicating that are all integrated of order 1 (I(1)). The alternative Philips-Perron test was then applied to those variables

and the results show (see TABLE 9) that unambiguously we can not reject the I(1) hypothesis for them. In this sense, all variables are stationary in their first differences and candidates for a long run relationship.

TABLE 9

PHILIPS-PERRON TEST OF EXISTENCE OF A UNIT ROOT

Variable	Level	Critical Value (5%)	First Difference	Critical Value (5%)	Conclusion
lusi	1.1426	3.4878	5.7795	2.9126	I(1)
lgdpbol	2.7286	2.9117	28.9077	2.9126	I(1)

LUSI: level of economic activity in the exporting markets, **LGDPBOL:** proxy for capacity utilization and productivity change.

In order to show that these variables are cointegrated –through the Johansen's test- first we proceeded with the selection of the appropriate lag order of the VAR system using different criteria.

TABLE 10

TESTS STATISTICS AND CHOICE CRITERIA FOR SELECTING THE ORDER OF VAR MODEL

(All Variables)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	123.03	NA	0.00	-4.04	-3.52	-3.84
1	148.81	42.97	0.00	-4.84	-4.18*	-4.59
2	154.88	9.66	0.00	-4.92	-4.11	-4.61
3	158.09	4.87	0.00	-4.89	-3.93	-4.52
4	161.31	4.65	0.00	-4.86	-3.76	-4.44
5	174.24	17.72	0.00	-5.19	-3.94	-4.71
6	188.22	18.12*	1.40E-05*	-5.56*	-4.16	-5.02*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

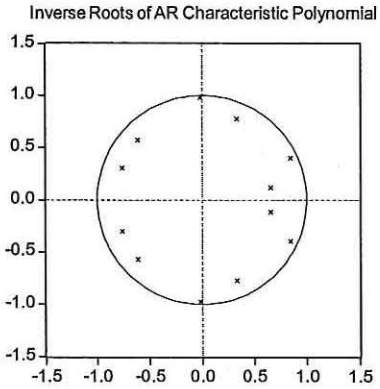
HQ: Hannan-Quinn information criterion

Endogenous variables: LEX LEP

Exogenous variables: C LCP LGDPBOL LDP LUSI LWAGE INTEREST

Four out of the five chosen criteria indicate that we should consider a VAR of order 6. Through GRAPH 3, we can also appreciate that all the inverse roots of the characteristic polynomial fall inside the unitary circle and hence that the VAR turns out to be covariance-stationary or stable.

GRAPH 3



Finally, the cointegration test of Johansen was performed for all the possibilities considered by the author[47], and TABLE 11 shows that at the 5% level of significance there are 2 cointegrating relations.

TABLE 11

COINTEGRATION TEST

(All Variables)

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Selected (5% level) Number of Cointegrating Relations by Model (columns)					
Trace	2	2	2	2	2
Max-Eig	2	2	2	2	2
Log Likelihood by Rank (rows) and Model (columns)					
0	163.9215	163.9215	165.2379	165.2379	171.4429
1	187.3553	187.4758	187.5249	187.5563	192.9096
2	194.1927	195.9673	195.9673	205.6366	205.6366
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-5.280057	-5.280057	-5.254259	-5.254259	-5.412941
1	-6.013406	-5.980218	-5.944335	-5.907784	-6.072061
2	-6.120481	-6.111975	-6.111975	-6.401381*	-6.401381
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-4.387849	-4.387849	-4.287701	-4.287701	-4.372032
1	-4.972497	-4.902134	-4.829076	-4.755349	-4.882451
2	-4.93087	-4.848014	-4.848014	-5.063069*	-5.063069

Series: LEX LEP

Exogenous series: LCP LGDPBOL LDP LUSI LWAGE INTEREST

Lags interval: 1 to 6

[47] 1. Series *y* have no deterministic trends and the cointegrating equations do not have intercepts.
2. Series *y* have no deterministic trends and the cointegrating equations have intercepts.
3. Series *y* have linear trends but the cointegrating equations have only intercepts.
4. Both series *y* and the cointegrating equations have linear trends.
5. Series *y* have quadratic trends and the cointegrating equations have linear trends.

5.2 PREVIOUS STUDIES IN BOLIVIA

This section is intended to present a brief summary of the main findings of papers that investigated issues similar to the one under consideration in the Bolivian economy. It is important to mention that only the first of the three investigations that will be analyzed in this section was intended to find the determinants of exports and that due to this situation, comparison of the results of the last two with ours may not be appropriate since the second paper estimated the demand for exports in order to test the Marshall-Lerner condition (and used more disaggregated data than the one given under the classification of traditional and non traditional exports) and the third was trying to measure the impact of the RER on exports and seems to be trying –although not explicitly stated- to solve the omitted variable bias, whereas the present investigation is not focused on those issues. However, they are considered in this section since they are the most similar researches that have been done in Bolivia.

Antelo *et al* (1993) estimated through OLS[48] the demand for total exports, exports of minerals, exports of hydrocarbons and non traditional exports for the period 1980:1-1990:4 using the following model:

$$Log\ X_t = a_0 + a_1\ log\ Y_t^* + a_2\ log\ e_t + a_3\ log\ X_{t-1} + u_t$$

Where X_t: exports (quantum index), Y_t^*: foreign income (USA's industrial production index) and two alternative definitions for the RER: e_{1t}= E^*P_t/W or e_{2t}= E^*IPM_{US}/IPC_{BOL}[49]

According to their results and focusing on the variable of interest of this investigation, the non traditional exports were found to be sensitive to both formulations of the RER in the short run but the coefficients of foreign income and lagged exports were not statistically different from zero. However, as the authors themselves recognize, it is important to take into consideration the facts that occurred in this decade -such as the shock in the petroleum's prices in 1979, the debt crisis in 1982 and the implementation

[48] Generalized Least Squares (GLS) when evidence of correlation was found.

