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**Macroeconomic Policy,  
the Real Exchange Rate  
and Agricultural Growth  
in Ecuador**

**December 1988**



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**MACROECONOMIC POLICY,  
THE REAL EXCHANGE RATE  
AND AGRICULTURAL GROWTH  
IN ECUADOR**

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## SUMMARY

The growth of the agricultural sector reflects both policies specific to agriculture as well as those which have economy wide implications. It is those macroeconomic policies which have become increasingly recognized as important determinants of the evolution of agriculture in Latin America.

This study analyzes the influence of macroeconomic, tariff and exchange rate policies on the relative production of the agricultural sector in Ecuador. The central focus of the paper is the real exchange rate which is defined as the price of tradable goods relative to non-tradables. The Paper analyzes the response of agricultural production to the real exchange rate from 1960 to 1986.

The results indicate clearly that the production of the sector has been strongly penalized, and could have been as much as three times higher, had the macroeconomic policies been more favorable. A series of simulations was carried out to estimate the impact of public consumption, the growth of the monetary sector, the external balance, and commercial policy on the prices of importables and exportables. It is well known that protection of the manufacturing sector penalizes agriculture. The decline in the importance of agriculture was due in considerable part to this policy, which was such an important element of the economic development strategy of the 1970s.

The accelerated growth of the money supply was accompanied by an increased rate of inflation, and an increase in the price of non-tradables, with a concomitant reduction in the profitability of the tradable sector. Given that the agricultural sector is largely open to foreign trade, it was affected significantly. The exchange rate and adjustment policies undertaken in 1981 and subsequently, had created an improved structure of incentives to which the agricultural sector responded with growth rates higher than they had been for almost 50 years.

The agricultural sector is of major importance in the generation of foreign exchange, employment, food production, and in the incomes of rural households, where poverty in Ecuador is concentrated. In the formulation of over-

all economic policy, the consequences for the agriculture must therefore be taken into account. In spite of sectoral policies apparently directed at the needs of agriculture in the 1970s, it is probable that any resulting gains were negated by the indirect effects of macroeconomic policies. The results of this study demonstrate and quantify the magnitude of this impact on the capacity of the agricultural sector to maintain an adequate rate of growth.

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## RESUMEN

El crecimiento del sector agropecuario refleja los efectos tanto de políticas específicas para la agricultura como de políticas económicas globales. Estas políticas macroeconómicas son reconocidas cada vez más como responsables principales de la evolución de la agricultura en América Latina.

Este estudio analiza la influencia de las políticas macroeconómica, arancelaria, y de tasa de cambio en la producción del sector agropecuario en el Ecuador. El tema principal es la tasa de cambio real, la cual se define como el precio de bienes comerciables relativo a los bienes no-comerciables. El trabajo analiza la respuesta de la producción agropecuaria a la tasa de cambio real de 1960 a 1986.

Los resultados indican que la producción del sector fue fuertemente penalizada, tanto que hubiera sido tres veces mayor si las políticas macroeconómicas hubiesen sido más favorables. Se llevó a cabo una serie de simulaciones para estimar el impacto sobre los precios de importables y exportables de cambios en el consumo público, el crecimiento del sector monetario, la balanza externa y la política comercial. Es bien sabido que la protección al sector manufacturero penaliza la agricultura. La declinación de la importancia de la agricultura se debió en gran parte a esa política, que fue un elemento clave de la estrategia de desarrollo de los años 1970.

El crecimiento acelerado del medio circulante estuvo acompañado por un incremento en la tasa de inflación, y de un aumento en el precio de los bienes no-comerciables, con una consecuente reducción en la rentabilidad del sector de comerciables. Las políticas de ajuste y de tasa de cambio tomadas a partir de 1981 crearon una mejorada estructura de incentivos, a la cual el sector agropecuario respondió con tasas de crecimiento mayores que las de los últimos 50 años.

El sector agropecuario es de mucha importancia en la producción de alimentos y en la generación de divisas, de empleo, y de ingreso en los hogares rurales, en los cuales se concentra la pobreza en el Ecuador. Al formular la política

macroeconómica, deben tomarse en cuenta las consecuencias para el sector agropecuario. A pesar de las políticas orientadas a la agropecuaria en la década de 1970, es probable que los resultados favorables fueron anulados por los efectos indirectos de las políticas macroeconómicas. Los resultados de este estudio cuantifican la magnitud de estos efectos en la capacidad de la agricultura de mantener una adecuada tasa de crecimiento.

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## 1. INTRODUCTION

Since the beginning of the 1980s, Ecuador has faced extremely complex choices concerning the performance and growth of the economy. Natural disasters have compounded the problems stemming from volatile world commodity prices. Recovery from the impact of both the global recession in 1982-83, and the rise in international real interest rates, has been hampered by the dramatic decline in petroleum prices since 1986.

Exogenous changes in world prices, in the weather patterns, in the demand for exports, and in access to foreign markets have unquestionably influenced the country's economic performance. Recent declines in the unit prices received by Ecuador for petroleum, coffee, shrimp and cocoa have been dramatic (Banco Central, 1988, p.42). Any interpretation of Ecuador's recent economic history which fails to recognize these factors would be seriously inadequate.

These random shocks to the Ecuadorean economy are by no means a recent phenomenon. The entire economic history of the country is punctuated with such events, reflecting the long-standing importance of international trade. Successive waves of economic growth have been interspersed with periods of severe adjustment or recession, principally as commodity prices have fluctuated in international markets. Rather than acquiring a more diversified portfolio of export oriented commodities, the country's economic history has been characterized by successive periods of dominance and decline of individual commodities.

