AGRICULTURAL EXPORTS AND ECONOMIC DEVELOPMENT IN COSTA RICA, 1973-1993

By

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CHAPTER I

INTRODUCTION

Costa Rica is a small open economy located in Central America, with a population of approximately three million and an area of twenty six thousand square miles. Costa Rica is a developing country in which the main economic activity is agriculture. As in many developing countries, Costa Rica has suffered from both a fiscal deficit, and a balance of trade deficit for many years. As a result of these deficits, the former of approximately 3.5% of Gross Domestic Product and the latter of about $300 million per year, the annual inflation rate has been around 20%, and the private sector has not been able to play an active role in the financial markets with the consistent negative influence on production.

Costa Rica Macroeconomic Background

In 1981-1982 the major economic crisis happened. Over this twenty-four months period, the Gross Domestic Product declined 10% in real terms and more than 15% in per capita real terms, inflation reached 82% in 1982, and a currency devaluation was 153% in 1981. This economic crisis was the result of problems that were already present since the middle of the 1970's.

During the 1970's two factors determined the development of the Costa Rican economy. On the one hand, in 1977 the increase in the international price of coffee, the main Costa Rican export, offset the negative impact of the increase in the price of oil. On the other hand, the availability of financial resources in the international market allowed Costa Rica to borrow money to finance the deficit in the balance of payments which was reflected on a continuous loss of international monetary reserves. During the same decade the Costa Rican central government grew to a size out of proportion with the economy becoming the largest employer in the nation. The creation of state owned enterprises contributed to an increase in the fiscal deficit as well as to the high inefficiency in the rest of the public sector. In the same way, the easy availability of financial resources in the international markets allowed the central government to finance its deficit.

Historically, the Central Government has financed its fiscal deficit in three different ways. Those are by selling fiscal bonds in the financial markets, by borrowing money from the Central Bank (i.e., by creating high-powered money), and by increasing some specific taxes such as income and sales tax. As a result of the combination of these three financing methods, high interest rates have not allowed the private sector to invest enough resources to increase production.

In addition, the fiscal deficit generates two important effects on the external sector. Initially, given the high internal rate of inflation, imported goods become cheaper relative to those produced domestically, stimulating the demand for the former. Moreover, this is reflected in an average deficit of the balance of trade of about $300 million during the last 17 years. Second, adjustments in the nominal exchange rate have not been enough to keep

the parity power of the Costa Rican colon to the U.S. dollar, a fact that is supported by the International Financial Statistics of the International Monetary Fund.

It is important to mention that during the 1970's Costa Rica had a fixed exchange rate. However, in 1979-1980 relations between Costa Rica and the International Monetary Fund broke down resulting in a dramatic reduction of financial resources in the international markets for Costa Rica. New loans were difficult to obtain. Shortly after that and as a main part of the adjustment process the Central Bank devaluated the colon in order to reestablish the international competitiveness of Costa Rican exports, and to avoid further complications not only in the balance of trade but also in the balance of payments. This process of devaluations in the early 1980's was later changed to a minidevaluation process which still continues.

In the 1980's the Costa Rican government with the cooperation of the World Bank established two Structural Adjustment Programs not only to reduce the problems in the external sector but also to reduce the size and to increase the efficiency of the public sector.

The first Structural Adjustment Program took place in 1985 and was mainly oriented to the external sector. Some of the changes proposed in this program were:

- Changes in external commercial policy, in order to increase exports of new products to new markets,
- Increase agricultural production,
- Reduction of government expenditures, and
- Control over the external debt.

However, the most important achievement of this program was to stimulate the production of new tradable goods through the export promoting policy and the reduction of protection rates. Before these changes were proposed Costa Rica had a production structure oriented towards import substitution, with high rates of both nominal and effective protection.

According to Hallaeur, the specific strategies used to promote the production of new export to new markets were tax concessions, "industrial contracts," drawback systems, free-trade zones, bureaucratic facilitation, and increased attention to publicizing and to marketing.

Tax concessions were established by three different methods. Tax Credit Certificates (CAT, Certificado de Abono Tributario), Export Increment Certificate (CIEX Certificado de Incremento a las Exportaciones), and Industrial Contracts.

Hallauer states that drawback system are firms that import semifinished materials into Costa Rica and add value to produce a finished good for reexport. The main benefit is a duty-free import of the materials to be used in the manufacturing of the finished good.

The second Structural Adjustment Program was approved in 1988 and the more important changes included in that opportunity were:

- Reduction in the nominal and effective rates of protection,
- Increased efficiency of the financial system,
- Increased efficiency of the public sector, and
- A new policy with regard to the determination of domestic agricultural prices.

In summary, the introduction of Costa Rica in the international markets with new export commodities, the modernization of the financial system, the reduction of the public sector, and the increase in efficiency of the public sector, have been the goals of the structural adjustment process. A change from the import substitution structure to the export promoting system has been the way to achieve economic growth. However, the process of stimulating the rate of growth of the economy has been difficult. For instance, in 1993 the per capita real income in Costa Rica was just equal to the same figure in 1979.

González and Camacho (1990), state that contrary to what was believed many years ago, experience has proven that those economies that follow export promoting policies are able to reach higher rates of economic development. Therefore, economic growth of small open economies like Costa Rica relies heavily on developing the export sector, which creates the resources to stimulate growth in the whole economy, as Export Base Theory states. In other words, to achieve economic growth is difficult if there is little growth in those sectors that provide most of the exports, which in the case of Costa Rica is the agricultural sector.

With regard to this particular matter, in the last two decades the agricultural sector in Costa Rica has accounted for 20% of Gross Domestic Product; however, the value of traditional exports which come from the agricultural sector has declined from 64% in 1977 to 40% in 1992 as a proportion of total exports. On the other hand, nontraditional exports have come mainly from the industrial sector, indicating a bias in the competitiveness of Costa Rican exports, in recent years, in favor of industrial commodities.

Previous studies for large economies like the United States, Australia, Japan, etc., which relate macroeconomic variables with the agricultural sector, in particular effects of the exchange rate on agricultural exports, like Schuh , Krueger et al, Chambers and Just, Belongia, Dwyer and Phillip, etc., have reached differing conclusions. On the one hand, Schuh, and Krueger et al, argue that overvaluation of the exchange rate reduces agricultural production since overvaluation acts like an export tax. On the other hand, Dwyer and Phillip, Belongia, and others argue that devaluation can only cause portfolio adjustments in the long run but can not change the balance of trade. This last argument is called the neutrality of money, and it is based on the law of one price, which says that all prices adjust by the same amount, leaving relative prices unchanged. Balassa, Michaely, and Kavoussi argue that there is a positive relationship between exports and economic growth for most of the less developed countries.

The motivation of this research is to determine, with the use of a model of two equations, how changes in macroeconomic conditions and in general macroeconomic policies relate to the growth of the agricultural export sector and to overall economic growth, based on the case study of Costa Rica for the period 1973-1993. Furthermore, this research is supported not only by the fact that some controversy exists about how devaluation of the currency affects the agricultural sector, but also because it is important for Costa Rica to develop a stronger agricultural sector to stimulate economic growth, which is defined as an increase in the real Gross Domestic Product.

This study is divided into five chapters besides the introduction. In the second chapter a literature review is presented based upon previous studies that relate, on the one

hand, agricultural exports and the exchange rate, and on the other hand, export growth and economic growth. The third chapter presents some microeconomic and macroeconomic theory that is relevant for the purpose of this study, i.e. supply, demand, excess demand and excess supply theory. In addition, two theories of economic growth are presented, Import Substitution, and Export-Led Growth. In the fourth chapter, a model of two equations is developed for the purpose of this research. Data used for the estimation of the model is presented as well. The fifth chapter is the empirical results chapter and it summarizes the results of the model estimation using three stage least squares. The final chapter concludes this study.

CHAPTER II

LITERATURE REVIEW

In this chapter two major fields of economic theory are discussed, based on previous literature. In the first part, those articles that explain the macroeconomic relationship between the exchange rate and exports, specifically those that deal with agricultural exports are reviewed. In the second part, the relationship between export growth and economic growth, is reviewed as addressed by the salient research in this area.

Relationship Between the Exchange Rate and Agricultural Exports

Previous studies for large economies like the United States, Australia, Japan, etc., relating macroeconomic variables with the agricultural sector, in particular the effects of the exchange rate on agricultural exports, like Schuh , Krueger et al, Chambers and Just, Belongia, Dwyer and Phillip, etc., have reached differing conclusions. On the one hand, Schuh, and Krueger et al, argue that overvaluation of the exchange rate reduces agricultural production since overvaluation acts like an export tax. On the other hand, Dwyer and Phillip, Belongia, and some others argue that devaluation only causes portfolio adjustments in the long run but does not change the balance of trade. This last argument is called the neutrality of money, and it is based on the law of one price, which says that all

prices adjust by the same amount, leaving relative prices unchanged and no real effects on the economy.

In a more general sense, Schuh, Krueger et al, and Cleaver agree that the most common reasons for inefficiencies in the agricultural sector are: encouraging industrial growth through policies of import substitution, high protective tariffs, export taxes, overvalued exchange rates, and credit and fiscal policies to stimulate industrial development. In addition, the same authors agree that the most important of all these elements is an overvalued exchange rate, because it acts like an export tax and promotes import substitution. To illustrate this point Fisher (p.118) states "If a devaluation makes home goods cheaper relative to traded goods, the demand for home goods rises. Producers, however, want to shift toward the production of traded goods. To ensure that resources are freed to produce traded goods, the government must reduce the overall level of demand in the economy to offset the expansionary effect of the increase in the demand for home goods." Furthermore, in the same reference (p.120) the author mentions "To be effective, a devaluation should be accompanied by monetary and fiscal measures. Contractionary monetary or credit policies can squeeze domestic demand and free resources for production of traded goods."

In their empirical studies for large economies, Chambers and Just, Henneberry et al, and Dornbusch, state that overvalued exchange rates will reduce exports of agricultural commodities because it increases the relative prices of exports. In the same sense, Dwyer and Phillip, and Johnson et al, argue that even though the exchange rate can affect agricultural exports, other factors like price flexibility in different markets have to be

included as determinants of the changes in agricultural exports. However, contrary to this hypothesis, Belongia, Reed, Belongia and Hafer, and Gennes et al, indicate that changes in monetary variables only cause portfolio adjustments but no real effects on inventories.

Therefore, in order to better understand this relationship, it is important to take a closer look at empirical studies in the area of exchange rates and agricultural exports..

One of the most relevant studies in this field is Chambers and Just (1981) which analyzes the effects of exchange rate changes on U.S. agriculture, finding that changes in the exchange rate do have real effects on agriculture. Furthermore, Chambers and Just (p.33) state "By and large, the results indicate that devaluations of the early 1970s had extremely important effects on agricultural exports and prices as well as on domestic disappearance and inventory accumulation. Interestingly, however, the short-run effects are more dramatic than the long-run effects. The results also suggest that monetary factors in general, such as money supply control, can have significant effects on agriculture through the exchange rate." This last point is supported by Schuh, as well.

Nevertheless, contrary to their finding, Chambers and Just state that the effectiveness of devaluation as a policy tool has been questioned by the monetarist school of thought which argues (p.32) "devaluation can have only monetary effects, in which case a devaluation likely causes portfolio adjustments but is unlikely to affect seriously the trade balance."

In opposition to the findings of Chambers and Just, and Schuh; Reed (1980) argues that "In the short-run an exchange rate change may be viewed as a more permanent development than a change in the world price", which implies that real adjustments exist in

the short-run; however, the same author argues that in the long run the effect on the exchange rate is compensated by price movements which leads to a zero real effect in the long-run.