[49] E: nominal exchange rate; P: price of tradable goods; W: wage index; IPM_{US}: wholesale price index USA and IPC_{BOL}: Consumer Price Index of Bolivia. For the case of non traditional exports, the reimbursement of duties was also considered in the calculations and hence the RER used was: $e^*=e_{1,2}*(1+t)$, where t was equal to 10% for the period 1987.4-1990.2 and to 6% for 1990.3-1990.4

of the NEP in 1985- because they may have produced instability in the elasticities (there might be a breakpoint). In this regard, they applied the Chow's stability test to the estimation of total exports and found that the elasticities were different for the sub periods 1980.1-1985.4 and 1986.1-1990.4. During the first half of the decade, the income elasticity was the main determinant whereas from 1986 onwards the exports responded for the most part to changes in the RER (under formulation 2) and the income elasticity lost its significance and turned to be negative, which is quite contradictory since it is not possible for a country to compete in prices in a market where its goods are demanded residually or considered inferior.

Nevertheless, as the present investigation dealt with non traditional exports from 1990.1 to 2004.4, for comparisons to be reasonable a Chow's stability test should have been required to be performed to their formulation of non traditional exports as was done with the total exports and attention would have been paid to the elasticities of the period after the implementation of the NEP. Nonetheless, as this was not the case it can be said that the results obtained for the non traditional exports in Antelo's (*et al)* investigation are not reliable.

Additionally, the underlying assumptions for their results were: supply is infinitely price elastic and data is stationary which –as mentioned before- can produce endogeneity bias and spurious results respectively.

By the same way, Loza (1993) used the RER (as calculated by the Central Bank), the volume of imports from the industrial countries and Latin America and the export's price as determinants of the volume of exports (total, total excluding hydrocarbons and sectoral exports: agricultural, minerals and manufactures) for the period 1990.1 to 1999.4. The base model estimated using OLS was:

$$Log\ X_t = a_0 + a_1\ log\ REER_{t-j} + a_2\ log\ IMPORT\ P.IND + a_3\ log\ IMPORT\ AL_j + a_4\ PRECIO\ EXPORT + u_t$$

This estimation was used to verify the Marshall-Lerner condition; however, what is not appropriate in its formulation is the consideration of the RER and price of exports simultaneously and what is more, the expected sign for the latter is positive. From this, we can imply that the author is combining an export demand and an export supply

functions and bringing them together in a single, reduced-form type equation which for the purpose of his investigation might not be adequate. Other issue that is important to be mentioned here is the fact that there is no further explanation of the formulation of the "base model" and it could be observed that for the estimation of the sectoral exports the export's price was not considered as a determinant[50]. By the same token, the exports of minerals' specification included a dummy variable whose requirement was not specified.

His results regarding the agricultural and manufacturing exports (components of the non traditional exports, although not exactly them[51]) were: exports of manufactures are sensitive (in the short and in the long run) to changes in the RER and more responsive to imports from the industrial countries than to imports from Latin America. Agricultural exports on the other hand, were also responsive -in the short and in the long run- to changes in the RER (although less responsive than the manufactured ones) and more sensitive to changes in the level of imports from Latin America. These results seem to concord with the data analysis of Chapter 3, in which it was shown that CAN was the major market destination of soja (that although agricultural is on average 84% processed for the period 1990-2004) and that USA was the one for jewelry and lumber's manufactures. However, the explanations given by the author for the high responsiveness of the agricultural exports to changes in the RER are based on supply-side determinants such as: expansion of the agricultural frontier, increase in the production of agricultural products for exports and more flexible factors of production in this sector.

Furthermore, the underlying assumption once more is that the exports are determined by the demand side or -if the intention of the paper was to estimate an export determination model- that the markets involved are oligopolistic and thus that prices are set prior to quantity.

Another investigation in this field was the one carried out by Zambrana (2001), where the model under consideration was:

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[50] The argument was that the responsiveness to exports' prices was low given that when they fall the exporters increase their volume of production so that to keep their revenue constant. What should be noted here is that this is a supply-side argument.

[51] Some traditional goods are also considered manufactured commodities.

$$Log\ X_t = a_0 + a_1\ log\ Y_t^* + a_2\ log\ REER_t + a_3\ logTI_t + ECM + u_t$$

Where: X_t, total exports, non traditional exports and exports of minerals; Y_t^* Foreign income (industrial production index of USA); REER, RER as calculated by the Central Bank; TI, Terms of Trade[52] and ECM, Error Correction Model. Once more, it is not clear why there is simultaneous consideration of the RER and the Terms of Trade. This again seems to be an export determination model intended to solve the omitted variable bias.

The period of investigation was 1989.1 to 1999.4 and the methods of estimation OLS and Impulse Response Functions (IRF). The main results concerning the non traditional exports indicated that not only in the short run but also in the long run although the RER played an important role the income elasticity was higher and hence regarded as the main determinant. However, both elasticities were not statistically different from zero in the short run. Even though consideration of the non stationarity of the data was done, the neglection of the interaction with the supply equation can be leading to biased results.

In this sense, the present investigation can be regarded as the first that allowed the simultaneous interaction of supply and demand and hence addressed the problem of simultaneity bias for the Bolivian non traditional exports. By the same way, the consideration of competitor countries and the role played by their prices were also introduced in this research but it is recognized that in order to have a more accurate index, a deeper analysis than the one did here is required, which is left for future investigations.

5.3 ESTIMATION RESULTS

Before proceeding with the estimation of the simultaneous-equation system, verification of identification of both equations was performed and it was found that they are over-identified and hence that the 2SLS is an appropriate methodology. For the identification procedures see Annex E.

[52] Ratio of Unit Value Index of Exports and Unit Value Index of Imports.

5.3.1 THE EXPORT DEMAND MODEL

Given the results obtained under the single demand-equation estimation (see TABLE 12) the demand for the Bolivian non traditional exports seems to be highly sensitive to changes in its major market's income (a 1% increase leading to a 1.74% increase in the demand for exports in the short run and to a 3.37%[53] increase in the long run) and to have a price elasticity of demand not statistically different from zero[54], implying that Bolivia has no scope to sustain export sales by any form of price competition in the face of an economic downturn in its major markets.