This dominance of individual commodities continued to characterize Ecuadorean exports, with the massive rise in petroleum production and exports starting in 1972. Rather than diversify the export portfolio, petroleum came to dominate export earnings, making domestic economic management even more susceptible to the vagaries of world markets.

It is clear that in interpreting the economic record of Ecuador, these random forces, which have buffeted the economy both favorably and unfavorably, must be given due regard. But at the same time, it would be unduly

simplistic to rely solely on these factors to explain economic performance. Evidence from many countries and time periods suggests that such measures as the rate of growth in income, the size and composition of the tradable goods sector, the levels of inflation and unemployment, and the relative rates of growth of different sectors of the economy, are systematically related to the economic policies which are adopted. Furthermore, while economic policies are an important determinant of long-run trends in economic performance, they also condition the nature and magnitude of the economy's response to the unanticipated short term random shocks in output and prices.

In short, both the long term performance of the economy, and the way it adjusts to short term shocks, are fundamentally related to the nature of prevailing economic policies. In this paper, we focus on the performance of the agricultural sector in the context of the mix of economic policies that were adopted in Ecuador. The next section provides a sketch of the nature of economic policies in relation to the agricultural sector, which is followed by a capsule view of the performance of the agricultural sector in Ecuador. This leads to a discussion of the real exchange rate as the central variable in the model. The results are given in the following section. The model is subsequently used to simulate the effect of a range of macroeconomic and trade policies on the relative output of the agricultural sector.

## **2. AGRICULTURE AND ECONOMIC POLICY**

In the past, it was customary to focus attention on the agricultural policies of a country when examining the impact of policies on the performance of the agricultural sector. Broadly speaking, these sector specific policies could be classified as either expenditure or incentive policies (Valdés, 1986, p.161).

While the distinction is sometimes blurred, government expenditure policies typically embrace investments in storage, transport, electrification, irrigation and drainage, and agricultural research.

In contrast a range of policies is used to alter the economic incentives facing the sector, including measures such as minimum producer price schemes, subsidized credit or crop insurance, taxes or subsidies on inputs (eg

machinery and fertiliser), together with interventions in agricultural trade. In Ecuador, this latter category has included such policies as a ban on imports of soya, quotas on the import of maize as a feed grain, state control on the exports of rice, subsidies to the export of non-traditional agricultural products, and the subsidized import of wheat and milk powder.

In order to interpret the relative performance of one crop versus another, or to explain the better performance of the livestock sector relative to the output of traditional highland cereals and tubers, these sector specific policies, either as expenditure or incentive policies, are often of considerable importance. The growth of Ecuadorean rice production relative to, say, wheat, must surely reflect on one hand the deliberate channeling of resources to infrastructural investments for rice, and the flow of credit at negative real interest rates, while on the other hand the subsidized import of wheat. A deliberate government policy to offer a higher price to foreign wheat growers than to Ecuadorean producers will inevitably result in a decline in domestic output.

In contrast to this focus on the role of policies designed specifically for the agricultural sector, it has become increasingly evident that the performance of the sector is greatly influenced by economy wide policies (Garcia, 1981; Schuh, 1976, 1986 and 1987; Orden, 1986; Lambert, 1986). In fact, it may often be the case that any impact of a sector specific policy is negated by the broader set of economic policies adopted by the country which have "unintentional" consequences for agriculture. Subsidized credit or under-priced irrigation water for rice production may constitute no more than partial compensation to domestic rice producers for the penalty imposed on them by, for example, the costs of their inputs inflated by the tariff protection accorded to the domestic manufacturing sector.. Alternatively, the economy wide policies which tend to penalize the agricultural sector (such as maintaining the sucre price of foreign currency below its market value) may accentuate the damage done to the sector through the imposition of export taxes on specific products. The historical taxation of exports of Ecuadorean coffee and cocoa is a case in point (Keeler, Scobie and Greene, 1987).

It is understandable that past analyses of agricultural performance in developing countries tended to focus principally on agricultural sector policies (and of course the implications of supposed changes in the external terms of

trade). The prevailing conditions and institutional arrangements prior to the early 1970s were such that it is conceivable (although debatable), that agricultural sector policies were, in some cases, of greater significance than macroeconomic policies in shaping the evolution of the agricultural sector.

There are a number of possible reasons for this. While the Bretton Woods accord was still operative nominal exchange rates were supposedly "fixed". Despite periodic adjustments that were often themselves destabilizing, there were periods when the prices of foreign currency were relatively stable. In addition, the volume of international trade and especially capital flows was very much smaller than today; prices on international markets were less volatile, and the transmission of the impacts of macroeconomic policy among countries was less complete than today. In short, the international economic environment in which a small open economy functions today, differs markedly from that prevailing for more than 25 years following the Second World War.