Other criticisms, like Belongia, are found in the literature. Belongia argues that the previous evidence, found by Chambers and Just, linking monetary policy and the agricultural sector are based on inappropriate applications of static comparisons to problems of dynamic adjustments.

In addition, Belongia and Hafer conducted a study based on the Business Cycle Theory. The model used by these authors estimate whether or not the rate of growth for each sector in the economy is equal to the rate of growth of the Gross National Product. In other words, they are testing whether the coefficients relating growth between sectors and Gross National Product are equal to one. If this is true then policy has no different effects for each sector; otherwise policy will be non-neutral, which means coefficients different than one. They conclude that the agricultural sector does not follow a cyclical Gross National Product path, hence, changes in macroeconomic policy variables do not affect real farm output. Moreover, they argue that coefficients relating Gross National Product and sectoral growth are close enough to zero for the agricultural sector, which is definitely opposed to the Chambers and Just, Schuh, and Krueger results.

Finally, a unique criticism made by Grennes et al, to Chambers and Just is based on a statement made by the latter where (p.250) "They deny that there are theoretical reasons to expect prices to rise by no more than the devaluation. At the same time they accept the so-called law of one price, which states that the domestic currency price (p) of a traded

good will equal the domestic currency equivalent price (ey) of the same product abroad, where e is the price of domestic currency in terms of foreign currency, and (y) is the foreign currency price of the traded product.", which implies that the devaluation has no real effects on the amount demanded for the traded good since the price of traded goods will rise by the same amount the exchange rate was devaluated.

Three more empirical studies will be presented to support this research. In the first study, Henneberry et al (1987), developed an analysis of the exchange rate and its impact on U.S. exports of wheat, corn, and soybeans, based on, Paasche, Laspeyres and Fischer Ideal Indexes for the 1970's and 1980's. Theoretical differences in the nominal and real exchange rate are relevant in the study, because the real exchange rate dictates the trend in the export supply, not the nominal one, as the authors state. Basic results suggest that in the 1970's the exchange rate depreciated both in nominal and real terms, which resulted in an increase in exports of corn, wheat, and soybeans. However, for the 1980's, the nominal exchange rate depreciated; although the real exchange rate appreciated and exports fell as a result.

In the second study, Dwyer and Phillip (1991), analyze the macroeconomic theory of non-neutrality of money and its impact on flexible and fixed price markets. The empirical applications are done for the case of Australia.

The authors conclude that in the short-run monetary policy has effects on the economy, though this is not always true in the long run. They say (p.122) "the degree to which monetary expansion has differential price effects and hence alters competitiveness, depends upon the degree of price flexibility in different markets, that is, goods, labor,

assets, and exchange rates." These results are contradictory to what Dornbusch and Fischer have said about the effect of monetary shocks, that is, an increase in monetary supply will stimulate exports due to a depreciation in the exchange rate.

The third study is that of Johnson, Grennes and Thursby (1977). In that paper the authors go beyond those analysis which only include the exchange rate as an explanatory variable of exports. Their hypothesis says that changes in exports of wheat are due not only to changes in the real exchange rate but also to changes in tariffs, export taxes, and transport costs. Final remarks in the analysis conclude that (p.623) "dollar devaluation contributed to the rise in the U.S. domestic wheat price in 1973-74. This monetary effect should not be ignored but neither should be exaggerated." In reality the complexity of economic variables determination makes one think that other elements have impacts of the same magnitude as the exchange rate does, such as, transportation costs, and trade barriers.

The macroeconomic theory that is relevant for the purpose of this research has been addressed. In a broad sense one would expect that any macroeconomic change that produces an overvaluation of the exchange rate will lead to a decrease not only in export revenues but also in economic growth or in economic development. However, Webb and Fackler, in a study done for Costa Rica state that the purchasing power parity nominal exchange rate is the price of dollars in terms of colones multiplied by the ratio of the U.S. to Costa Rican Gross Domestic Product deflator. In addition, changes in the purchasing power parity nominal exchange rate measure aggregate changes in world prices relative to Costa Rican prices, with U.S. prices proxing for world prices. An increase in the

purchasing power parity nominal exchange rate may be expected to increase exports to the North, South, and Central American Common Market. However, if the behavior of prices and exchange rates in the South and Central American Common Market are closer to those of Costa Rica than to the U.S. then the estimated relationship between the purchasing power parity nominal exchange rate and Costa Rican exports to those destinations may be negative.

The relationship between export growth and economic growth.

Economic development theories like the Export Base Theory state that the growth of any economy depends upon its capacity to stimulate the export sector. In the same respect, Schuh (1976, p.802) argues that "the contribution of agriculture in the past consisted primarily of furnishing abundant supplies of food to the domestic economy at constant or declining real prices, releasing large numbers of workers to man an ever expanding nonfarm sector, and supplying of large amounts of capital for the development of the rest of the economy".

In addition, Schuh (1976) states "that the problem of agricultural development is not a problem of increasing output but a problem of increasing per capita income of those working in the agricultural sector".

For the purpose of this study, economic development can be defined as an increase in the real Gross Domestic Product, as authors like Michaely, Balassa, and Kavoussi do. Furthermore, a positive relationship between exports and economic growth is generally assumed, i.e. if real exports earnings increase then society is better off.

A pioneering study in the field of exports and economic growth is that of Michael Michaely. His hypothesis is that rapid export growth accelerates the economy's growth. Moreover, he argues that previous studies which have found these two variables to be significantly correlated present a shortcoming because, (p.49) "they correlate growth, measured by change in the national product with the change in exports. Since exports are themselves part of the national product, an autocorrelation is present; and a positive autocorrelation of the two variables is almost inevitable, whatever their true relationship to each other." In other words, none of these studies were done properly according to Michaely.

A new approach is presented by Michaely though, where he argues (p.50) "To be meaningful, the variable used to represent export performance must indicate the extent of export bias; that is, it must refer not to the absolute level of exports but to the portion of exports in the product." In addition, in the same reference "the rate of expansion of exports is represented by the rate of change of the proportion of exports in the national product, whereas the growth rate is represented by the rate of change of per capita product."

Finally, a basic result of his study for 41 less developed countries provides him support for the hypothesis that export growth leads to economic growth.

In another study, Balassa measures effects of exports on economic growth in eleven countries which have already established an industrial base. Although the hypothesis is similar to the one tested by Michaely, it differs in the sense that it tests whether export oriented policies lead to better growth performance than policies favoring

import substitution. This may be true because export oriented policies lead to resource allocation according to comparative advantage, taking advantage of economies of scale, and technological improvements. In the author's words, (p.181) "After the "easy" stage of import substitution is over, substituting domestic product for imports entails rising costs due to loss of economies of scale in small national markets and the relatively capital intensive nature of the products involved."

As a support to Michaely's findings, Balassa argues that the effects of exports on economic growth can be divided between direct and indirect effects. The first one is the simple relation that exports are themselves a part of the Gross Domestic Product. The second relationship reflects the fact that the indirect effects are measured when export growth and growth of the Gross Domestic Product net of exports are correlated. Balassa says (p.182) "In an intercountry context, the correlation between export growth and growth of Gross National Product net of exports may be taken to reflect the indirect effects of exports operating through changes in income and costs. In turn, the correlation between export growth and Gross National Product growth will provide an indication of the total effects of exports on economic growth."

Finally, general results from this study suggest evidence on the benefits of export orientation as compared to policies oriented towards import substitution. At the same time, the empirical results tend to underestimate the effects of export growth on the growth of Gross National Product, since the method does not take account of the implications of export growth for other variables.

Kavoussi, in a very interesting approach studies the relationship between exports and economic growth. The argument of his research is that export expansion contributes to economic growth by increasing the rate of capital formation and enhancing the growth of factor productivity.

According to Kavoussi, two approaches have been used to study this macroeconomic relation, (p.241) "A number of case studies have examined the effects of trade strategies on the economic performance of individual countries and have analyzed extensively the consequences of policies biased in favor or against exports. Other studies have used intercountry statistical comparisons to investigate the relationship between export expansion and economic growth." This study investigates whether this relation is affected by the level of economic development already achieved and the commodity composition of exports.

The sample is of 73 countries divided in groups of low and middle income countries. Moreover, since no previous study was concerned with the composition of exports, he determines the composition of exports by omitting from both groups of less and more advanced developing countries those where manufactured goods are at least forty-four percent of total exports in the year 1978. In other words, the remaining countries are predominantly exporters of primary products, which is the main concern of this research.

Basic results suggest that in low-income countries the expansion of primary exports is strongly associated with economic growth. In addition, for middle-income

countries, exports of manufactured goods tend to strengthen the association between export expansion and economic performance.

Some other results imply that in less advanced countries export expansion enhances the growth of total factor productivity regardless of the composition of exports. On the other hand, in the sample of middle-income countries results seem to indicate that the effect of export expansion on the growth of total factor productivity is very sensitive to the share of manufactured goods in total exports. If a country continues to depend completely on exports of primary commodities, as it reaches higher income levels the positive impact of export expansion on factor productivity practically disappears. Moreover, if it is able to shift to exports of manufactured products, the favorable effects of exports on productivity will be enhanced considerably, as stated by Kavoussi.

The final topic in this chapter deals with the empirical results identifying causality between exports and economic growth. All previous studies that relate exports and economic growth have assumed that exports generate growth, but none of them have tested for causality in the opposite direction.

Ni Sung-Shen et al, conclude based on the cases of Japan, South Korea, and Taiwan, that the casual link between export promotion and economic development is neither straightforward nor universal. They argue that the relation among them operates through a variety of channels, which are generally inter-mixed, and depends on the special features of the economy and the development strategy followed by each country. In addition, they criticize the studies by Michaely, Balassa, and Kavoussi, because they did not prove causality between exports and economic growth.

Furthermore, they provide some demand and supply foundation by saying (pp.58-59) "Theoretically, export expansion helps economic growth both from the demand side and from the supply side. The demand side effect is generated in the presence of excess capacity and unemployed labor in the economy where aggregate production is demand-determined. Export-promoting policies lead to an increase in the aggregate demand, which causes an improvement in the rate of capacity utilization and a reduction in unemployment. As a result, the aggregate output expands."

On the other hand, in the same reference (p.59) "The supply side effect works through two channels. One is that the supply bottlenecks caused by relative scarcity of capital and imported raw materials in less developed countries may be relaxed through the loosening of the foreign exchange constraint because of the export promotion. The other is that the diversion of resources from the nonexport sector to the export sector may improve the overall productivity of the economy. Higher factor productivity in the export sector, economies of scale, and externalities due to learning effect and spin-off effect are the reasons why export promotion may lead to overall productivity improvement. From a different point of view, it is quite plausible that the expansion of domestic production causes an increase in the exports of a country. An unbalanced growth strategy in a small open economy generally directs the causal effect from output growth to export expansion. The rate of growth of domestic demand for a product is determined by its income elasticity of demand and the rate of growth of domestic income. If the income growth is highly concentrated in a few sectors with income elasticities less than one, the domestic supply of the expanding products will exceed their domestic demand. As a small open

economy, it will be no problem for the country to sell the excess supply in the world market. Again, economic growth in a highly specialized country with a high degree of openness means that its exportable sector expands and export growth is the inevitable consequence of economic growth. However, if the nontraded sector expands faster than the traded sector, the increase in the domestic consumption of the exportable goods may lead to a decline in the exports of a country."