TABLE 12

EXPORT DEMAND MODEL

Period: 1990.1-2004.4 **Dependent variable: LEX**	**Demand**
_cons	-5.543
se	*1.790*
t	*-3.100*
(LEP-LCP)	-0.218
se	*0.174*
t	*-1.253*
LUSI	1.740
se	*0.494*
t	*3.525*
LEX(-1)	0.483
se	*0.119*
t	*4.053*
N	59
Adjusted R^2	0.8597

LEX: Volume of Exports, LEP: Exports' Price, LCP: competitors' prices, LUSI: level of economic activity in the exporting markets.

As the model passes all the diagnostic tests (see TABLE 13) these results seem to be reliable.

[53] Long run income elasticity = 1.740/(1-0.483)= 3.366

[54] And a small magnitude not only in the short run but also in the long run (0.218/(1-0.483)=0.422).

TABLE 13

DIAGNOSTIC TESTS

TEST	H_0	Decision Rules		Conclusion
Ramsey Reset Test	Model has no omitted variables	Prob > F = 0.0213	$3.52\ (F_{3,52}) < 4.13(F_{3,60,1\%})$	NRH_0*
Breusch-Pagan	Constant variance	Prob > χ^2 = 0.1597	$1.98(\chi^2_1) < 3.84146\ (\chi^2_{1,5\%})$	NRH_0
Jarque Bera	Errors follow a normal distribution		JB = 1.448** < 5.991 ($\chi^2_{2,5\%}$)	NRH_0
LM test (1 lag)	No serial correlation	Prob > χ^2 = 0.3481	$0.880\ (\chi^2_1) < 3.84146\ (\chi^2_{1,5\%})$	NRH_0

* At the 1% level of significance

** Skewness = -0.2887503; Kurtosis = 2.494453; N=59

However, given that the demand is not price elastic and that hence it can only change via shifts in its curve it is important to know the price elasticity of supply since under this framework it is an important determinant of exports.

Additionally, given the possibility of simultaneity between quantity and prices, the Hausman's Specification test[55] was applied, regressing the logarithm of exports' prices on all the exogenous variables in the system (the reduced-form regression) and predicting the error term. As a second stage, we regressed the original structural equation of the logarithm of exports' volumes but this time including the predicted error term as an explanatory variable, and given the fact that the latter was statistically significant at the 10% level of significance we could conclude that the simultaneity problem is present and hence that a formulation that allows this interdependency is required.

The results of the estimation of the second stage of the Hausman's test were:

$$\hat{LEX}_t = -29.85 + 2.33\ LEP_t + 0.09\ LDP_t + 2.45\ LGDPBOL_t + 0.50\ LWAGE_{t-1} + 0.03\ INTEREST_{t-1} + 0.36\ LEX_{t-1} - \mathbf{2.33\ residuals}$$

$$t = (5.01)\quad (3.32)\quad (0.36)\quad (4.29)\quad (1.69)\quad (0.85)\quad (3.04)\quad \mathbf{(1.66)}$$

5.3.2 A SIMULTANEOUS MODEL OF EXPORT SUPPLY AND DEMAND

When the interaction of supply and demand was allowed and using the limited information approach (2SLS) for the estimation, the results obtained (see TABLE 14) were significantly different from those found in the previous section and indicate that we can not reject the "small country" assumption for the Bolivian economy, since the

[55] For further reference see Gujarati (2003).

demand equation seems to be infinitely elastic with respect to price (the coefficient for export volume does not differ statistically from zero) and consistent with this finding the coefficient of foreign income is also not statistically significant.

Additionally, the long-run price homogeneity hypothesis could not be rejected according to the F-test[56], which may be an indication that Bolivian export prices are almost equivalent to its competitors' prices (and hence to the world prices) highlighting once more the adequacy of the assumption of Bolivia acting as a price-taker in the world market. Corresponding to this issue, the price of Bolivian non traditional exports seems to follow the world price with a mean adjustment lag of 11 quarters.[57]

TABLE 14

SIMULTANEOUS-EQUATIONS

Period: 1990.1-2004.4 Dependent variable: LEX	**Supply**
_cons	-21.611
se	*4.424*
t	*-4.885*
LEP	2.361
se	*0.342*
t	*6.899*
LGDPBOL	1.760
se	*0.451*
t	*3.905*
LEX(-1)	0.372
se	*0.109*
t	*3.406*
N	59
Adjusted R^2	0.91

Period: 1990.1-2004.4 Dependent variable: LEP	**Demand**
_cons	0.109
se	*0.357*
t	*0.306*
LEX	-0.017
se	*0.035*
t	*-0.484*
LCP	0.057
se	*0.022*
t	*2.609*
LUSI	0.032
se	*0.064*
t	*0.493*
LEP(-1)	0.905
se	*0.098*
t	*9.285*
N	59
Adjusted R^2	0.99

LEX: Volume of Exports, **LEP:** Exports' Price, **LCP:** competitors' prices, **LUSI:** level of economic activity in the exporting markets, **LDP:** domestic price, **LWAGE:** cost of labor, **LGDPBOL:** proxy for capacity utilization and productivity change, **INTEREST:** capital cost.

On the other hand, the results of the supply equation suggest that exporters are also sensitive to changes in the exports' prices, a 1% increase leading to an increment of 2.36% of the exports' volume in the short run with a mean adjustment lag of exports to

[56] [LCP + LEP (-1) = 1]; [$F_{(1, 54)}$=0.21 < $F_{(1, 54, 5\%)}$ = 4] and Prob = 0.6515 > 0.05

[57] 1/(1-0.905) = 11 quarters.

profitability of about 2 quarters, meaning that the incentives provided by the government are well received by this sector. By the same token, the *proxy* used for capacity utilization and productivity change is statistically significant at the 5% level of significance and carries the expected sign, stating that if it increases by 1% the volume of exports will increment in 1.76%.

One extra consideration in relation to this is the fact that even though some variables representing costs of production, such as wages and interest rates, were introduced for the analysis of the supply equation they were not statistically significant and hence detached from the specification.

Finally, although the domestic price was also included in previous estimations it turned to be not statistically significant and thus removed from the equation. On the subject of this issue it is worth mentioning that the Bolivian domestic market is very small and that the exporters sometimes do not even consider the production of goods to be sold on it for a variety of reasons, such as the fact that imported inputs are required for the production of the commodities and that they are only duty-free if they are going to be used in the production of exportable goods, as was already mentioned in Chapter 3.