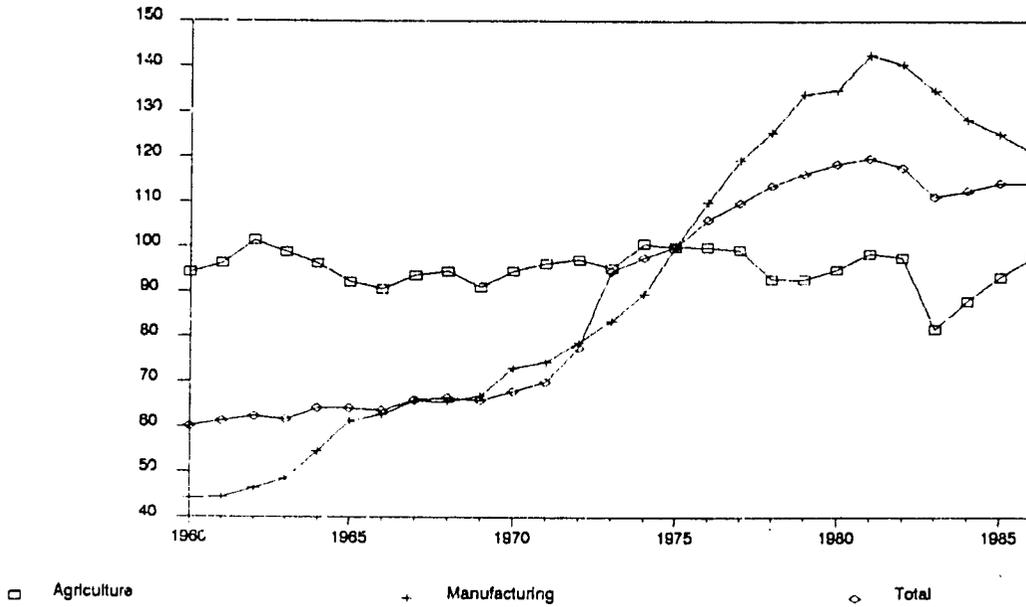
For this reason, the fundamental proposition on which this study is based is that the interpretation of the performance of the agriculture sector, relative to the rest of the economy, must be based on the influence of economy wide policies. Particular attention is focused on the influence of the commercial (trade), nominal exchange rate, and macroeconomic policies. An attempt is made to quantify these policies and to measure their impact on the real exchange rate, a crucial variable determining the incentives facing agriculture in a small open economy.

### **3. AGRICULTURAL PERFORMANCE IN ECUADOR**

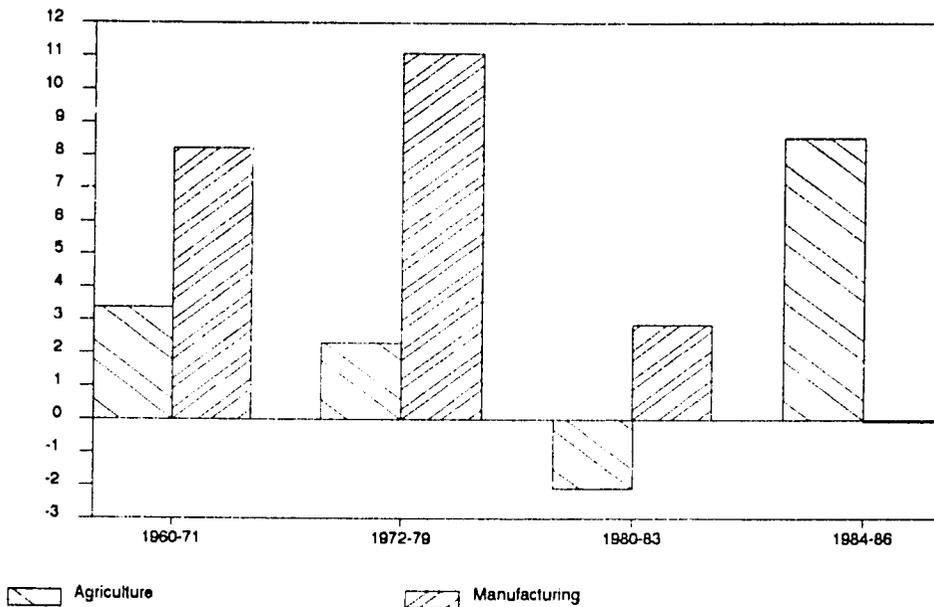
The performance of the agricultural sector in Ecuador has been poor for close to two decades. The growth in real output has been below that of other sectors in most years. Overall growth of agriculture has only just equalled the rapid rate of population growth (Table 1), with the consequence that output per capita today is virtually no higher than it was in 1960 (Figure 1).

Figure 2 shows the marked contrast in the growth rate of agriculture and manufacturing. Throughout the 1960s and 1970s the growth of agriculture was markedly below that of manufacturing. In part this reflected the deliberate

**Figure 1 : GDP per Capita for the Three Main Sectors  
(1975 = 100)**



**Figure 2 : Sectoral Growth - Agriculture and Manufacturing  
(Annual Average Percentage)**



policy choice to stimulate import competing industrialisation as a fundamental strategy of economic development in Ecuador. This policy was reinforced in the 1970s following the petroleum boom, and resulted in an accelerated rate of real growth for the manufacturing sector of around 11 percent annually.