Finally, Woo and Marshall test for causality between exports and economic growth in 37 developing countries by using the Granger causality test. Although, the results are not conclusive for most of the 37 countries in the sample, they argue that for the case of Costa Rica an export promotion hypothesis has some support. They mention that for Costa Rica the statement that export growth causes output growth is statistically supported and the sum of export growth coefficients is significantly positive in the output growth regression. However, one important consideration here is that in general the results presented by Woo and Marshall for most of the 37 countries are contrary to those found by Michaely, Balassa, and Kavoussi, where the latter conclude that exports generate growth.

In order to explain these difference they mention that most of the other studies were international cross-section regressions, while the tests here are based on the comparison of each individual country's time series.

Finally, a recommendation made by Woo and Marshall is that in general there is a lack of support for the export promoting hypothesis, which places doubt on the efficacy of policies designed to enhance development by promoting the export sector.

CHAPTER III

THEORY

This chapter presents relevant microeconomic and macroeconomic theory which relates agricultural export growth and economic growth. The microeconomic theory considered in this chapter involves demand and supply theory, which is required to develop excess supply and excess demand theory. Macroeconomic theory will consider the determination of exchange rates, economic growth theory, and basic macroeconomic relations that will allow us to understand the implications of agricultural growth on economic growth. Exchange rates and economic growth are key parts in the macroeconomic theory section. As a result, in the first part of the chapter microeconomic theory will be discussed, leaving macroeconomic theory to the end of the chapter.

Microeconomic Background

This section is not intended to present a complete description of supply and demand theory. However, basic concepts and assumptions about demand and supply theory are presented.

For the purpose of this research the main assumption is that Costa Rican exports are ruled by a perfectly competitive market structure. This is based on the fact that Costa

Rica is a small open economy, without power in the world market to influence prices. In addition, a long run analysis is required since the period of study is from 1973 to 1993, implying that all factors of production are variable.

Assuming that producers of agricultural exports in Costa Rica are rational implies that producers want to maximize profit or minimize cost given the prices of the inputs used in the production of export goods. To illustrate, and for simplicity of the analysis, assume that only two factors of production are used, i.e. capital and labor. The conclusions for the two factors model can be easily extended to a more general case where more than two factors are used.

In the long run producers produce any specific amount of output using different production techniques where each technique requires different combinations of capital and labor. To represent all these different combinations an isoquant map can be defined, where an isoquant is any combination of inputs that yields the same amount of output. Moreover, several assumptions about isoquants need to be stated. In the first place no intersection between isoquants is allowed, meaning that a higher isoquant implies higher output. Furthermore, the marginal rate of technical substitution is decreasing in absolute terms, making isoquants convex to the origin. The marginal rate of technical substitution is the rate at which one factor is substituted for the other leaving the amount of output unchanged. Finally, decreasing returns to scale are assumed.

In the cost side, producers are assumed to have no power to affect the price of inputs used on the production of tradable goods. Total cost is the sum of the price of each input times the quantity of input used. Since it was assumed that producers are rational,

they will combine resources in order to minimize costs for a given level of output which is defined by the isoquant map. The dual approach is to maximize output for a given initial cost. To fulfill either one of these approaches the marginal rate of technical substitution must be equal to the price ratio of capital to labor.

A profit maximization function is defined as follows, where total revenue is equal to the price of the good times its quantity minus total costs. Quantity is defined as the production function q = f(K,L). Producers will produce where the marginal cost of the last unit of output is equal to the marginal revenue of the same last unit; i.e. when the first order conditions are met.

The profit maximization function is:

$$\pi(K,L) = Pf(K,L) - (vK + wL)$$

where:

K : capital,

L : labor

v : price of capital,

w : price of labor.

The first order conditions are:

$$\frac{\partial \pi}{\partial K} = P\frac{\partial f}{\partial K} - v = 0$$

$$\frac{\partial \pi}{\partial L} = P\frac{\partial f}{\partial L} - w = 0$$

Finally, second order conditions require that the second derivative of the profit function with respect to each factor has to be negative.

From an initial equilibrium situation, assuming everything is held constant, changes in the price of the export goods imply an increase in the quantity supplied. This is true because an increase in the price of the export good implies that firms are getting more than economic profits, creating an incentive for new firms to enter the market until economic profits are zero again. However, compared to the initial situation, the market has now more firms than before, supplying as a whole a higher level of output. As a result, an upward sloping supply curve is defined. For a thorough description refer to Varian or Nicholson.

On the demand side and for the purpose of illustration only two goods are assumed. As done before for the producer, an indifference curve map is defined where each indifference curve represents all the possible combinations of any two goods that yield the same level of utility or satisfaction. Higher isoquants mean higher utility levels. Moreover, no intersection between isoquants is allowed. The marginal rate of substitution defines how consumers substitute goods in order to keep the same level of utility, in other words, it measures how many units of one good an individual has to give up to get an extra unit of the other good. The marginal rate of substitution is decreasing in absolute terms since decreasing marginal utility is assumed. As a result, indifference curves are convex to the origin. Finally, the objective of consumers is to maximize utility given a budget constraint. The dual approach is to minimize cost given a specific utility level. According to microeconomic theory, equilibrium will be achieved when the price ratio of consumption goods is equal to the marginal rate of substitution of the same goods. An

utility maximization function is defined as follows, where equilibrium is achieved when the first order conditions are met.

$$L = U(X_1, X_2) + \lambda(I - P_1 X_1 - P_2 X_2)$$

where:

$U(X_1,X_2)$ is the utility function,

I = income level,

P_1 and P_2 = prices of good 1 and 2 respectively,

λ = is the Lagrangian multiplier.

First order conditions are:

$$\frac{\partial L}{\partial X_1} = \frac{\partial U}{\partial X_1} - \lambda P_1 = 0$$

$$\frac{\partial L}{\partial X_2} = \frac{\partial U}{\partial X_2} - \lambda P_2 = 0$$

$$\frac{\partial L}{\partial \lambda} = I - P_1 X_1 - P_2 X_2 = 0$$

Solving for the first order conditions implies that the marginal utility of the last dollar spent on each good must be equal. In addition, since diminishing marginal utility was assumed. The second order conditions are already met.

Now if it is assumed that everything is held constant, changes in the price of the good will imply that demand is inversely related to price for two different reasons, i.e. the substitution effect and income effect. For normal goods both effects will go in the same direction. In other words, an increase in the price of the good results in a decrease in the

quantity demanded. Therefore, demand for any good is assumed to be negatively sloped relative to own price changes. For further discussion refer to Varian or Nicholson.

In a broad sense both demand and supply functions have been defined. However, it is important to mention some of the effects in the demand and supply functions due to changes in the ceteris paribus conditions.

In general when any of the *ceteris paribus* conditions are changed, the demand or supply will be shifted either inward or outward, which means that for the same price level a different quantity will be supplied or demanded. Some of the most important shifters of supply are technology and the price of inputs. For demand, some of the most important shifters are income and the prices of other goods. No further detail in this particular matter is required for the purpose of this research.

Now that domestic demand and supply have been defined (and following McCalla), it is possible to define the excess supply function of exportable goods as follows. An excess supply function is the difference between domestic demand and domestic supply of any commodity that is exported to the rest of the world for those world prices that are higher than the domestic equilibrium price. The equilibrium price in the domestic country reflects the fact that domestic supply and demand are equal. Moreover, if one assumes that the world price of the exportable commodity is higher than the equilibrium domestic price, then the domestic country will be an exporter to the rest of the world. On the other hand, if the world price is lower than the domestic equilibrium price, then the country is defined as a net importer, creating an excess demand curve

instead of an excess supply curve. Furthermore, if no transportation costs are assumed then excess demand and excess supply are equal at the world price.

The slope of the domestic excess supply and the foreign excess demand functions will depend on the particular slopes of the domestic and foreign demand and supply functions. Therefore, for any price, the elasticities of the excess functions are a weighted sum of the elasticities of the parent functions as McCalla says.

If domestic demand in the exporting country is perfectly inelastic, the slope of the excess supply function is equal to the slope of the domestic supply function in absolute terms. In addition, as more countries are included in trade the slopes of the excess functions will increase implying a high price responsiveness of the aggregate functions in the world market.

Furthermore, for the specific case of a small open economy which exports in the world market, one can say that the excess demand function faced by that country is either perfect or highly elastic, which means that the world market will take whatever the country exports at one specific price.

Nevertheless, considerations about the macroeconomic impacts on the excess functions are also important. Two main mechanisms are mentioned by MaCalla. First, tight monetary policy will raise a country's interest rates, increasing production costs, which implies a possible change in composition of output. Second, macroeconomic policies of large countries have effects on other countries through world prices. In the last case, some of the most common instruments used to achieve policy goals are monetary policy, fiscal policy, and international trade policy through exchange rates.

The main concern of this research is with regard to the exchange rate and its implications on the excess supply of agricultural exports. Nevertheless, it is important to consider that monetary and fiscal policies, both at the national and international level, are also important in the determination of exports in a small open economy.

In the first instance, it is possible to define the nominal exchange rate as the number of units of local currency needed to buy one unit of foreign currency. Two different regimens of exchange rates exist: fixed and flexible. In the case where the nominal exchange rate is fixed, it means that the same amount of local currency is needed per unit of foreign currency no matter what the situation in the balance of payments is. In the other case the nominal exchange rate is flexible, meaning that the value of local currency in terms of foreign currency will be adjusted automatically as changes in the balance of payments occur. For instance, if the monetary international reserves of a country are declining then the nominal exchange rate will adjust upwards. Therefore, the exchange rate might express the relative competitiveness of any country compared to other countries. However, a better indicator for this purpose is the real exchange rate.

The real exchange rate is the value of the foreign currency in terms of domestic currency adjusted by the difference in inflation among those countries with whom the domestic country has international trade. To determine the real exchange rate the following formula defined by Dernburg is used,

$$RER = \frac{eP^*}{P}$$

where e is the nominal exchange rate in the domestic country related to foreign currency, P* is the price level in the foreign country, and P is the price level in the domestic country.

According to Mahdavi and Zhou (p.405) "The absolute version of the Purchasing Power Parity doctrine asserts that economic forces set the nominal exchange rate between currencies of two countries (defined as number of units of domestic currency per unit of foreign currency) equal to the ratio of domestic to foreign price level so that the price of a standard market basket of goods, when expressed in terms of a common currency, would be the same in the two countries."

Furthermore, the real exchange rate is at equilibrium when the demand for and supply of foreign currency are equal. In other words, there is no capital flow of foreign currency neither from the domestic country to other countries nor from the other countries to the domestic country. Otherwise, the real exchange rate will be either overvalued or undervalued.

If the real exchange rate is overvalued, it means that in real terms less domestic currency is given up for each unit of foreign currency compared to an equilibrium situation, or there is an increase in the price of domestic goods relative to the price of imported goods. In addition, a deterioration in the terms of trade of the domestic country has occurred.

According to Dornbusch, some of the effects of an overvaluation are a loss in external competitiveness leading to an increase in imports and a decrease of exports; a loss of domestic production, employment, and fiscal revenues due to the increase in imports

and the decrease in exports; an ultimate devaluation which comes from an external balance crisis; and finally, an adverse effect on domestic financial markets.

On the contrary, if the real exchange rate is undervalued, it means that in real terms more domestic currency is given up for each unit of foreign currency compared to an equilibrium situation, or there is a decrease in the price of domestic goods relative to the price of imported goods. In addition, an improvement in the terms of trade of the domestic country has occurred.