TABLE 15

DIAGNOSTIC TESTS: SUPPLY EQUATION

TEST	H_0	Decision Rules		Conclusion
Ramsey Reset Test	Model has no omitted variables	Prob > F = 0.7287	0.44 ($F_{3,51}$) < 2.76 ($F_{3,60,5\%}$)	NRH_0
Breusch-Pagan	Constant variance	Prob > χ^2 = 0.2936	1.10 (χ^2_1) < 3.84146 ($\chi^2_{1,5\%}$)	NRH_0
Jarque Bera	Errors follow a normal distribution		JB = 1.974* < 5.991 ($\chi^2_{2,5\%}$)	NRH_0
LM test (1 lag)	No serial correlation	Prob > χ^2 = 0.1699	1.884 (χ^2_1) < 3.84146 ($\chi^2_{1,5\%}$)	NRH_0

* Skewness = -0.3989797; Kurtosis = 2.592454; N=59

DIAGNOSTIC TESTS: DEMAND EQUATION

TEST	H_0	Decision Rules		Conclusion
Ramsey Reset Test	Model has no omitted variables	Prob > F = 0.0143	3.87 ($F_{3,51}$) < 4.13($F_{3,60,1\%}$)	NRH_0*
Breusch-Pagan	Constant variance	Prob > χ^2 = 0.1064	2.61 (χ^2_1) < 3.84146 ($\chi^2_{1,5\%}$)	NRH_0
Jarque Bera	Errors follow a normal distribution		JB = 2.299** < 5.991 ($\chi^2_{2,5\%}$)	NRH_0
LM test (1 lag)	No serial correlation	Prob > χ^2 = 0.6881	0.161(χ^2_1) < 3.84146 ($\chi^2_{1,5\%}$)	NRH_0

* At the 1% level of significance

** Skewness = -0.4603772; Kurtosis = 2.703831; N=59

Both equations were evaluated through the typical diagnostic tests of autocorrelation, heteroscedasticity, normality and regression specification error, and passed all of them as it is shown in TABLE 15. Additionally, following Johnston and Dinardo (1997) in their citation of Hsiao (1994) regarding the legitimacy of the 2SLS methodology using non stationary variables, through TABLES 16 and 17 it is shown that they are cointegrated under a VAR system of order 6 and hence that the chosen method is still valid.

TABLE 16

TESTS STATISTICS AND CHOICE CRITERIA FOR SELECTING THE ORDER OF VAR MODEL

(Selected Model)

Order	LL	AIC	SBC	LR test	Adjusted LR test
6	169.1769	139.1769	109.3421	------	------
5	161.5475	135.5475	109.6907	CHSQ(4)= 15.2588[.004]	11.0202[.026]
4	149.7245	127.7245	105.8457	CHSQ(8)= 38.9048[.000]	28.0979[.000]
3	142.0321	124.0321	106.1313	CHSQ(12)= 54.2895[.000]	39.2091[.000]
2	136.4442	122.4442	108.5213	CHSQ(16)= 65.4654[.000]	47.2806[.000]
1	132.1229	122.1229	112.1779	CHSQ(20)= 74.1081[.000]	53.5225[.000]
0	83.6073	77.6073	71.6403	CHSQ(24)= 171.1393[.000]	123.6006[.000]

AIC=Akaike Information Criterion SBC=Schwarz Bayesian Criterion
List of variables included in the unrestricted VAR: LEX, LEP
List of deterministic and/or exogenous variables: LCP, LGDPBOL, LUSI

TABLE 17

COINTEGRATION TEST

(Selected Model)

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

Null	Alternative	Statistic	95% Critical Value
r = 0	r = 1	33.95	27.80
r<= 1	r = 2	25.79	20.47

List of variables included in the cointegrating vector: LEX, LEP, LCP, LGDPBOL, LUSI, Trend
List of I(1) exogenous variables included in the VAR: LCP, LGPPBOL,
* Order of VAR = 6

Cointegration LR Test Based on Trace of the Stochastic Matrix

Null	Alternative	Statistic	95% Critical Value
r = 0	r = 1	59.74	40.37
r<= 1	r = 2	25.79	20.47

List of variables included in the cointegrating vector: LEX, LEP, LCP, LGDPBOL, LDP, LUSI, Trend
List of I(1) exogenous variables included in the VAR: LCP, LGPBOL, LDP,

By the same way, as the critics pointed out that the limited information approach (2SLS) was not the most appropriate for estimation of simultaneous-equations, since it estimated one equation at a time, the full information approach (3SLS) was also performed and its results do not contradict the findings of the previous one. This estimation's results can be seen in TABLE 18.

TABLE 18

3SLS ESTIMATION RESULTS

Period: 1990.1-2004.4 **Dependent variable: LEX**	**Supply**
_cons	-21.636
se	*4.261*
z	*-5.077*
LEP	2.364
se	*0.329*
z	*7.190*
LGDPBOL	1.762
se	*0.435*
z	*4.055*
LEX(-1)	0.371
se	*0.105*
z	*3.533*
N	59
Adjusted R^2	0.91

Period: 1990.1-2004.4 **Dependent variable: LEP**	**Demand**
_cons	0.148
se	*0.341*
z	*0.434*
LEX	-0.015
se	*0.034*
z	*-0.446*
LCP	0.058
se	*0.021*
z	*2.779*
LUSI	0.020
se	*0.061*
t	*0.329*
LEP(-1)	0.906
se	*0.093*
z	*9.745*
N	59
Adjusted R^2	0.99

LEX: Volume of Exports, **LEP:** Exports' Price, **LCP:** competitors' prices, **LUSI:** level of economic activity in the exporting markets, **LDP:** domestic price, **LWAGE:** cost of labor, **LGDPBOL:** proxy for capacity utilization and productivity change, **INTEREST:** capital cost.

The message that can be extracted from the results obtained until this point is that being Bolivia a price-taker in the world market, policy should concentrate on the supply side trying to make exports a "profitable business" for producers. This issue will be thoroughly analyzed in the next section of this chapter.

Finally, it is important to mention that although the demand was found to be infinitely elastic with respect to price, we can not take this result and try to estimate the supply under a single-equation framework and test for cointegration, since we know that the results obtained from such estimation will be biased due to the neglect of the interaction.