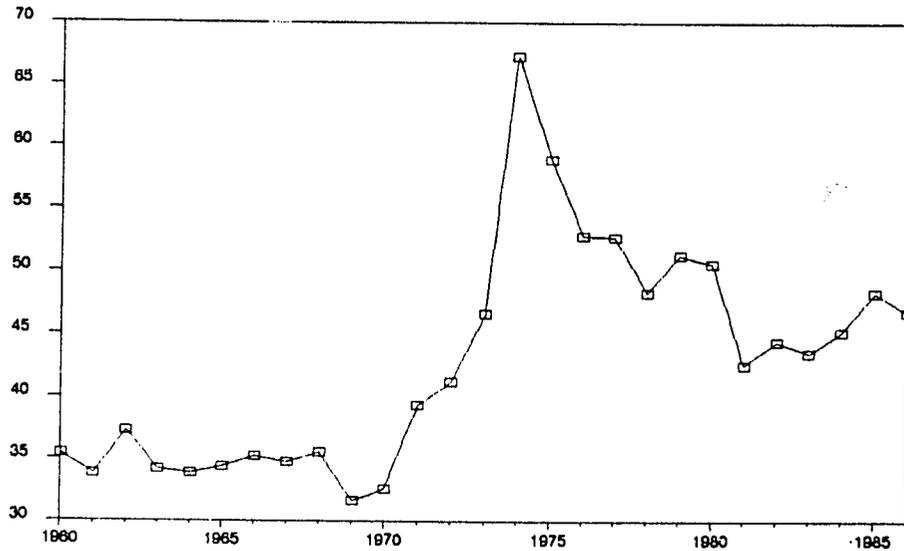
In contrast, despite an increase in public resources channelled to the agricultural sector in the form of subsidized credit and investment in infrastructure, agricultural growth fell to 2.3 percent per year, significantly below the rate of population growth. This in itself suggests that an explanation for the performance of the sector has to be sought outside the sphere of agricultural policy per se.

The 1980s brought a severe economic crisis with rising real international interest rates, a world recession with its attendant fall in the demand for Ecuador's exports and a sudden change in the access to foreign credit. In the agricultural sector this difficult situation was compounded by extreme climatic conditions in 1982-83. Starting in 1981, a whole series of significant policy changes were initiated. Predominant among these was the move to greater flexibility in nominal exchange rate policy, in domestic interest rate policy, and in commercial policy. The net effect of these changes was to create an economic environment that led to a notable recovery in agricultural growth in the period 1984-86 (Figures 1 and 2). The agricultural sector has in fact become the major source of economic growth in Ecuador, as manufacturing output has stagnated, and petroleum income has been dramatically reduced through falling world prices and the interruption to exports caused by the damage to the Trans-Andean pipeline in March, 1987.

Agricultural output grew faster in the period 1984-86 than in any other three year period in recent history. The troubled sector of the economy now assumes much greater importance than it did in the past and the recovery of agriculture is contributing to the expansion in foreign trade, which after the petroleum boom had slumped until 1981 (Figure 3).

However the record across different sub-sectors within agriculture continues to be mixed (Table 2). Differential policies by regions and crops with respect to trade taxes, the allocation of credit, the control of imports, investment

**Figure 3 : The Importance of Traded Goods - Imports and Exports  
(Percentage of GDP)**



in infrastructure, and input, producer and retail pricing have resulted in distortions to the pattern of growth of the various sub-sectors.

Of particular note is the poor performance of highland food crops whose output has declined as land was moved to pastures for livestock production and wheat imports were heavily subsidized. The consequences of these trends for income generation, employment, food prices and the dependency on imported foods are of serious concern.

In this paper, however, we focus on the broad pattern of agricultural growth relative to other sectors of the economy.

The central hypotheses to be examined are:

(a) that pattern of intersectoral growth can be explained by the structure of economic incentives, as encapsulated in a measure of relative prices facing the sectors; and

(b) that a broad range of macroeconomic policies play a predominant role in shaping the course of those key relative prices.

A simple model encompassing these propositions is set out in the following section.

It should be stressed that the analytical approach adopted here is one targeted very specifically to the two central hypotheses posed above. Given the nature of the model, one cannot analyze specific agricultural policies for parts of the sector. The effect of a support price for rice, a fertiliser subsidy, a new grain marketing system or a ban on soybean imports are all important and relevant policy issues for the sector. A single market (such as one used by Stewart et al, 1988) or a multi-market approach (as in Braverman et al, 1987) are appropriate tools for the analysis of agricultural policy. Furthermore, if one is concerned with distributional consequences, the computable general equilibrium framework, incorporating factor markets, (as reviewed by de Janvry and Sadoulet, 1987) may be a useful approach.

Our aim in this paper is more modest. Given the mounting body of evidence from other countries that trade and macroeconomic policies are important in determining the evolution of agriculture, it is argued that a test of this hypothesis for the case of Ecuador could be a useful contribution to the policy debate

#### **4. THE MODEL**

The central element of the model is the real exchange rate. This is defined as the price in domestic currency of tradable goods relative to that of non-traded or home goods. It is this relative price that determines the social profitability of agriculture (and other traded goods) in relation to all other goods and services. If this price shifts in favour of agriculture, returns to fixed factors within the sector will rise and encourage increases in agricultural investment and output. To achieve this labour and capital will have to be drawn from the non-traded goods sector, in the short run.

The fundamental distinction between tradable and non-tradable goods concerns the mechanism for price formation. The prices of home goods are determined by the interaction of market forces in the domestic economy, and are not directly influenced by developments in the rest of the world. In contrast, the domestic prices of traded goods are a reflection of world market conditions which determine the border price of exportables and importables, together with exchange rate and commercial policies which convert the border prices in foreign currency, to domestic prices received by domestic producers or paid by domestic consumers.