Nevertheless, in the case of an undervalued real exchange rate the effects are not completely clear. If used correctly, an undervaluation can create current account surpluses, which allow the country to build up international reserves, to pay off debts, and to invest more at home. On the other hand, if not used correctly, undervaluation can create capital exports harming domestic production.

So far, microeconomic theory has been discussed in order to develop supply and demand functions which later were combined into the excess demand and excess supply functions. In addition, basic concepts and definitions of real exchange rates were provided. The rest of the chapter will discuss some of the theoretical relationships between agriculture and economic growth, in the theoretical framework of Export-Led Growth and Import Substitution models.

Economic Growth Background

According to Reynolds, for most economic development models in the closed economy case, industry is the cutting edge of economic growth, while agriculture plays

the role of reservoir in terms of supplying food, labor, and finance to fuel the growth of urban activities.

With regard to this Reynolds stated two different scenarios to be considered. On the one hand, in an economy where agricultural output is not rising, the agricultural sector contains potential surpluses of labor, food output, and saving capacity requiring only appropriate public policies for their release. On the other hand, in an economy where agricultural output is being increased by a combination of investment and technical progress, part of the increment in farm output and income is available for transfer to nonagricultural uses.

To provide transfers of labor from agriculture to urban areas technical progress is required. This comes from the fact that migration from agriculture to urban areas implies a reduction in food production, because of diminishing returns in agriculture. In summary, agricultural labor can be transferred to other activities if there is enough food available.

In the same sense, the only way to make food available to transfer from rural to urban areas depends on the generation of new technology, because food consumption is already low at the farm level in most less developed countries.

Finally, capital transfers go from agriculture to industry in most economic development models. The common assumption of these models is that agricultural investment is not required anymore, because investment has already been pushed to the limit of profitability. However, Reynolds argues that changes in techniques require rising agricultural output per man and per acre, and this is where investment is needed in agriculture.

As a result, when building any economic development model, private investment, public investment, etc., should be considered as going back and forth between rural and urban areas simultaneously. Allocation of resources then goes according to the relative returns in each activity.

Reynolds states that for the open economy case Hla Myint says that the role of agriculture in overall economic growth can be seen in any of the following four ways. As providing foreign exchange through agricultural exports, contributing to domestic savings and capital formation, increasing domestic food supplies, and providing a growing market for domestic manufactures.

Among the many models of economic growth, Export-Led Growth and Import Substitution models are presented here to illustrate the point just mentioned in the last paragraph.

In the Export-Led Growth model two important considerations should be taken into account. On the one hand, is it possible for agricultural exports to increase without reducing the supply of food for domestic consumption. For that to be true, some assumptions are needed. First, agricultural exports come from production that is not used for food production. Second, there are unused land and labor, which can be used for the production of agricultural exports. Third, technical progress is presented when land becomes scarce.

On the other hand, the existence of international markets for agricultural exports may be uncertain, mainly because the markets increase too slowly and do not provide an adequate increase in foreign exchange availability, as Prebisch and Myrdal state in

Reynolds' book. In addition, the same authors argue that when countries push exports up there is a secular deterioration of the terms of trade. However, export performance should not be taken as exogenously given from developed countries, as Prebisch and Myrdal state. To determine the relationship between export performance and economic growth, Reynolds mentions that Irving Kravis developed a model in which the competitiveness of traditional agricultural exports and a diversification factor of traditional exports to nontraditional exports are related to good economic performance, showing that in some cases these two factors are the main reason for exports to grow.

Therefore, the basic logic of the Export-Led Growth model is as follows. Foreign exchange earned by agricultural exports is initially used to increase consumption of imported goods, later imports of capital goods and industrial materials rise. As Hirschman states in Reynolds' book, domestic manufacturing industries appear as the size of domestic markets approaches the optimum-sized production unit capacity. This new sector grows by reinvesting profits and replacing both consumption import goods and domestic handicraft output. Finally the role of government is important in providing infrastructure and modernizing economic institutions.

The other growth model in less developed countries is the Import Substitution model. Reynolds states that the reasoning used in support of this approach is the infant industry argument, reinforced by labor surplus and factor price distortion arguments as well.

"The essence of import substitution policy is to make domestic manufacturing profitable. The available instruments are exchange rate policy, inflation, and tariff

protection. In large measure these are substitutable for each other; the degree of profit transfer to industry can be achieved by different policy packages. The economic effects are not identical, however, and there are sometimes political reasons for preferring one package to another." Reynolds (p.20).

Moreover, these policies produce a double squeeze on the agricultural sector. Reynolds argues that the overvalued exchange rate penalizes agricultural exports, meanwhile the apparent rise in the price of domestic manufactures turns the domestic terms of trade against farmers.

Finally, the last concern about import substitution models is that the high protectionism does not bring the economy to efficiency and the attainment of international competitiveness.

Before the next chapter is developed it is considered that some of the assumptions mentioned in this chapter that might have an impact in this study should be discussed. Microeconomic theory assumes that all markets are perfect competitive and no distortions exist. However, in reality it is almost impossible to find a market that fulfill this requirement. For instance, in Costa Rica there are price controls for several commodities. In addition, interest rates are set by the Central Bank, and interest subsidies are given for different economic activities. Under this scenario resources might not be allocated in their best economical use. As a result when analyzing results one should take into account this particular characteristics of the Costa Rican economy.

Another important macroeconomic assumption is that there is no trade distortions between countries such as tariff or quotas. However, when determining trade flows not

only competitive advantages and real exchange rates are important but also trade barriers must be included in order to determine whether a country is an importer or export. If a country is promoting an import substitution strategy that implies that high rates of nominal and effective protection are in place. On the other hand, if a country is promoting an export promotion strategy, there are going to be subsidies and other incentives to stimulate the exporter sector. Devaluation of the domestic currency can be used as a method to stimulate the growth of the exporter sector by increasing the revenues of the domestic producers and by reducing the relative price of the domestic goods compared to the imported goods.

In summary, this chapter has provided the necessary theoretical framework to develop the model in chapter IV. A reduced form type function was developed from the excess functions, and some important ideas about agricultural export growth and economic growth were mentioned as well.

CHAPTER IV

DATA AND METHODOLOGY

In this chapter a system of two equations is developed for the purpose of this research. Furthermore, a complete description of the data used is presented as well.

Model Specification

Determination of economic variables can be described either by a simple model where the dependent variable is a function of a group of explanatory variables or by a more complex structure where a feedback process exists between explanatory and dependent variables. The interest of this research is based on the second type of relationship between economic variables. To determine such a relation a system of simultaneous equations can be developed. One of the most common examples of simultaneous equations in economic theory is the well known model of demand and supply, which determines simultaneously price and quantity.

Based on that special relationship between economic variables and for the purpose of this research a two equation model is built to determine how macroeconomic policies and variables relate to agricultural exports and how agricultural exports relate to economic growth.

The first equation is a reduced form type equation, which combines domestic and external variables both for demand and supply. For this purpose the first equation is defined as the domestic excess supply of Costa Rican agricultural goods. The second equation is used to explain how Costa Rican economic growth is generated, where the key variable is agricultural exports. Estimation of the model is done by a simultaneous equations technique, since it is recognized that determination of macroeconomic variables is related between macroeconomic variables.

On the one hand, the model considers exports as the supply of Costa Rican goods to the rest of the world. On the other hand, exports are the demand from the rest of the world for Costa Rican agricultural goods. An approach is to estimate one equation at a time and compare statistical results to demand and supply theory. A different approach, though, is to combine both equations in one. This second approach is known as the reduced form equation as Judge et al state, and it will be used in this research.

One particular characteristic of reduced form equations is that they estimate all the parameters for demand and supply functions at the same time; in other words, if for example the own price good is in both equations then the reduced form will estimate the parameter for this price, given results that can be either positive or negative. This same argument is valid for any variable which appears in both the demand and supply functions.

However, assuming that producers want to maximize their profits and consumers want to maximize their utility, we proceed to define the model. For further detail in microeconomic theory, a reader is referred to any advanced microeconomic theory book such as Varian or Nicholson.

Before defining equation (1), lets define the demand and supply equations that make up the reduced form equation (1).

Supply of Costa Rican agricultural exports is:

$$AE_t = \alpha_0 + \alpha_1 ER_t + \alpha_2 AGI_t + \alpha_3 P_t + \varepsilon_t$$

Demand for Costa Rican agricultural exports is:

$$AE_t = \alpha_0 + \alpha_1 I_{FCt} + \alpha_2 GNP_{NEt} + \alpha_3 P_t + \alpha_4 ER_t + \varepsilon_t$$

Now combining both demand and supply equations, the reduced form equation (1), is as follows:

$$AE_t = \alpha \ + \alpha \ I_{FCt} + \alpha \ ER_t + \alpha \ AGI_t + \alpha \ GNP_{NEt} + \alpha \ P_t + \varepsilon t \qquad (1)$$

where:

AE : value of Agricultural Exports of Costa Rica in millions of real U.S. dollars in year t,

I : income of importing countries in millions of real U.S. dollars in year t,

ER : real effective exchange rate of colones per U.S. dollar in Costa Rica in year t,

AGI : percentage real agricultural interest rate in Costa Rica in year t,

P : weighted average world price of agricultural exports in Costa Rica in real U.S. dollars per ton in year t,

GNP : Gross Domestic Product net of Exports for Costa Rica in millions of real U.S. dollars in year t,

e : a disturbance error in year t.

In addition, ai are parameters to estimate, where i=0,1,2,3,4,5.

According to economic theory the expected signs for the coefficients of the explanatory variables in equation one are determined as follows. The first parameter α_1 is expected to be positive because increments in the real income of the importing countries increases the demand for import goods, i.e. Costa Rican exports, if these goods are assumed to be normal goods. The second parameter α_2 is expected to be positive. Increments in the real exchange rate result in a reduction of the relative price of Costa Rican exports compared to exports from other countries. In other words Costa Rican exports are now more competitive in the international markets. The third parameter α_3 is negative according to economic theory. Increments in the real agricultural interest rate paid by Costa Rican producers result in a reduction of investment in that sector with the consequent negative effect on production and exports. The forth parameter α_4 is expected to be negative. Increments in the real income of the domestic consumers will increase the demand for both tradable and non-tradable goods based on the income elasticity of each one. If the income elasticity for tradable goods is assumed to be positive or if tradable goods are assumed to be normal goods, then as the income in the domestic country rises the demand for tradable goods will rise as well. Finally, α_5 is expected to be either positive or negative. Price of agricultural exports is a explanatory variable in both the demand and supply functions for Costa Rican agricultural exports, therefore the effect of price in the reduced form function is a combination of opposite effects.

Demand factors include income of both domestic and foreign countries, and the real world price of agricultural export commodities. As proxy variables, income in the domestic country (Costa Rica), will be defined as the Gross Domestic Product net of

Exports to avoid autocorrelation, since exports are by themselves part of the Gross Domestic Product. Furthermore, since Costa Rica exports most of its commodities to the United States, income in the importing country is defined as the real Gross National Product of the United States. Supply elements or production factors will be represented by the real world price of agricultural export commodities, and the real interest rate that is paid for agricultural loans in Costa Rica. For the real world price of export goods a weighted average is calculated as explained later. Finally, the real exchange rate represents a competitiveness measure of Costa Rican exports.

One important consideration though is that according to microeconomic theory the dependent variable of either the demand or supply functions is defined as the quantity in units of the commodity under study. However, in the specification of the first equation of this model, the dependent variable of the reduced form type equation is defined as the value of Costa Rican agricultural exports in millions of real U.S. dollars, which is equal to the price of agricultural exports times the quantity of those exports, and not just the quantity of agricultural exports as it should be. The real value of agricultural exports is used as a proxy variable instead of the quantity of agricultural exports. Consequently, results in the next chapter have to be analyzed carefully.