5.4 ANALYSIS OF THE RESULTS

Finding that the demand for Bolivian non traditional exports is infinitely elastic with respect to price has important implications since it is indicating on the one hand that they are not demand-constrained (and hence that there is some scope for price competition) and on the other hand that the adequate policy in order to foster the non traditional exports should focus on making them more profitable for producers.

As has been already mentioned in Chapter 2 and following Piana (2001), price competitiveness can arise from different factors, such as: costs advantages, state aid, high productivity, favorable exchange rate, higher inflation abroad than domestically and so forth.

In relation to this, it is important to highlight once more the importance of the appropriate construction of the RER as a measure of competitiveness, since the Bolivian RER is currently calculated following the IMF's formula that considers trading partners and not competitor countries which are the ones that matter for this issue. By the same token, the CPI is used as the measurement of price of tradable goods whereas by its construction the weight given to traded goods in this index is very low. Finally, in the ideal case, the RER should be constructed based on costs of production –instead of prices- so that it can really reflect the country's competitiveness in the world market.

In the same way, and as mentioned in Chapter 3, although it can be considered that the management of the exchange rate in the actual context was appropriate in order to have a stable RER there are two important characteristics of the economy that limit the dynamism of the exchange rate policy. First, the existence of a non linear relation between the rate of depreciation and inflation which implies that after a certain threshold the effects of a depreciation will be passed directly to the domestic prices leaving the RER unaffected and producing only a trade off between the attainment of the simultaneous internal and external equilibrium[58]. Second, the high level of dollarisation[59] that implies that a depreciation represents a significant burden in the financial sector and in the economy as a whole.

Additionally, we should not forget that exporters of processed goods face an almost inelastic demand for imported materials[60] (since there are no immediate available substitutes in the domestic market) whose costs can rise through a depreciation and that this can disincentive the production of exportable commodities instead of fostering

[58] For further reference see footnote 29.
[59] See Orellana and Requena (1999) *Determinantes de la inflación en Bolivia*. Banco Central de Bolivia. Revista de Análisis Vol.2 N°2. La Paz, Bolivia. As cited in Zambrana (2000:39).
[60] Even in the case of agricultural products since items such as fertilizers as well as genetic seeds are also imported.

them. As we have seen in Chapter 3, for the period 1990-2004 the non traditional exports were, on average, 80% processed.

In this sense, it seems that the exchange policy should be carried out with extreme caution and that the price competitiveness should be pursued by other means. Furthermore, non-price factors should not be neglected since they can help to move up the value chain of the non traditional exports.

Cognizant that since the application of the NEP in 1985, not only the roles of the private and public sector were well defined but also there was productive transformation of the economy redirecting it to the market through the elimination of trade barriers and the establishments of clear and permanent rules, it is possible to attribute the recovery of the total exports to a combination of all these issues.

Relative to this, it is believed that the supply-side determinants (in agreement with the econometric findings) have played an important role in explaining the sustained growth of the non traditional exports. The commercial policy (through the expansion of foreign markets), the refund of taxes and duties of the imported inputs, the promotion of exports in the world market, the promulgation of the "Exports' Law" and all the policies (already discussed in Chapter 3) intended to provide incentives to the exporters, were adequately used to foster the exports' competitiveness. This is consistent with what has been mentioned by Rodrik and Hausmann (2005) in regard to the successful productive transformation from traditional to non traditional (higher productivity) activities of countries such as Taiwan, South Korea and Chile where this "was hardly ever a natural, purely market-driven process" and instead "it was always almost stimulated and supported by public policies and public-private collaboration" (p.6).

In addition, although the costs of production were not statistically significant in the econometric estimation, we shall not fail to remember that the high capital cost is still perceived by the bidders as a constraint and by the same way that the low productivity of the labor force is also seen as a major restraint given the fact that the results showed an unambiguous increment of the volume of non traditional exports in the face of an increase in the *proxy* for capacity utilization and productivity change. That is why, it is considered that some extra measures –not only regarding these two last issues but all

potential constraints- need to be taken in order to not only foster and incentive the non traditional exporter sector, but also to pursue its sustainable development, looking for diversification as well as an increase in the value chain of the exportable commodities. Among them we can mention[61]:

Those destined to reduce the level of hindering factors,

- As new activities are plagued of uncertainty, there is an economic reason to defray the costs of early stages of the self discovery process, co-financing[62] feasibility studies, demonstration projects, technology transfer arrangements, and the preparation of business plans in non traditional activities. The idea is to allocate the subsidy among private-sector entrepreneurs who present a pre-investment proposal that –among other things- fosters activities that can crowd in other activities, complementary investment as well as/or generate technological or informational externalities.

- Provision of physical and institutional infrastructure; investment should be prioritized in the provision of services in the fields of transport and communication since they have a high incidence in the costs' structure given the geographical conditions of Bolivia.

- Invigoration of the institutions created for the promotion of exports. Given the fact that foreign firms already have a technology but it still requires to be tested in the host country and that through this process spillovers of valuable information can be generated, there is case for an active promotion policy by which potential innovating firms are convinced that the government has an interest in their productive success.

- Given the fact that coordination externalities are very specific to each activity and at the same time very changing, the government should rely on the involved business sectors (such as the commerce chambers) to identify them but should also constraint inconvenient rent-seeking behavior, developing mechanisms that legitimate the

[61] Following the exports' determinants highlighted by Piana (2001) in Chapter 2 and also Rodrik and Hausmann's (2005:17-22) positive policy recommendations for El Salvador.
[62] Co-finance is considered a good instrument since it reduces the problem of moral hazard given the fact that private sector agents also risk their own resources.

relationships i.e. having proposals made public and formally scored for their impact on fiscal accounts and on the society as a whole.

- Ensure the provision of fuels and regulate their prices in the rural area, where the raw materials are being produced.

Those directed to increase productivity,

- Investment in human capital so that the productivity of the labor force can be increased; this has to be done considering the productive structure of the economy. In this regard, due to the labor externalities firms are be motivated to under-provide training and hence government intervention, for instance by co-financing training efforts, is necessary.