The real exchange rate (RER) is defined in the following manner:

$$D_h(P_h) - S_h(P_h) = 0 \quad (1)$$

$$P_t = E \cdot P_w \cdot (1 + T) \quad (2)$$

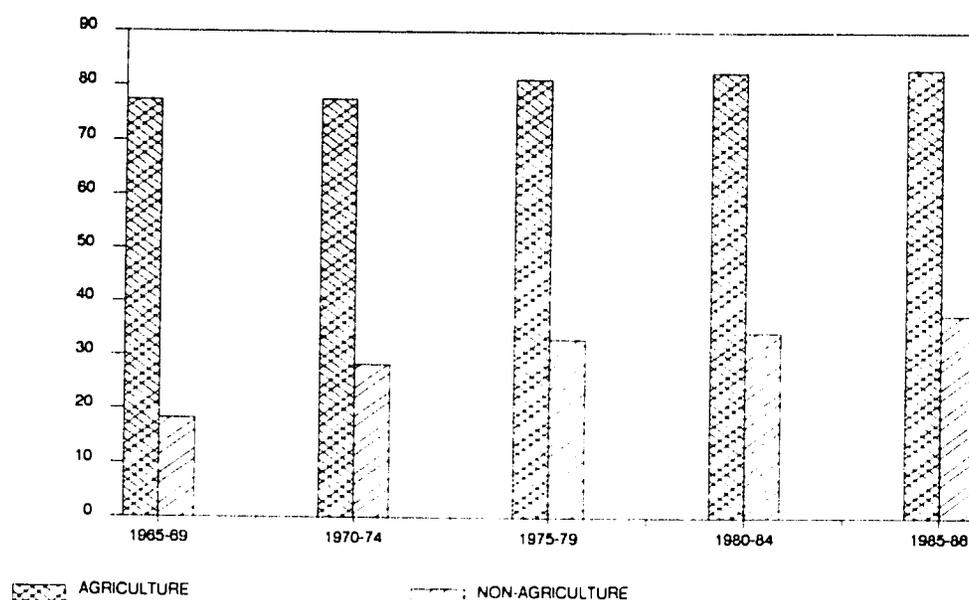
$$RER = P_t / P_h \quad (3)$$

where equation (1) specifies that the price of home goods ( $P_h$ ) is formed under the assumption that the excess demand is zero. Equation (2) describes the formation of the price of tradable goods based on the world price at the Ecuadorean border ( $P_w$ ), the nominal exchange rate ( $E$ ), and a variable ( $T$ ) capturing all the interventions in taxes and subsidies to traded goods.

The importance of the real exchange rate as the measure of relative sectoral profitability in agriculture stems from the highly open nature of the agricultural sector (Table 3). A very high proportion of total value added in agriculture comes from the production of tradable goods (Figure 4); in fact, it can be argued that there are virtually no home or non-traded agricultural goods in Ecuador, given the highly porous nature of the borders with Peru and Colombia. This fact is constantly in the minds of policy makers contemplating interventions which would create a disparity with prices of similar commodities in these neighbouring countries, and result in often politically sensitive, albeit economically rational episodes of "smuggling".

In contrast to agriculture, the rest of the economy (with the notable exception of the petroleum sector) is characterized by a very much lower proportion of economic activity coming from the tradable goods sector (Scobie and

**Figure 4: Share of Tradable Goods - Agriculture and Non-Agriculture**



Jardine, 1988a). For this reason whatever policy interventions or exogenous changes in Ecuador's economic circumstances alter the relative profitability of producing tradable goods (in other words the real exchange rate as defined in equation (3)), are likely to have a disproportionate effect on the agricultural sector.

The first equation of the model describes the formation of the real exchange rate. The studies by Cavallo and Dadone (1986), Cavallo, Cottani and Khan (1985), Edwards (1985) and the review by Valdés (1986) have been used to provide guidance as to the range and formulation of variables that could be expected to be important in explaining the real exchange rate in Ecuador. These are the international terms of trade (TOT), government consumption (CG), the current account balance (CAB), the monetary growth rate (MONEX), and trade policies, summarised as tariffs on importables ( $1 + t_m$ ) and taxes on exportables ( $1 - t_x$ ). The nature of their effects on the real exchange rate are discussed in greater detail below.

The relationship can be denoted as follows:

$$RER = f\{TOT, CG, CAB, MONEX, (1 + t_m), (1 - t_x)\} \quad (4)$$

where

**TOT** = the international terms of trade facing Ecuador, defined as the ratio of an index of import prices to an index of export prices, both in foreign currencies;

**CG** = government consumption expenditures as a ratio of GDP;

**CAB** = current account balance as a ratio of GDP;

**MONEX** = rate of expansion in M2 less the rate of change in the nominal exchange rate, corrected for the rate of international inflation and the rate of real income growth in Ecuador;

$(1 + t_m)$  = the average equivalent tariff on importables;

$(1 - t_x)$  = the average equivalent tax on exportables.

This formulation (which is highly reduced form in nature) encompasses elements of a number of approaches to exchange rate determination (Harberger, 1986) including the elasticities approach, the absorption approach and the monetary approach. The role of each of the independent variables is now discussed in turn.

### **Terms of Trade (TOT)**

An improvement in the terms of trade through higher export prices increases real income, and the resultant expansion in demand for all goods would raise the price of home goods, so reducing the real exchange rate. The substitution effect also acts to shift the demand away from exportables and toward home goods, reinforcing the income effect on the real exchange rate.

If on the other hand, TOT improves due to a fall in the border price of importables, then demand will switch to importables, while resources will move out of their domestic production. The level of imports will rise and the ensuing deficit on the current account will devalue the exchange rate. Note however that the income effect of the price fall will increase the demand for non-traded goods and the real exchange rate will fall. The net effect of the opposing price and income forces must be resolved empirically (Valdés, 1986). The question is further com-

pounded by allowing for the possibility that agents perceive the changes as temporary rather than permanent (Edwards, 1985). This distinction is not drawn in the current analysis.