The second equation, which is based on Michaely's concept, relates economic growth to the growth of exports. However, it is important to mention, that the model developed here differs from the one explained by Michaely, since he uses the rates of growth and this model uses the absolute values. In addition, in order to avoid autocorrelation, the GNP is netted out of exports since exports themselves are part of the

national product as mentioned before. If exports are not excluded from the Gross National Product it is likely that the error terms between these two variables will be correlated, reducing the efficiency of the estimators and making the estimators biased. For further discussion about autocorrelation and its implications refer to Judge et al.

Furthermore, since this study is interested in the relationship between agricultural exports and economic growth, it divides total exports into agricultural exports and non-agricultural exports. Moreover, this division between agricultural and non-agricultural exports is useful to explain which sector explains economic growth better.

Even though the main concern of this study is to determine the relationship between Costa Rican agricultural export growth and Costa Rican economic growth, some other explanatory variables such as, the overall real interest rate, the real minimum wage index, the real government expenditures, and the real amount of money supply are included. These four variables may represent some of the most important determinants of Gross Domestic Product and allow the study to measure the effect of macroeconomic policies on the overall rate of growth. Moreover, fiscal and monetary variables are important because they affect the rate of growth of the national product.

The following is the specification of the second equation:

$$GNP_{NEt} = \beta_0 + \beta_1 AE_t + \beta_2 Ti_t + \beta_3 W_t + \beta_4 RE_t + \beta_5 G_t + \beta_6 MS_t + \varepsilon_t \qquad (2)$$

where:

GNP_{NEt} : Gross Domestic Product net of exports for Costa Rica in millions of real U.S. dollars in year t.

AE_t : value of agricultural exports of Costa Rica in millions of real U.S. dollars in year t,

RE_t : value of non-agricultural exports of Costa Rica in millions of real U.S. dollars in year t,

W_t : real average minimum wage index 1984=100 in Costa Rica in year t,

Ti_t : percentage overall real interest rate in Costa Rica in year t,

G_t : expenditures of the Central Government of Costa Rica in millions of real U.S. dollars in year t,

MS_t : total liquidity in Costa Rica in millions of real U.S. dollars in year t,

ε_t : disturbance error in year t.

β_i : parameters to estimate, where i=1,2,3,4,5,6.

Based on economic theory the expected signs for the coefficients of the estimated parameters in equation two are as follows. The first coefficient β_1 reflects a positive relationship between the real value of agricultural exports and the real Gross Domestic Product net of exports, as the export sector grows two different effects are created, the direct and the indirect. In this case the model is measuring the indirect effect that agricultural exports have on the Gross Domestic Product. The second coefficient β_2 determines the relationship between the real interest rate and the Gross Domestic Product. A negative relationship between these two variables is normally expected. As the real interest rate increases less projects are profitable reducing the level of investment and the overall real rate of growth of the economy. The third coefficient β_3 reflects the relationship between the real price of labor and the real rate of growth of the Gross

Domestic Product. As in the previous case, as the price of one of the production factors increase the rate of growth of the real Gross Domestic Product is expected to decrease. For the fourth coefficient β_4 a positive relationship is expected. The same argument used for the agricultural exports is used here for the non-agricultural exports. The sign for β_5 is determined by the relationship of real government expenditures to real Gross Domestic Product. Being the government one important part in the determination of the Gross Domestic Product, a positive relationship is expected. Finally, β_6 reflects the relation between total liquidity and the rate of growth of the Gross Domestic Product. In this final case, the sign of the estimated coefficient is not clear, and it will depend on the employment rate and on the expected level of inflation.

Data

The data used in this study comes from the International Financial Statistics of the International Monetary Fund 1973-1993, and from the yearly publications of the Central Bank of Costa Rica for the years 1973-1993. Modifications to the original data such as, transformation from Costa Rican colones to U.S. dollars, and elimination of inflationary effects are required in order to avoid some statistical problems such as autocorrelation and multicolinearity.

The first transformation of the data is to express it in U.S. dollars, since Costa Rica's exports are valued in that currency. Following that, any inflationary effect in the data is eliminated dividing the data by the Consumer Index Price of the United States 1985=100.

To do so, it is required to have the Consumer Price Index for both the United States and Costa Rica and the average nominal exchange rate of colones to U.S. dollars. The average nominal exchange rate is used to convert nominal values in colones to nominal values in dollars because the model works with flows and not with stocks, i.e. gross domestic product, government expenditures, total liquidity, and exports.

As a first step all the variables that are expressed in nominal Costa Rican currency are divided by the average nominal exchange rate. After that, the data is divided by the United States Consumer Price Index base 1985=100, to eliminate the inflationary effects in the variables.

Different transformation procedures are used for the real effective exchange rate, real average minimum wage, price of exports, and the real interest rates, than the one applied before.

Data for the exchange rate came originally from the International Financial Statistics of the International Monetary Fund, and it was defined as the real effective exchange rate index. This index is a nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country and its competitors and partners. The weights are based on desegregated data for manufactured goods and primary products covering the three year period 1980-1982, as stated in the International Financial Statistics yearbook. However, the series of real exchange rate data is not available for the years 1973,1974, and 1975, that means that a proxy variable for the real exchange rate has to be used for the entire period instead of the one provided by the International Financial Statistics. Dernburg defines the real exchange rate as,

$$RER = \frac{eP^*}{P}$$

where e is the nominal exchange rate of Costa Rican to U.S. currencies. P* is the price level in the foreign country and P is the price level in the domestic country. An important fact is that a big portion of Costa Rica's trade is with the United States. Therefore, the inflation in the foreign countries is proxied by the inflation in the United States. Finally, an index is calculated, where 1985=100. The base year 1985 was chosen because this is the one used by the International Monetary Fund. Value for the index above 100 means that the real exchange rate is undervalued, and values below 100 mean that the real exchange rate is overvalued. In other words, an overvalued real exchange rate means that for each unit of foreign currency you give or receive less domestic currency compared to the condition where there is no overvaluation. In the case of an overvalued real exchange rate domestic goods are more expensive than foreign goods. Otherwise, the real exchange rate is undervalued.

The real average minimum wage index for Costa Rica is defined with base 1984=100. The calculation of this index is as follows. First of all the index is calculated on a monthly basis and then a simple average is taken for every year. The nominal monthly index is divided by the nominal average index of 1984 and then it is deflated by the ratio of the consumer price index for that specific month and the simple average of the same CPI for 1984. Data for this index is taken from the Costa Rican General Direction of Statistics publications.

Price of agricultural exports is estimated using a proxy variable which is a weighted average price of the four main agricultural exports, coffee, banana, sugar, and

meat. It is important to mention that these four exports account for about 85% of the total agricultural exports of Costa Rica. Furthermore, the original prices of these exports are in different units of measure. This requires to express them in a standard unit of measure such as price per ton.

Real interest rates both for agriculture and the overall economy are defined as the difference between the nominal interest rate and the inflation rate, divided by one plus the inflation rate.

Real interest rate is:

$$r = \frac{i - P}{1 + P}$$

where:

i = nominal interest rate,

r = real interest rate,

P = inflation rate.

Contrary to the most common method of just subtracting the nominal interest rate minus the inflation rate, the method used in this research to calculate the real interest rate considers that the difference between nominal rates is still nominal, so it has to be deflated in order to express a real interest rate. Moreover, the overall real interest rate is a simple average of agriculture, industry, and home building interest rates.

Finally, fiscal and monetary variables are the Central Government Expenditures and the total liquidity, respectively. Total liquidity is the sum of cash and demand deposits plus all monetary assets that yield interest. These two variables are introduced into the

model developed in this study to determine based on statistical relationships whether they contribute or not to economic growth.

Costa Rican Central Government efficiency has been questioned for many years, despite the fact that the central government has grown very rapidly. Some of the main problem with regard to the government inefficiency are the fiscal deficit and the high transaction cost in the financial markets. If perfect competitive markets are assumed it is straightforward to conclude that the real interest rate will reflect the real return to money. Moreover, resources will be allocated according to their higher economic return. However, when market imperfections or distortions exist, such as high transaction cost in financial markets, subsidized interest rates, and high fiscal deficit: it is likely that the real interest rate is not reflecting the real return to resources. Therefore, resources misallocation will result.

The data used in this research is presented in Table I as follows. Economic figures are presented for Costa Rica and the United States for the years 1973 to 1993. A brief description of the main economic issues during the time period used in this research are discussed.

During the 1970's Costa Rica had a positive real rate of growth of the Gross Domestic Product. In addition, the nominal exchange rate was fixed and the real exchange rate was overvalued due to a higher inflation rate in Costa Rica than to the one in the United States. Interest rates were negative in real terms for the early 1970's because of high inflation rates and fixed nominal interest rates. It is important to mention that in

Costa Rica the nominal interest rates are set by the Central Bank. Moreover, subsidies are given according to each economic activity.

In the early 1980's the most dramatic changes in the Costa Rican economy took place. Real Gross Domestic Product declined in about 10%, the nominal exchange rate was devaluated in more than 200%, inflation reached 82%, government expenditures declined in real terms, and the value of total exports declined as well. Financial aid from the International Institutions was reduced because of the high external debt and the low capacity of Costa Rica to pay off its external debt. In 1983, Costa Rica started to recover with the help of new loans from the International Monetary Fund. Inflation was reduced, real Gross Domestic Product increased, and trade barriers began to be removed. Moreover, in 1985 the first Structural Adjustment Program with the World Bank was installed. This process of change allowed Costa Rica to recover from the economic crisis, reducing inefficiency from the financial system and promoting exports of new products to new markets. The second Structural Adjustment Program with the World Bank, introduced more changes to increase the efficiency in the National Banking System, and to reduce the size of the fiscal deficit.

In the last years of the 1980's and the early years of the 1990's, the major concerns in Costa Rica have been to keep the inflation low, to reduce the fiscal deficit, and to eliminate distortions from the economy in order to allocate resources in their alternative use. As a result of these changes the real Gross Domestic Product has grown an average rate of 4.62% in the last eight years, even though inflation and the fiscal deficit are still the main problem in Costa Rica.

Table I: Costa Rica and The United States, Macroeconomic Figures, 1973-1993

Variable	1973	1974	1975	1976	1977	1978	1979
Costa Rica							
Real Exchange Rate (2)	62.2	57.7	54.2	58.8	59.6	59.3	58.3
Government Expenditures (1)	551.2	545.5	639.8	741.6	761.0	965.3	1,120.4
Total Liquidity (M2) (1)	988.0	1,058.7	1,287.8	1,627.4	1,994.9	2,406.0	2,601.7
Value of Total Export (1)	832.1	959.7	985.0	1,119.9	1,467.8	1,425.0	1,383.7
Value of Ag Export (1)	622.8	672.0	712.6	771.8	1,061.0	1,055.6	1,010.2
Value of Non Ag Exp (1)	209.3	287.7	272.4	348.1	406.8	369.4	373.5
Real Ag Exp Price/Ton	1,850.3	1,811.1	1,332.1	2,338.3	5,341.5	3,795.7	3,147.0
Real Ag Int Rate	−6.9%	−17.2%	−10.3%	10.9%	2.7%	−0.2%	−4.5%
Real Overall Int Rate	−6.6%	−16.2%	−9.2%	12.3%	4.0%	1.7%	1.5%
Real Min Wage Index1984 = 100	86.4	84.7	78.5	85.6	91.3	97.4	99.0
Gross National Product (1)	3,230.3	3,472.7	3,904.1	4,540.4	5,427.7	5,784.1	5,957.6
GNP net of Exports (1)	2,398.2	2,513.1	2,919.1	3,420.5	3,959.8	4,359.0	4,573.9
U.S.A.							
US Inflation 1985 = 100	41.3	45.9	50.1	53.0	56.4	60.7	67.5
US REAL GNP 1985 (3)	2,904.7	2,897.8	2,865.1	3,019.5	3,185.0	3,353.4	3,448.5

Sources: International Financial Statistics, IMF. 1973-1994

Central Bank of Costa Rica.