Those focused on the development of complementary services,

- Reduction of the capital cost and the exigencies of collaterals by the banking system so that the exporter sector can access more easily to credit. This requires a modernization of the financial sector[63]. Alternatively, this may require the creation of a development bank or a development corporation but subject to problems of moral hazard of the previous experience.

Those seeking economic integration,

- Perpetuate the existing international treaties but trying to negotiate the removal of non-trade barriers and demanding the egalitarian treatment of our commodities in the importing country's market in the tax field.

- Negotiate new international treaties under favorable conditions so that our markets can diversify.

[63] As mentioned by Rodrik and Hausmann (2005:18), "business development and self-discovery requires [...] riskier forms of financial intermediation" such as "corporate debt, subordinated debt, preferred equity, normal equity, venture capital and angel capital"

Those focused on the provision of clear and permanent rules,

- Provision of legal security and enforcement of the law. Since indebtedness is not penalized, most of the time the supplier of raw materials (as in the case of the chestnuts) does not complete its contract with the exporter and hence the latter can not carry out the production process and thus fails to complete his commitment with the international buyers, loosing competitiveness.

- Protections as well as a clear definition of the property of the land, since the suppliers of raw materials sometimes loose not only their harvest but also their land under social pressure.

CHAPTER 6
CONCLUSIONS

Since the implementation of the NEP in 1985 the Bolivian total exports started to recover and diversify. There was a shift from traditional goods –minerals and hydrocarbons that were produced and exported by the State Owned Enterprises- towards non traditional commodities (produced and exported by the private sector) and although the former group did not register a negative rate of growth over the years its share on the total declined and hence provided some evidence to believe that a structural transformation in the export base was beginning, which can place Bolivia in a better position in the international market of its commodities and at the same time represents a more stable source of foreign exchange for the economy.

Because of this, it is important to determine what factors produced this phenomenon and through this evaluate if nowadays the Bolivian government is carrying out appropriate policies with the intention to fuel the non traditional exports. In this regard, the main objective of this investigation was to establish the determinants of the behavior of the Bolivian non traditional exports for the period from 1990 to 2004, but considering not only demand but also supply factors. Additionally, it was also of interest to try to find out if the policies that the Bolivian government is applying at the present time are the appropriate ones or if some extra measures or corrections are required.

As previous studies on the behavior of exports have tended to ignore the interdependence between the quantity of exports and their price this investigation can be regarded as innovative in the sense that it took explicit account of the simultaneity by specifying –under the imperfect substitutes model's framework- separate equations of export supply and demand and estimated them simultaneously using the 2SLS method on quarterly aggregated export data over the period 1990-2004.

At a first stage and taking the generalized assumption that exports' supply is infinitely price elastic, estimation of a single demand equation was performed and the outcomes were consistent with the "elasticity pessimism", that is to say, that Bolivia has no scope to sustain export sales by any form of price competition in the face of an economic downturn in its major markets. Additionally, these results established that, given the

(statistically) zero price elasticity of demand, it was necessary to identify the price elasticity of supply so that the appropriate policies could be identified and then applied; however, all previous researchers ignored this fact.

Furthermore, through the implementation of the Hausman's specification test it was found that the simultaneity problem between quantity and prices was present at the 10% level of significance, hence in order to get rid of this and to have accurate estimates a method that takes into consideration this interdependence was required.

On the subject of this issue, the simultaneous interaction of supply and demand was allowed by using 2SLS[64]. With the intention to test the "small country" assumption – given the fact that Bolivia can be regarded as a price-taker in the world market- the model specification for the Bolivian non traditional exports contained an inverse demand equation and a volume-determined supply equation.

The results suggested that the "small country" assumption could not be rejected. This issue was supported by two facts: first, the demand for the Bolivian non traditional exports was infinitely price elastic and second, the price of Bolivian non traditional exports followed the competitors' prices and hence the world price (the long run price homogeneity hypothesis could not be rejected). Consequently, it is possible to say that there is scope for price competition but as all export supply shifts will be matched completely by increments in export demand and not lessen by changes in export prices, supply factors -those destined to make exports a profitable business- were identified as the main determinants of the observed performance of the non traditional commodities.

Therefore, and bearing in mind the high level of dollarisation of the Bolivian economy, the existence of a pass-through effect and that exporters face an almost inelastic demand for imported inputs, a dynamic exchange rate policy was discarded as an option to improve competitiveness. What is more, it was also highlighted that the current calculation of the RER might not be the most appropriate since the countries considered in its construction are the main trading partners and not the competitors which were the ones required in order to have the appropriate cross elasticity of demand.

[64] And also 3SLS.

By the same way, it was recognized that all the policies applied by the Bolivian government since the implementation of the NEP in 1985 were effectively making exports profitable for producers and hence fostering their production. Among the policies that still remain today, we can mention: creation of institutions intended to promote internationally the Bolivian commodities; promulgation of the "Exports' Law" which gave permanent and stable rules of game; refund of domestic taxes and or/duties paid for the purchase of capital goods, fixed assets, inputs, services and other necessary expenses that are required for the production of export commodities; signature of international treaties with ALADI, CAN, MERCOSUR, Chile, Cuba, USA, Japan and Europe.

However, referring to the costs of production and mainly to the high capital costs, it is considered that extra measures are required since -although not statistically significant in the econometric estimation- this issue is perceived as an important constraint by the exporters. Likewise, even though labor is cheap its productivity is very low and thus also represents a restraint for the expansion of the sector, this was also verified by the econometric model, where the *proxy* used for capacity utilization and productivity change was found to be positive and statistically significant.

Consequently, measures directed to solve not only these two issues but any potential obstructing factor so that the exporter sector can develop, are still needed. However, considering that both the market and the government are prone to failures the optimal strategy should balance incentives and discipline and thus should be carried out in an appropriate institutional framework, which should be the first objective to be attained.

Among the extra needed measures, and also considering some non-price factors, we can mention[65]: those destined to reduce the level of hindering factors, such as the co-financing of feasibility studies, demonstration projects, technology transfer arrangements, and the preparation of business plans in non traditional activities so that the underlying uncertainty is reduced. Additionally, provision of physical and institutional infrastructure as well as supply of fuels and regulation of their prices in the

[65] These recommendations were thoroughly developed in Chapter 5.

rural areas is required. By the same way, invigoration of the institutions created for the promotion of exports and identification of coordination externalities, are also needed.