### **Public Consumption (CG)**

An increase in CG (in relation to GDP) will result in a fiscal budget deficit, which starting from a position of sustainable equilibrium will cause domestic absorption to exceed real income, and leave a balance of payments deficit. To the extent that a decline in net foreign assets is used to finance this extra spending the RER will decline, penalizing the agricultural sector. The extent to which public sector imbalances have resulted in an increase in foreign liabilities in Ecuador is documented by Scobie and Jardine (1988a).

Following Rodriguez (1980), it is likely that public consumption expenditures are strongly biased toward home goods, and the excess demand for them is only eliminated through a fall in RER. As O'Mara et al. (1986) conclude "...the major role of the real exchange rate is to maintain equilibrium in the non-traded goods market in the presence of shifts in aggregate demand or absorption" (p.11). This effect would be reinforced if the government used inflationary tax financing to cover its deficits through expansion of the monetary base, the extent of which is analyzed by Scobie and Jardine (1988a). The expansion in public consumption spending in the 1970s resulted in a surge in demand for construction services, and a dramatic rise in the civil service wage bill. The rising wages resulted in a fall in the RER and a fall in the incentive to produce non-petroleum tradables.

### **Current Account Balance (CAB)**

The extended period of a deficit on the current account and its corollary, net capital inflows, are expected to have reduced the real exchange rate in Ecuador, and reduce the incentives for tradable goods production. The extent to which this occurs depends crucially on the propensity to spend on tradable goods. If all the income from capital flows were spent solely on tradables there would be no effect on the real exchange rate. A government using foreign loans to buy imported defense equipment would constitute such a case. However to the extent that inflows are associated with a rise in the excess demand for home goods, then the RER can be expected to appreciate.

### Monetary and Exchange Rate Policy (MONEX)

The construction of this variable follows from the demand ( $M_d$ ) and supply ( $M_2/P$ ) for real money balances. Equilibrium in the demand for real balances requires that

$$M_2 = P \cdot M_d(y, i) \quad (5)$$

where  $P$  is the domestic price level,  $y$  is real income and  $i$  the rate of interest. By defining MONEX as the proportionate increase in the excess supply of money balances,

$$\text{MONEX} = E(M_2) - \{E(P) + E(M_d)\} \quad (6)$$

where  $E$  is the logarithmic differential operator such that in general  $EX = d \ln X$ . If we now introduce four assumptions, viz. (a) that the income elasticity of demand for money balances is unitary; (b) that the law of one price holds; (c) that the interest elasticity of demand for money balances is zero; and (d) that the economy is dominated by traded goods, then it follows that (6) can be written as

$$\text{MONEX} = E(M_2) - \{E(P_w) + E(E_n) + E(y)\} \quad (7)$$

where  $P_w$  is a world price index, and  $E_n$  the nominal exchange rate. The variable MONEX then measures the excess rate of growth in the supply of money balances. When the Central Bank increases the monetary base at a rate such that  $E(M_2)$  exceeds the second term in (7), then there will be excess supply of money and a corresponding excess demand for goods. This will create upward pressure on the price of home goods, and the resultant excess inflation will appreciate the real exchange rate and penalize the production of agricultural and other tradable goods. Only when the growth of the money supply is matched by a combination of foreign inflation, real income growth and nominal devaluation will this tendency to appreciate the real exchange rate be eliminated.

### Commercial Policy ( $1 + tm$ ) and ( $1 - tx$ )

Commercial policies can take many different forms. Ecuador has employed a bewildering array of tariff barriers which have varied in coverage and intensity almost weekly; prior import deposits; taxes on exports; quotas or outright bans on imports; subsidies to non traditional exports and processing; special exchange payments and tax credit certificates to qualifying exporters. A detailed analysis of these policies and quantitative estimates for them is given in Keeler, Scobie and Greene (1987).

The standard analysis of the relation between tariffs and the exchange rate leads to the conclusion that the rise in the price of importables occasioned by the introduction of tariffs will lead to a surplus in the balance of payments, and a rise in demand for non-traded substitutes, resulting in an appreciation of the real exchange rate when the price of home goods rises more than the price of tradables. The effect of export taxes (tx) is "...to move the exchange rate in the opposite direction, ie, they produce a real depreciation". (Cavallo and Dadone, 1986). The impact of tariffs needs closer examination when intermediate goods are introduced, and Edwards (1985) reviews the range of potential outcomes when there are three goods and two factors of production.

To the extent that increases in the price of importables are accompanied by "compensating" rises in wage levels and hence the price of home goods, then experience in other countries in Latin America suggests that there is little true protection afforded by import substituting industrialisation policies. The net effect is to act as a tax on the production of exportables, largely agricultural goods.

While Cavallo et al. (1986) include a single term to reflect trade policy, the present study has attempted to allow for the separate influence of tm and tx. The variables were constructed by dividing estimates of the effective exchange rates (Keeler, Scobie and Greene, 1937) which attempted to capture all the major elements of Ecuadorean commercial policy, by the nominal exchange rate, as, following Garcia Garcia (1981)

$$E_e = E_n.(1 + tm_1 + \dots + tm_M) \quad (8)$$

where  $tm_i, i = 1 \dots M$  are the series of tariff equivalents of each of the policy interventions altering the domestic relative price of importables. A similar expression applies to exportables. The data for the exchange rates and the implied trade taxes is given in Table 4.