(1) Figures in millions of real U.S. dollars, deflated by the consumer price index 1985 = 100

(2) Real Exchange Index 1985 = 100

(3) Figures in billions of real U.S. dollars, deflated by the consumer price index 1985 = 100

Table I: Costa Rica and The United States, Macroeconomic Figures, 1973-1993, continued.

Variable	1980	1981	1982	1983	1984	1985	1986
Costa Rica							
Real Exchange Rate (2)	62.6	93.8	98.3	98.2	94.6	100.0	97.8
Government Expenditures (1)	1,117.6	536.8	422.0	680.7	738.9	708.6	807.6
Total Liquidity (M2) (1)	2,390.3	1,727.0	1,435.4	1,691.8	1,725.9	1,731.3	1,841.4
Value of Total Export (1)	1,308.1	1,191.5	969.6	942.8	1,041.4	976.0	1,099.1
Value of Ag Export (1)	858.7	783.6	663.7	637.3	712.2	680.3	793.2
Value of Non Ag Exp (1)	449.4	407.9	305.9	305.4	329.3	295.7	306.0
Real Ag Exp Price/Ton	2,339.0	1,721.0	1,621.6	1,303.3	1,397.1	1,656.0	2,602.9
Real Ag Int Rate	−6.6%	−32.1%	−35.1%	10.2%	0.6%	7.7%	7.4%
Real Overall Int Rate	1.0%	−26.9%	−32.5%	12.3%	2.5%	11.7%	8.0%
Real Min Wage Index1984 = 100	99.7	90.1	83.2	95.1	100.0	103.9	106.3
Gross National Product (1)	5,636.6	3,142.3	2,816.6	3,379.7	3,766.7	3,901.4	4,303.4
GNP net of Exports (1)	4,328.5	1,950.9	1,847.0	2,436.9	2,725.3	2,925.4	3,204.3
U.S.A.							
US Inflation 1985 = 100	76.6	84.6	89.7	92.6	96.6	100.0	101.9
US REAL GNP 1985 (3)	3,438.2	3,638.2	3,545.5	3,638.1	3,879.7	4,014.9	4,129.2

Sources: International Financial Statistics, IMF. 1973-1994
Central Bank of Costa Rica.

(1) Figures in millions of real U.S. dollars, deflated by the consumer price index 1985 = 100

(2) Real Exchange Index 1985 = 100

(3) Figures in billions of real U.S. dollars, deflated by the consumer price index 1985 = 100

Table I: Costa Rica and The United States, Macroeconomic Figures, 1973-1993, continued.

Variable	1987	1988	1989	1990	1991	1992	1993
Costa Rica							
Real Exchange Rate (2)	98.0	98.1	100.7	93.7	104.5	100.6	95.3
Government Expenditures (1)	753.3	751.7	871.5	884.8	787.9	898.1	1,040.0
Total Liquidity (M2) (1)	1,893.4	2,059.7	2,260.7	2,320.5	2,223.0	2,425.6	2,629.6
Value of Total Export (1)	1,095.6	1,133.8	1,228.3	1,192.8	1,262.2	1,402.6	1,471.3
Value of Ag Export (1)	730.3	719.6	739.0	727.2	797.6	829.2	908.6
Value of Non Ag Exp (1)	365.3	414.1	489.3	465.5	464.7	573.4	562.8
Real Ag Exp Price/Ton	1,504.1	1,545.5	1,134.4	832.1	814.2	553.8	549.6
Real Ag Int Rate	7.0%	1.1%	15.8%	2.4%	10.0%	9.2%	13.5%
Real Overall Int Rate	7.5%	1.6%	16.3%	3.0%	10.3%	8.9%	12.6%
Real Min Wage Index1984 = 100	102.3	97.0	100.0	101.0	98.0	99.0	102.0
Gross National Product (1)	4,255.9	4,170.9	4,503.2	4,666.8	4,405.0	4,981.7	5,625.7
GNP net of Exports (1)	3,160.3	3,037.1	3,274.9	3,474.0	3,142.8	3,579.1	4,154.4
U.S.A.							
US Inflation 1985 = 100	105.7	109.9	115.2	121.4	126.6	130.4	134.3
US REAL GNP 1985 (3)	4,284.3	4,452.8	4,565.6	4,602.7	4,549.5	4,705.4	4,843.6

Sources: International Financial Statistics, IMF. 1973-1994
Central Bank of Costa Rica.

(1) Figures in millions of real U.S. dollars, deflated by the consumer price index 1985 = 100

(2) Real Exchange Index 1985 = 100

(3) Figures in billions of real U.S. dollars, deflated by the consumer price index 1985 = 100

Estimation Method

In order to proceed with the estimation of the model, it has to be consider which is the most appropriate econometric approach to use. Two facts are important in determining the method with which to work. The first relates to the fact that the dependent variable of the first equation is an explanatory variable of the second equation, and the dependent variable of the second equation is an explanatory variable of the first equation. The second fact is that the error terms between equations are correlated. Given that, the most appropriate way to estimate this system of two simultaneous equations is to use either two stage least squares or three stage least squares. If the data shows contemporaneous correlation among equations the most appropriate method to be used in this research is three stage least squares as Judge et al argue.

In a system of simultaneous equations there are different types of variables. These variables can be classified as endogenous and exogenous. According to Judge et al. (p.601) "Endogenous variables, or jointly determined variables have outcome values determined through the joint interaction with other variables within the system." On the other hand, "Exogenous variables are variables that affect the outcome of the endogenous variables, but whose values are determined outside the system. Exogenous variables thus are assumed to condition the outcome values of the endogenous variables but are not reciprocally affected because no feedback relation is assumed."

In the specification of our model the exogenous and endogenous variables are as follows. On the one hand, exogenous variables include, the income of foreign countries, real exchange rate, agricultural interest rate, price of agricultural exports, value of non-

agricultural exports, real average minimum wage, overall interest rate, government expenditures, and total liquidity. On the other hand, endogenous variables are the value of agricultural exports and gross domestic product net of exports.

In a final classification the nonobservable random errors are assumed stationary and temporally uncorrelated.

One of the most common methods of econometric estimation is least squares. However, in the case with which this study works such a method will produce biased estimators, since the expected value of the parameters will contain endogenous variables that are jointly determined with our dependent variable and are not independent of the error terms as mentioned by Judge et al (p.610). Moreover, as the sample size increases, the value of the estimated parameters do not converge to the real value of these parameters. Therefore, alternative methods of estimation must be considered since the model used in this research is a system of recursive equations.

A relevant factor in the specification of any system of simultaneous equations is the condition for identification of each equation within the system as Judge et al state. With respect to this factor, there are three different possibilities, underidentification, just identification, or overidentification. In the first case, if an equation is underidentified within a system of equations no solution can be achieved because the matrix of explanatory variables is not singular. In the second case, if an equation is just identified, the structural parameters can be estimated with the use of an indirect least squares method. Finally, if each equation is overidentified there are many ways in which the

structural parameters can be estimated. However, in the last case indirect least squares estimators are consistent but not efficient.

In addition, some practical rules can be used to examine an econometric model, as mentioned by Judge et al (p.625).

1. An equation that contains one endogenous variable and all predetermined variables in the system is just identified.

2. An equation that contains all the variables in the system is not identified.

3. If none of the excluded variables of the *i*th equation appears in the *j*th equation, the *i*th equation is not identified.

4. If two equations contain the same set of variables, both equations are not identified.

5. If the same excluded variables of the *i*th equation are also excluded from the *j*th equation, the *i*th equation fails the rank condition and is not identified.

6. If any excluded variable of the *i*th equation does not appear in any linear combination of the other equations, the *i*th equation is not identified.

Based on these practical rules it is possible to conclude that the model developed in this research is overidentified, because each equation contains one of the two endogenous variables as the dependent variable and not all of the predetermined variables as explanatory variables. In addition, the variables that are excluded from one equation are included in the other equation.

The most common method to estimate an overidentified system of equations is two stage least squares. However, if a joint estimation of the parameters for all the structural equations in the system is wanted a three stage least squares estimator should be used.

According to Judge et al, Zellner and Theil developed an efficient estimator to estimate recursive systems where the error terms among equations are correlated. This method is known as three stage least squares. The advantage of using three stage least squares instead of two stage least squares is that the former uses the parameters in order to form the residual covariance matrix, or what is the same it computes the estimated residual covariance matrix by using the two stage least squares residuals. In addition, the residual covariance matrix is used to obtain the three stage least squares estimators. Moreover, one important property of the three stage least squares estimator over the two stage least squares estimator is that the former is asymptotically more efficient. This is true because the two stage least squares estimator ignore the information contained in the off-diagonal elements of the residual covariance matrix.

Finally, in this chapter a model for estimation of export growth and economic growth in Costa Rica has been specified. A system of two simultaneous equations is used, since determination of export growth and economic growth implies a feedback process between these two economic variables. Different econometric techniques of estimation are considered, in particular two stage least squares and three stage least squares. Results of the estimation are presented in the next chapter.

CHAPTER V

EMPIRICAL RESULTS

This chapter presents the results from the estimation of the system of two equations developed in this research.

As mentioned in the previous chapter, a three stage least squares method was used since contemporaneous autocorrelation was found between equations. Twenty-one observations and eleven variables were included in the estimation of the model. Nine out of the eleven variables were exogenous variables, leaving two endogenous variables. These two variables were the real value of agricultural exports and the real Gross Domestic Product net of exports.

Based on the results of the first estimation which are shown in Table II, a second estimation was done dropping out those variables that were not significant at the 15% level of significance, i.e. the total liquidity (M2) and the value of non-agricultural exports. The second estimation is shown in Table III. From here on, the first estimation will be referred as the full model, meanwhile the second estimation will be called the partial model.

The initial estimation of the full model was done with one iteration, which is the default number set up by the econometric software Shazam. However, since three stage

least squares yields estimators which are asymptotically efficient, more iterations were tried in order to improve the efficiency of the estimators. Convergence of the estimators to their real value was achieved at iteration number thirteen. In general, results from the second estimation are better and therefore used from here on.

In estimating the partial model, those parameters that were not significant at the 15% level of significance in the full model were dropped out. The remaining parameters are significant at the 10% level of significance. Convergence to their real value was achieved at iteration number eight. Degrees of freedom are eleven for the full model and nine for the partial model.

Tables II and III present the results of the empirical estimation of the model developed in the previous chapter. Results are divided by equation one and equation two. For each equation figures included in the Tables are the values of the estimated coefficients, the estimated T-ratio value, the probability of Type I error, the R2 for each equation, and the Durbin-Watson value to measure autocorrelation. Level of significance for each parameter are presented at the bottom of each table.

Before proceeding, one should notice that in estimating systems of equations a different goodness of fit measure than R^2 should be used, because this measure can either be negative or not minimize the sum of square errors, as Berndt argues. Therefore, in evaluating the goodness of fit of the model the significance of the estimated parameters is used as they relate to economic theory.