Secondly, to increase productivity, investment in human capital by co-financing training efforts given the existence of labor externalities is necessary. By the same token, focusing on the development of complementary services, an easier access to credit would definitely favor the sector.

Thirdly, seeking a deeper economic integration, the government should try to perpetuate and improve the conditions of the existing international treaties and also negotiate new ones under favorable conditions so that a market diversification can take place.

Last but not least, the provision of clear and permanent rules is very important and should cover issues such as legal security and enforcement of the law in the case of indebtedness as well as protection and clear definition of the property of land.

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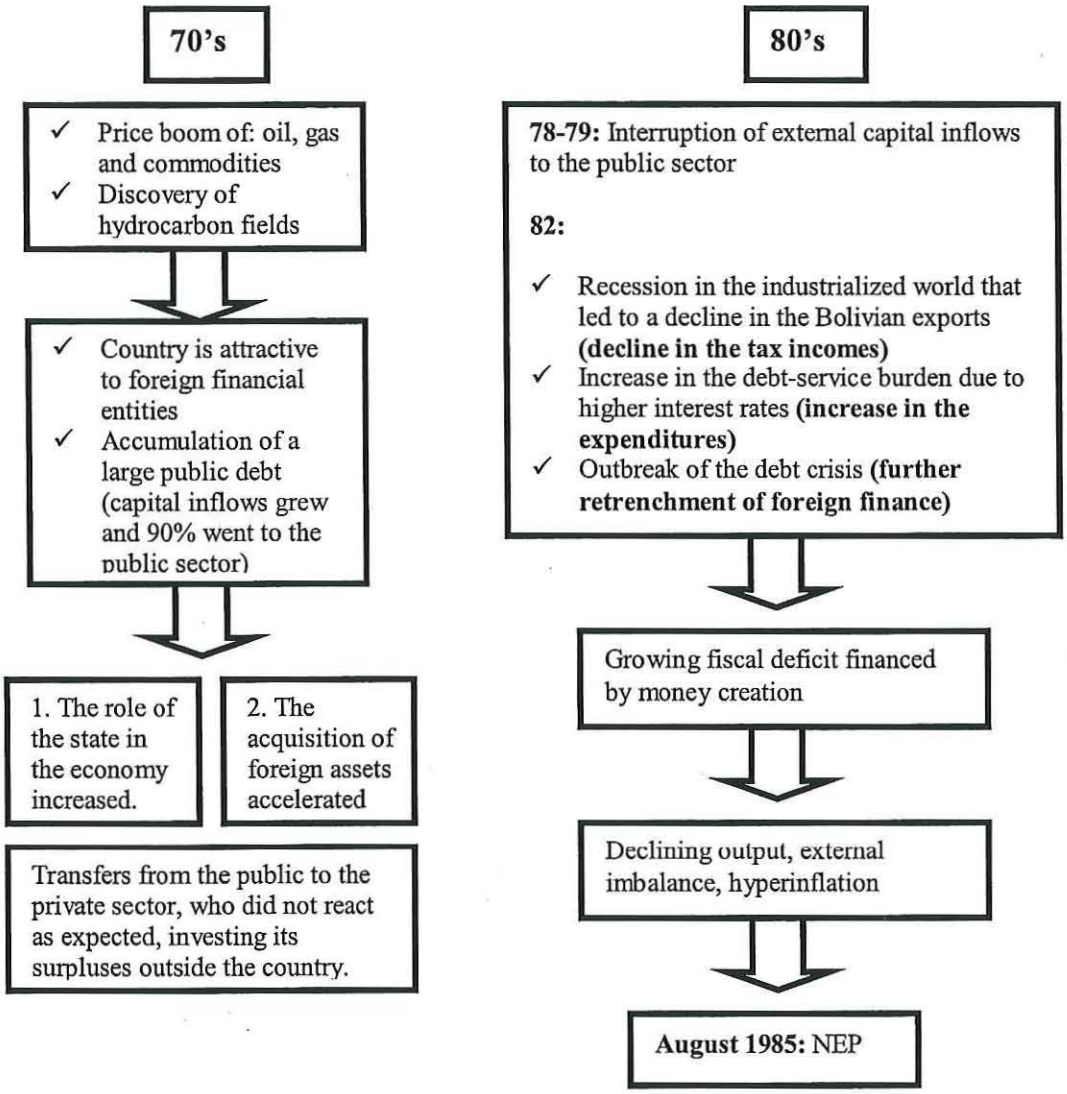
ANNEX A



Source: Jemio (1993), Author's elaboration.

ANNEX B

TABLE B.1

CAN'S EXPORTS OF SOJA

	1990	1991	1992	1993	1994	1995	1996	1997
Colombia	3.94%	53.62%	45.53%	50.88%	53.00%	50.33%	68.06%	54.12%
Ecuador	0.00%	1.08%	4.24%	5.50%	3.79%	3.83%	3.03%	1.54%
Peru	96.06%	45.30%	50.24%	43.63%	42.60%	41.22%	28.91%	44.04%
Venezuela	0.00%	0.00%	0.00%	0.00%	0.60%	4.62%	0.00%	0.31%

	1998	1999	2000	2001	2002	2003	2004	Average
Colombia	50.40%	79.97%	73.56%	59.43%	38.73%	37.91%	23.61%	49.05%
Ecuador	10.04%	3.31%	1.42%	2.40%	0.42%	3.09%	0.75%	2.78%
Peru	37.41%	12.77%	7.89%	6.45%	8.19%	10.76%	14.43%	20.80%
Venezuela	2.15%	3.95%	17.13%	31.72%	52.66%	48.23%	61.22%	41.34%