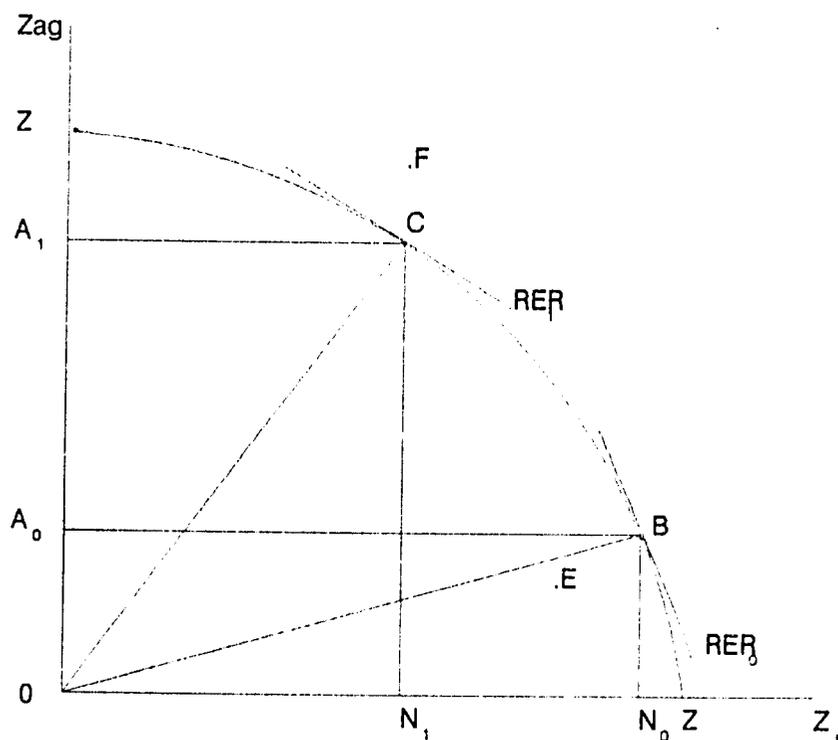
The second relationship in the model is given by

$$Z_{ag}/Z_{nt} = g(RER) \quad (9)$$

where  $Z_{ag}$  and  $Z_{nt}$  are the values added in agriculture and the non-traded sector of the economy. Details of the disaggregation of the national accounts for constructing this variable are given in Scobie and Jardine (1988b), while the data are shown in Table 5.

The implications of equation (9) can be depicted graphically. In Figure 5, the production possibilities frontier is given by  $ZZ$  and describes the possible combinations of  $Z_{ag}$  and  $Z_{nt}$  that can be produced. At an initial real exchange rate of  $RER_0$  the production point is at  $B (A_0, N_0)$ . If as a result of changes in the policies outlined above the real exchange rate were to rise to  $RER_1$  then the equilibrium production point would move to the point  $C (A_1, N_1)$ . Equation (9) describes the way in which the slope of the ray from the origin ( $OB$  or  $OC$ ) changes in response to movements in the  $RER$  induced by macroeconomic policies.

**Figure 5 : Intersectoral Output and the Real Exchange Rate**



As shown in Figure 5, the economy is always producing on the frontier ZZ. However if policies distort key domestic relative prices, it may well be that the economy is actually at some point such as E inside the frontier. Furthermore, with liberalisation that raises RER, the incentives for investment may be enhanced. Policies which have castigated the agricultural sector will have reduced the incentive for capital formation, and for the generation and adoption of new techniques for enhancing productivity. As a result, a sustained improvement in the intersectoral terms of trade will result in both a shift around the frontier, and an expansion of the frontier so that in effect the production point moves from E to a point such as F. In this study we focus on the shifts around the frontier as represented by the change in the slope of the ray from the origin.

## 5. THE RESULTS

The estimation involves fitting equations (4) and (9) by least squares. These two equations form a recursive system, which is characterised by a diagonal matrix on the parameters. As a consequence, the application of OLS to each of the structural equations generates estimates that are consistent and asymptotically efficient. This result follows provided that the disturbance terms are not correlated. To allow for this possibility, the equations were estimated using 2SLS. As the results were virtually identical, the OLS estimates are presented here.

The data for the estimation are given in Tables 4, 5 and 6. The equations were estimated with annual data for 1960 through 1985.

The data for 1986 were excluded, as estimates of the effective exchange rates on which the trade policy variables are based were not available. However in forming the predicted values of the dependent variables, the values of the trade policy variables for 1986 were set at their 1985 values. Where natural logarithms of the variables were used, the name of the variable is preceded by "ln". The consumption by the public sector (CG), and the current account balance (CAB), are both expressed as a percentage of GDP. The estimated equations (with t values in parentheses) are as follows:

**Dependent Variable: lnRER** R Squared = 0.65

Independent Variables, Estimated Parameters (t values)

Constant	-0.486	(-3.92)
lnTOT	-0.271	(-2.04)
lnCG	0.363	(-1.68)
CAB	0.031	(2.74)
MONEX	-0.005	(-2.15)
ln(1 + tm)	-0.851	(-2.12)
ln(1 - tx)	-0.606	(-1.07)