The main result from the estimation of the full and partial models is that the hypothesis that export growth leads to economic growth and that economic growth leads to growth of agricultural exports are statistically supported.

Table II : Estimation Results, Full Model of Agricultural Exports and Gross Domestic Product net of Exports with Selected Independent Variables.

Variables	Coefficient	T-Ratio	P-Value	Elasticity at means	R2	Durbin Watson
Equation 1					84.59	1.646
Dependent						
Agricultural Exports						
Explanatory						
U.S. Gross Dom. Product*	0.1709	2.7810	0.0140	0.8287		
Agr. Export Price*	0.0606	3.6150	0.0030	0.1442		
Real Exchange Rate**	−3.8372	−1.9440	0.0710	−0.4065		
Agr. Interest Rate**	−243.6800	−1.8500	0.0840	0.0022		
Gross Dom. Prod. Net of Exports***	0.0694	1.6560	0.1180	0.2836		
Constant	115.9800	0.8759	0.3950			
Equation 2					95.34	2.4488
Dependent						
Gross Dom. Product Net of Exports						
Explanatory						
Agricultural Exports*	3.0106	5.8290	0.0000	0.7366		
Overall Interest Rate*	1,256.6000	2.7770	0.0150	0.0044		
Non-Agricultural Exports	−0.2028	−0.3312	0.7450	−0.0241		
Government Expends*	2.6363	5.4800	0.0000	0.6387		
Minimum Wage*	−18.6970	−2.6650	0.0180	−0.5551		
Total Liquidit	−0.1014	−0.4171	0.6830	−0.0607		
Constant	834.7700	1.1820	0.2570			

System R2 = 99.41
Convergence at iteration 13.
*** Significant at 99%**
**** Significant at 90%**
***** Significant at 85%**

Table III : Estimation Results, Partial Model of Agricultural Exports and Gross Domestic Product net of Exports with Selected Independent Variables.

Variables	Coefficient	T-Ratio	P-Value	Elasticity at means	R2	Durbin Watson
Equation 1					84.78	1.646
Dependent						
Agricultural Exports						
Explanatory						
U.S. Gross Dom. Product*	0.1530	2.8560	0.0120	0.7423		
Agr. Export Price*	0.0618	3.8810	0.0010	0.1469		
Real Exchange Rate**	−3.6528	−2.1450	0.0490	−0.3869		
Agr. Interest Rate**	−214.8000	−1.7710	0.0970	0.0019		
Gross Dom. Prod. Net of Exports***	0.0718	1.8900	0.0780	0.2935		
Constant	158.8400	1.3720	0.1900			
Equation 2					94.99	2.2621
Dependent						
Gross Dom. Product Net of Exports						
Explanatory						
Agricultural Exports*	2.8339	6.4940	0.0000	0.6933		
Overall Interest Rate*	1,203.8000	2.6880	0.0160	0.0043		
Government Expends*	2.4648	5.7560	0.0000	0.5971		
Minimum Wage*	−19.0170	−2.8750	0.0110	−0.5646		
Constant	865.9600	1.3410	0.1990			

System R2 = 99.36
Convergence at iteration 8.
*** Significant at 99%**
**** Significant at 90%**

From both models it is clear that in Costa Rica the indirect effect of agricultural exports on economic growth is much more important than the indirect effect of manufactured exports on economic growth. In the case of agricultural exports, its estimated parameter is positive and significant at the 99% level as it was expected. The estimated parameter for non-agricultural exports is not significant and the null hypothesis of the parameter being equal to zero is not rejected.

Parameters in equation 1 of the full model have the expected signs mentioned in the previous chapter. The coefficients are statistically significant in most cases, except for the parameters corresponding to the real unit value of agricultural exports and the real exchange rate.

A positive relationship between real income in the United States and the real value of Costa Rican agricultural exports was found. In other words, increments in the real U.S. income are reflected as an increase in the supply of Costa Rican exports because there is an increase in the demand for domestic and foreign goods in the United States.

In addition, as the real agricultural interest rate increases there is a decrease in the real value of the agricultural exports. The value of the estimated coefficient for the interest rate presented in Tables II and III has to analyzed carefully because interest rates are presented in percentage terms. In other words, an increase of one percent in the interest rate is equal to a change of 0.01 units. When the price of the resources used in the production of agricultural exports rises there is a negative effect on the production process of agricultural exports due to an increase in the cost of production, resulting in the expected negative relationship between these two variables.

Another relevant result implies that there is a positive relationship between growth in the Costa Rican Gross Domestic Product and the agricultural exports. In fact as the Costa Rican Gross Domestic Product grows one percent the value of agricultural exports increases by 0.2836 percent. As stated in the literature review chapter, Ni Sung-Shen et al argue that if income growth is highly concentrated in a few sectors with income elasticities less than one, a small open economy will have an excess supply of production that can be sold in the world market. In other words, for Costa Rica there is support to the hypothesis that domestic supply is growing faster than domestic demand resulting in a positive relationship between Gross Domestic Product and agricultural exports. Furthermore, since exports are increasing that means that the traded sector is expanding faster than the nontraded sector.

Elasticity analysis provides support for the hypothesis that Costa Rican agricultural exports are highly sensitive to changes in the income of foreign countries. The mean elasticity of the U.S. real Gross Domestic Product to Costa Rican agricultural exports is 0.8287, the highest among all the estimated parameters. This means that a one percent increase in U.S. real income leads to an increase of 0.8287 percent in the real value of Costa Rican agricultural exports.

Since equation 1 was defined as a reduced form equation the effect of own price on quantity is ambiguous. A combination of demand and supply effects are mixed in the reduced form equation and either a positive or negative relationship between price and quantity is possible. Moreover, the final outcome will depend on the relative importance of demand and supply. In this case supply effects apparently overcome demand effects,

because there is a positive and statistical significantly relationship between the real unit value and the real value of Costa Rican agricultural exports.

One more factor should be mentioned when evaluating the sign of the parameter for the own price variable, since the dependent variable, i.e. agricultural exports, was defined as the real value of agricultural exports instead of the quantity of agricultural exports. It is likely that some autocorrelation exists between the real value of agricultural exports and the price of those exports, since the real value is equal to the quantity times the price.

On the other hand, the relationship between the real exchange rate and the real value of agricultural exports is negative and contrary to what most empirical studies have found. There are several possible explanations for this result.

In the first place, production of tradable agricultural goods in Costa Rica uses a high import component, therefore as the nominal exchange rate rises not only is there an incentive for Costa Rican producers to shift toward the production of tradable goods, but also there is an increase in the demand for imported inputs such as fertilizers, machinery and technology, that are used in the production of tradable goods. This increase in the demand for imported inputs will increase the cost of production and can possibly lead to a loss in competitiveness reducing the exports of agricultural goods.

Another explanation to this outcome lays on the fact that the specification of the model used in this research relates the real value of agricultural exports, and not the quantity exported, to the real exchange rate. Data desegregation between price and quantity is not available for most of the nontraditional agricultural exports, actually only

coffee, banana, sugar, and meat report both quantities and prices. Hence, it is possible that the real value of agricultural exports does not reflect the real trend of quantity supplied since there is a price effect included. Actually, there is evidence that supports this explanation.

Exports of coffee and bananas have been the most important agricultural exports of Costa Rica for several years, especially during the 1970's where they accounted for about 50% of the total exports. In addition, despite the fact that during the 1970's the real exchange rate was overvalued, the total quantity of exported coffee either grew or remained constant, contrary to what might be expected. Furthermore, in 1977 there was a tremendous increase in the international price of coffee leading to an increase in the quantity of exported coffee, even though the exchange rate was fixed and overvalued. On the other hand, banana exports grew in value during the 1970's, yet the volume exported decreased.

Therefore, two different effects need to be considered when explaining the relationship between the real value of agricultural exports and the real exchange rate since these effects work in opposite directions. On the one hand, as the real exchange rate appreciates the volume or quantity exported of any commodity should decrease. On the other hand, even if the quantity exported decreases, an increase in the price enough to offset the decrease in quantity will lead to an increase in the value exported, and a negative relationship between the real exchange rate and the value of agricultural exports will result.

A third reason that explains the negative relationship between the real exchange rate and the real value of agricultural exports is stated by Webb and Fackler when they argue that if the behavior of prices and exchange rates in the South and Central American markets are closer to those of Costa Rica than to the U.S., then the estimated relationship may be negative.

Finally, during the 1970's Costa Rica was characterized for having a fixed nominal exchange rate and a very rigid export structure which was based on four traditional exports. coffee, bananas, meat, and sugar represented about 65-70% of total exports. Moreover, the coffee and banana markets were characterized by a quota structure where variations on demand factors ruled the production of those commodities, i.e. changes in prices of coffee and banana were more important than changes or variations in the real exchange rate, in order to explain changes in exports.

It was not until the early 1980's that a minidevaluation process took place not only to keep the parity of Costa Rican currency to the U.S. dollar but also to improve the international competitiveness of Costa Rican exports. In addition, an export promoting process was installed through the introduction of nontraditional exports, both from the agricultural and non-agricultural sectors. Therefore, if any positive relationship between the real exchange rate and nontraditional agricultural exports exists, it is possible that negative effects from coffee and banana exports overcome them.

The model does not include the relationships mentioned in the last paragraphs because they are beyond the scope of this research. They were introduced as possible explanations that could be considered in future research.

From equation 2 in Table II, some important conclusions can be drawn. In the long run the null hypothesis that total liquidity (M2), has no relation to the growth of Gross Domestic Product is not rejected. Monetary effects are neutral under the definition of money supply used in this research. However, fiscal policy through government expenditure is significant at the 99.9% level, with a mean elasticity of 0.6387, the second largest in this model.

Based on these results it seems that the Central Government in the last twenty-one years has contributed to the economic growth of Costa Rica in a positive way, even though the fiscal deficit is currently one of the major problems of the Costa Rican economy.

A positive relationship between the value of agricultural exports and the Gross Domestic Product net of exports is found at the 99.9% level of significance. Mean elasticity is 0.7366, the largest in the model.

Comparing elasticities between the Gross Domestic Product net of exports and the value of agricultural exports, it might be possible to say that in Costa Rica a one percent change in the value of agricultural exports has a greater impact on the rate of growth of Gross Domestic Product net of exports, than a one percent change in the former has over the latter, 0.7366 to 0.2836.

Therefore, the Costa Rican export promoting policies, as a way to stimulate economic growth, is supported by the results presented in this study.

In the early 1980's a strong export promoting plan took place in Costa Rica to stimulate exports of non-traditional goods. These goods were divided between agricultural

and non-agricultural goods. According to the model developed and estimated here the major success of this plan has come through the promotion of non-traditional agricultural goods. Even though non-agricultural non-traditional export goods have increased in the last few years, Costa Rica is still in an early stage of development, and that is why non-agricultural export goods do not contribute that much to economic growth, as measured in this research.

In addition, and contrary to what was expected, the overall real interest rate has a positive relation to the growth of Gross Domestic Product. However, some causality between these variables can exist where increases in the Gross Domestic Product may reduce the availability of financial resources, thus causing an increase in market interest rates.

Finally, as the real minimum wage in Costa Rica rises there is a negative effect on production.

Estimation of the partial model yields slightly better parameter estimators in both equations than the estimation of the full model. (See Table III).

All parameters in the partial model are significant at the 90% level or better. The same parameter signs are found in the partial and full models. However, the probability of not rejecting the null hypothesis of the parameters being equal to zero is reduced, in other words, type I error is reduced in the partial model.