Source: INE
Author's Elaboration

ANNEX C

TABLE C.1

DESCRIPTION OF THE VARIABLES*

Variable	Description	Source	Construction/notes
EX	Quantum Index of Non Traditional Exports (Expressed in $us)	INE	2000=100
EP	Unit Value Index of Non Traditional Exports (Expressed in $us)	INE	2000=100
CP	Competitor's Price - based on Consumer Price Index of Peru, Indonesia, Colombia, France, Brazil, Argentina and Ecuador (expressed in $us)	IFS	Consumer Price Indexes weighted according to market share in the USA, stage of development and distance from Bolivia (more weight was given to the neighbor countries and also to those that have similar stage of development). The items considered for the market share were the three major commodities exported to this market: jewerly, wood and articles of wood, and apparel articles and accesories. 2000=100
USI	Industrial Production Index of United States ($us)	IFS	2000=100
DP	Domestic Price, based on the Consumer Price Index (Expressed in $us)	IFS	2000=100
INTEREST	Effective interest rate for loans	SBEF	
LWAGE	Public sector wage index (Expressed in $us)	INE, UDAPE	Quarterly data was available only from 1996 to 2004, but anual data was available since 1990. Following Mahía (2001), and based on the assumption that the average yearly data represented the data of the fourth quarter , the anual data was transformed into quarterly data through two methods. First, the absolute rate of growth inter 4th quarters was found, then it was divided by 4 and added in each quarter. Second, the relative rate of growth inter 4th quarters was found and it was distributed among the four quarters. Additionally, as the 1996-2004 series were not seasonally adjusted, their seasonal component was found (see regression) and the mean of the four coefficients calculated. Subtracting each coefficient from this mean and adding this results to the 1990-1995 period allowed us to incorporate the seasonal component in our series. It is important to remark that the data calculated through the second method was the one that was actually used in the estimations altough it was quite similar to the one obtained trough the first methodology. 2000=100
GDPBOL	Quarterly Gross Domestic Product of Bolivia	INE	(Million $us of 2000)

INE: National Institute of Statistics
IFS: International Financial Statistics (IMF)
UDAPE: Unit of Social and Economic Policy Analysis
SBEF: Banks and Financial Entities' Superintendence
Author's Elaboration
*These variables (with exception of the interest rate) were transformed into logarithms for estimation purposes.

TABLE C.2

SEASONAL COMPONENT OF QUARTERLY WAGES

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@SEAS(1)	113.77170	12.21669	9.31281	0.00000
@SEAS(2)	114.55150	12.18218	9.40321	0.00000
@SEAS(3)	113.71370	12.20202	9.31925	0.00000
@SEAS(4)	113.62770	12.27103	9.25983	0.00000
@TREND(1996:1	1.56134	0.47283	3.30209	0.00260
AR(1)	0.84373	0.12551	6.72218	0.00000
N =	35	R-squared =		0.980432
LM test (1) Prob =	0.815959	Adjusted R-squared =		0.977059

ANNEX D

UNIT ROOT TESTS, SELECTING THE ORDER OF VAR MODEL AND COINTEGRATION TESTS

Criteria used for selection of components employed in the ADF test:

1. If Mean (X_t) = 0 and Mean (ΔX_t) = 0 then perform the test without constant and trend.
2. If Mean (X_t) $\neq 0$ and Mean (ΔX_t) = 0 then perform the test without trend but including a constant.
3. If mean (X_t) $\neq 0$ and Mean (ΔX_t) $\neq 0$ then perform the test including constant and trend.

TABLE D.1

Variable Xt	Mean Xt	Probability	Mean Δ Xt	Probability	Components to include
lcp	4.60170	0.00000	0.02924	0.00350	Constant and trend
ldp	4.20707	0.00000	0.03410	0.00000	Constant and trend
lep	4.50848	0.00000	0.01472	0.00000	Constant and trend
lex	4.16397	0.00000	0.03828	0.29780	Constant
interest	16.08750	0.00000	-0.24509	0.01680	Constant and trend
lusi	4.42374	0.00000	0.00699	0.00010	Constant and trend
lwage	4.46154	0.00000	0.02034	0.00020	Constant and trend
lgdpbol	7.72	0.00000	-0.00640	0.53650	Constant

LEX: Volume of Exports, **LEP:** Exports' Price, **LCP:** competitors' prices, **LUSI:** level of economic activity in the exporting markets, **LDP:** domestic price, **LWAGE:** cost of labor, **LGDPBOL:** proxy for capacity utilization and productivity change, **INTEREST:** capital cost.

ANNEX E
THE ORDER AND RANK CONDITIONS[66]

$$LEX_t = \theta_0 + \theta_1 LEP_t + \theta_2 LDP_t + \theta_3 LGDPBOL_t + \theta_4 LWAGE_{t-1} + \theta_5 INTEREST_{t-1} + \theta_6 LEX_{t-1} \quad (1)$$

$$LEP_t = \gamma_0 + \gamma_1 LEX_t + \gamma_2 LCP_t + \gamma_3 LUSI_t + \gamma_4 LEP_{t-1} \quad (2)$$

Order Condition: Let g be the number of endogenous variables in the system and k the total number of variables (endogenous and exogenous) missing from the equation under consideration. Then:

1. If k = g-1, the equation is exactly identified.
2. If k > g-1, the equation is over-identified.
3. If k < g-1, the equation is under-identified.

Equation 1: g = 2 and k = 3, then this equation is over-identified.
Equation 2: g = 2 and k = 5, then this equation is over-identified.

Rank Condition:

Equation	ENDOGENOUS		EXOGENOUS							
	LEX	LEP	LDP	LGDPBOL	LWAGE	INTEREST	LEX(-1)	LCP	LUSI	LEP(-1)
1	X	X	X	X	X	X	X	0	0	0
2	X	X	0	0	0	0	0	X	X	X

Mark with a cross X if a variable occurs in an equation, and a 0 if not

Where: **LEX:** Volume of Exports, **LEP:** Exports' Price, **LCP:** competitors' prices, **LUSI:** level of economic activity in the exporting markets, **LDP:** domestic price, **LWAGE:** cost of labor, **LGDPBOL:** proxy for capacity utilization and productivity change, **INTEREST:** capital cost.

Rule for identification:

1. Delete the particular row
2. Pick up the columns corresponding to the elements that have zeros in that row.
3. If from this array of columns we can find (g-1) rows and columns that are not all zeros, then the equation is identified. Otherwise, not.

Both equations are found to be identified hence we can proceed with their estimation.

[66] Maddala (1988).