CHAPTER VI

CONCLUSIONS

Agriculture is the main economic activity in Costa Rica not only in the production of food for domestic consumption but also for the production of tradable goods. Foreign exchange earnings in Costa Rica have been generated mainly by the agricultural sector through the selling of coffee, bananas, meat, and sugar to traditional markets, and more recently by the introduction of new agricultural and non-agricultural commodities to new markets. However, Costa Rica still relies on the four traditional exports to generate most of its foreign exchange earnings.

From the empirical results presented in the previous chapter there is statistical support for the alternative hypothesis that agricultural exports have a positive effect on economic growth in Costa Rica. Furthermore, it was also found that overall economic growth defined as the growth of the real Gross National Product has a positive effect on the growth of the real value of agricultural exports. In this sense the hypothesis that export promotion policies are one of the alternative ways Costa Rica may achieve economic development is supported.

From the empirical results the null hypothesis that non-agricultural exports are not related to economic growth is not rejected. In other words, even though it is possible that a positive direct effect between non-agricultural exports and economic growth exists, there is no evidence that an indirect effect between these two variables exists. Kavoussi argues that the expansion of primary exports is strongly associated with economic growth. Moreover, he argues that in further stages of economic development non-agricultural exports play a key role in continuing the process of economic development. If this is true, one can say that Costa Rica is still in an early stage of economic development since non-agricultural exports are not contributing greatly to overall economic development. In other words, further development of agricultural exports is needed before non-agricultural exports start to increase more rapidly. In 1985 a process of export diversification took place in Costa Rica promoting the production of both agricultural and non-agricultural exports to new markets. Some of the instruments used to promote the production of export goods according to Hallauer were tax concessions, "industrial contracts," drawback systems, free-trade zones, bureaucratic facilitation, and increased attention to publicizing opportunities and to marketing. Moreover, a process of currency devaluation was promoted to reestablish the international competitiveness of Costa Rican exports. The results of this program are positive, particularly when measured as the real increase of Gross Domestic Product.

Contrary to what was expected and perhaps one of the most important results of this research is that the empirical results suggest that there is a negative and statistically significant relationship between the real value of agricultural exports and the real exchange

rate. Nevertheless, there are still some considerations that must be taken into account when evaluating this result.

In the first place, more data desegregation is needed in order to express Costa Rican exports as the quantity effectively exported instead of the real value of exports as it was done in this study, because the real relationship between agricultural exports and the real exchange rate can be biased by the presence of price effects. In addition, considerations about inflation and devaluation on the Costa Rican competitors need to be included when explaining trade flows between Costa Rica and the rest of the world, as Webb and Fackler argue. Trade barriers such as tariff and export tax are also an important element when explaining international trade.

Costa Rican agricultural exports have a high positive responsiveness to changes in the international prices and to changes in the income of importing countries. In a sense it is possible to argue that responsiveness of agricultural exports to changes in the exchange rate are overcome by changes in international prices and macroeconomic conditions in the importing countries.

If used as a policy instrument, the model developed in this research needs to be adjusted by the market distortions that prevail in Costa Rica as mentioned in chapter I and III. For instance market imperfections such as subsidized interest rates, and overvalued real exchange rates will result in a misallocation of financial resources, that need to be considered when determining the optimal set of policies in order to achieve the highest level of economic development.

Finally, further research is needed in the particular matter of agricultural export and economic development, not only for the specific case of Costa Rica, but also for the case of any other developing country which is pursuing an export promotion policy. Moreover, there is still controversy about the empirical and theoretical relationship between agricultural exports and exchange rate, and further research is needed in this area as well.

As part of the export promotion policies in Costa Rica further research needs to be done on the particular matter of Free-Trade Agreements. Two major areas of research are the North American Free Trade Agreement between the United States, Canada, and Mexico, and the Free Trade Agreement between Costa Rica and Mexico. The new macroeconomic agreements are oriented to the elimination of trade distortions both at the international level and at the domestic level.

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APPENDIX

Appendix Table I : Costa Rica Macroeconomic Figures

	1973	1974	1975	1976	1977	1978
Production (Colones of 1966)						
Gross Domestic Product (Mill)	6,934	7,319	7,473	7,885	8,587	9,125
Rate of change	7.7%	5.5%	2.1%	5.5%	8.9%	6.3%
Per capita GDP (Thou)	3,714	3,825	3,803	3,899	4,147	4,292
Rate of change	4.0%	3.0%	−0.6%	2.5%	6.4%	3.5%
Balance of Payments (Mill of U.S. $)						
Exports (FOB)	344	440	493	593	828	865
Rate of change	22.6%	27.8%	12.0%	20.2%	39.6%	4.5%
Imports (CIF)	455	720	694	770	1,021	1,166
Rate of change	22.1%	58.1%	−3.6%	11.0%	32.6%	14.2%
Trade Balance	−111	−279	−201	−177	−193	−301
External Debt	288	377	510	635	833	1,048
Ratio External Debt to GDP	18.8%	24.5%	26.0%	26.3%	27.1%	29.7%
Nominal Exchange Rate	6.65	8.57	8.57	8.57	8.57	8.57
Central Government (Mill colones)						
Central Govt Deficit	347	140	475	685	281	1,101
Ratio Govt. Expen. to GDP	17.1%	15.7%	16.4%	16.3%	14.0%	16.7%
Ratio Govt. Income to GDP	13.6%	14.7%	13.6%	13.0%	13.2%	13.0%
Ratio Fiscal Deficit to GDP	3.4%	1.1%	2.8%	3.3%	1.1%	3.6%
Prices (rate of change)						
Consumer Price Index	15.9%	30.6%	20.5%	−2.6%	5.3%	8.1%
Wholesale Price Index	26.4%	38.2%	14.0%	7.2%	7.4%	8.9%
Population and Employment						
Total Population (Thou)	1866.77	1913.4	1964.9	2022.3	2070.6	2126
Unemployment Rate					4.6%	4.5%

Source: Central Bank of Costa Rica

Appendix Table I : Costa Rica Macroeconomic Figures, continued.

	1979	1980	1981	1982	1983	1984
Production (Colones of 1966)						
Gross Domestic Product (Mill)	9,576	9,648	9,430	8,743	8,993	9,715
Rate of change	4.9%	0.8%	−2.3%	−7.3%	2.9%	8.0%
Per capita GDP (Thou)	4,369	4,296	4,163	3,741	3,742	4,019
Rate of change	1.8%	−1.7%	−3.1%	−10.1%	0.0%	7.4%
Balance of Payments (Mill of U.S. $)						
Exports (FOB)	934	1,002	1,008	870	873	1,006
Rate of change	8.0%	7.3%	0.6%	−13.7%	0.3%	15.2%
Imports (CIF)	1,397	1,524	1,209	893	988	1,097
Rate of change	19.8%	9.1%	−20.7%	−26.1%	10.6%	11.0%
Trade Balance	−463	−522	−201	−23	−115	−91
External Debt	1,424	1,692	2,210	2,428	3,226	3,289
Ratio External Debt to GDP	35.3%	58.1%	139.4%	100.9%	108.9%	96.8%
Nominal Exchange Rate	8.57	14.23	36.01	40.50	43.65	48.00
Central Government (Mill colones)						
Central Govt Deficit	2,265	3,298	2,478	2,008	4,627	4,966
Ratio Govt. Expen. to GDP	18.8%	19.8%	17.1%	15.0%	20.1%	19.6%
Ratio Govt. Income to GDP	12.3%	11.9%	12.7%	12.9%	16.6%	16.6%
Ratio Fiscal Deficit to GDP	6.5%	8.0%	4.3%	2.1%	3.6%	3.0%
Prices (rate of change)						
Consumer Price Index	13.2%	17.8%	65.1%	81.8%	10.7%	17.3%
Wholesale Price Index	24.0%	19.3%	117.2%	79.1%	5.9%	12.2%
Population and Employment						
Total Population (Thou)	2,192	2,246	2,265	2,337	2,403	2,417
Unemployment Rate	4.9%	5.9%	8.7%	9.4%	9.0%	6.4%

Source: Central Bank of Costa Rica

Appendix Table I : Costa Rica Macroeconomic Figures, continued.

	1985	1986	1987	1988	1989	1990
Production (Colones of 1966)						
Gross Domestic Product (Mill)	9,785	10,326	10,818	11,190	11,824	12,245
Rate of change	0.7%	5.5%	4.8%	3.4%	5.7%	3.6%
Per capita GDP (Thou)	3,818	3,923	4,002	4,031	4,149	4,191
Rate of change	−5.0%	2.8%	2.0%	0.7%	2.9%	1.0%
Balance of Payments (Mill of U.S. $)						
Exports (FOB)	976	1,120	1,158	1,246	1,415	1,448
Rate of change	−3.0%	14.8%	3.4%	7.6%	13.6%	2.3%
Imports (CIF)	1,098	1,163	1,385	1,405	1,715	1,990
Rate of change	0.1%	5.9%	19.1%	1.4%	22.1%	16.0%
Trade Balance	−122	−43	−227	−159	−300	−542
External Debt	3,580	3,582	3,914	3,834	3,800	3,173
Ratio External Debt to GDP	97.6%	86.1%	96.0%	87.7%	75.7%	63.5%
Nominal Exchange Rate	53.95	59.25	69.75	80.00	84.90	104.60
Central Government (Mill colones)						
Central Govt Deficit	3,940	8,246	5,713	8,835	1,873	25,086
Ratio Govt. Expen. to GDP	18.2%	18.8%	17.7%	18.0%	19.4%	19.0%
Ratio Govt. Income to GDP	16.2%	15.4%	15.7%	15.5%	14.9%	14.2%
Ratio Fiscal Deficit to GDP	2.0%	3.3%	2.0%	2.5%	0.4%	4.8%
Prices (rate of change)						
Consumer Price Index	10.9%	15.4%	16.4%	25.3%	9.9%	27.3%
Wholesale Price Index	7.6%	11.9%	10.9%	19.6%	10.7%	25.9%
Population and Employment						
Total Population (Thou)	2,563	2,632	2,703	2,776	2,850	2,922
Unemployment Rate	6.8%	6.2%	5.6%	5.5%	3.8%	4.6%

Source: Central Bank of Costa Rica

Appendix Table I : Costa Rica Macroeconomic Figures, continued.

	1991	1992	1993
Production (Colones of 1966)			
Gross Domestic Product (Mill)	12,520	13,434	14,036
Rate of change	2.2%	7.3%	4.5%
Per capita GDP (Thou)	4,180	4,376	4,460
Rate of change	−0.2%	4.7%	1.9%
Balance of Payments (Mill of U.S. $)			
Exports (FOB)	1,598	1,829	1,976
Rate of change	10.4%	14.5%	8.0%
Imports (CIF)	1,853	2,445	2,994
Rate of change	−6.9%	31.9%	22.5%
Trade Balance	−255	−616	−1,018
External Debt	3,267	3,289	3,628
Ratio External Debt to GDP	64.8%	51.7%	50.5%
Nominal Exchange Rate	136.80	138.00	149.00
Central Government (Mill colones)			
Central Govt Deficit	22,641	18,043	18,079
Ratio Govt. Expen. to GDP	17.9%	18.0%	18.5%
Ratio Govt. Income to GDP	14.6%	16.0%	16.8%
Ratio Fiscal Deficit to GDP	3.3%	2.1%	1.7%
Prices (rate of change)			
Consumer Price Index	25.3%	17.0%	14.0%
Wholesale Price Index	21.0%	13.9%	11.0%
Population and Employment			
Total Population (Thou)	2,995	3,070	3,147
Unemployment Rate	5.5%	4.1%	4.0%

Source: Central Bank of Costa Rica

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