**Dependent Variable: ln(Zag/Znt)** R Squared = 0.76

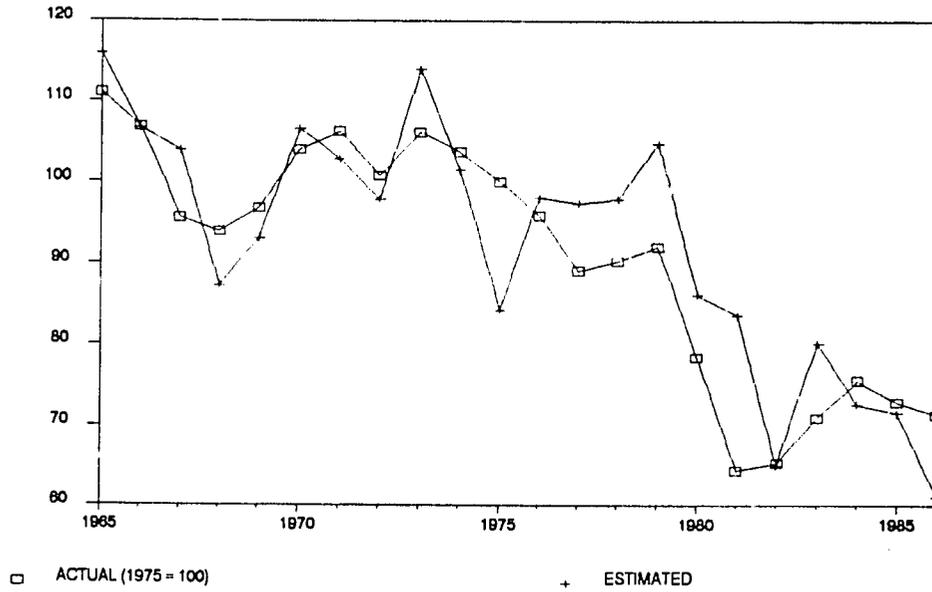
Independent Variables, Estimated Parameters (t values)

Constant	-0.908	(-5.34)
lnRER	1.645	(8.90)

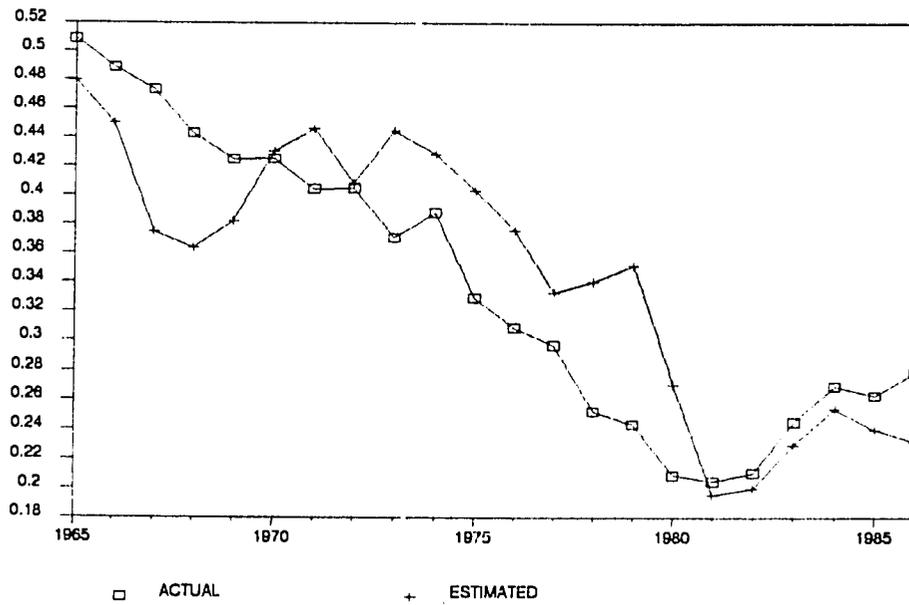
In order to explore the possibility that the response of the intersectoral output ratio might involve lags due to adjustment costs, and to allow for the possible effect on the current ratio of lagged values of the RER, a series of alternative formulations for the second equation were estimated. However, neither the lagged values of RER (for one or two years), nor the lagged dependent improved the overall results in terms of fit and significance.

In both equations, the independent variables have the expected sign and are statistically significant, with the exception of export taxes. The actual and projected values of the dependent variables are given in Tables 7 and 8, and shown graphically in Figures 6 and 7. These figures serve to highlight the dramatic fall in both the real exchange rate and the relative output of agriculture throughout the 1970s, and the recovery since the policy changes initiated in 1981.

**Figure 6 : Real Exchange Rate - Actual and Simulated**



**Figure 7 : Relative Output of Agriculture  
Tradables to Home Goods**



## 6. POLICY SIMULATIONS

This section explores the path of the real exchange rate, and through it, the relative output of agriculture, that would have prevailed had the policy mix been different. The policies that are considered are government consumption (CG), the current account balance (CAB), the rate of monetary growth (M2), and commercial policy.

An important caveat should be noted at the outset. These simulations are based on the standard procedure of setting all variables to some predetermined level and then varying the one of interest. In the case where the variables are truly independent, this is perfectly valid. However, it is clear that in the present case, given the reduced form nature of the model, this is not necessarily the case. For example, if the fiscal deficit is reduced there may well be changes in the rate of growth of the money supply. A richer specification of the key macroeconomic relations which form the underlying structure of the present model is needed. This remains part of the future research agenda.

The simulated values of each of these independent variables are given in Table 9. In general the values were changed starting in 1970, and set at levels that were typical of the preceding decade. In the case of public consumption expenditures, the simulated value was set at 11 percent of GDP (Figure 8). The value of CAB/Y was set at -4.5 percent, or its average for the 1960s (Figure 9). The rate of expansion of the nominal money supply (M2) was set at 12.2 percent annually, from the following regression estimated for 1960 to 1970:

$$\ln(M2) = -239.17 + 0.122 (\text{YEAR})$$

This rate of growth contrasts with an annual average rate between 1971 and 1986 of 22.2 percent (Figure 10). In the case of the trade interventions, it was assumed that free trade would prevail from 1970 implying a complete removal of all trade distortions.

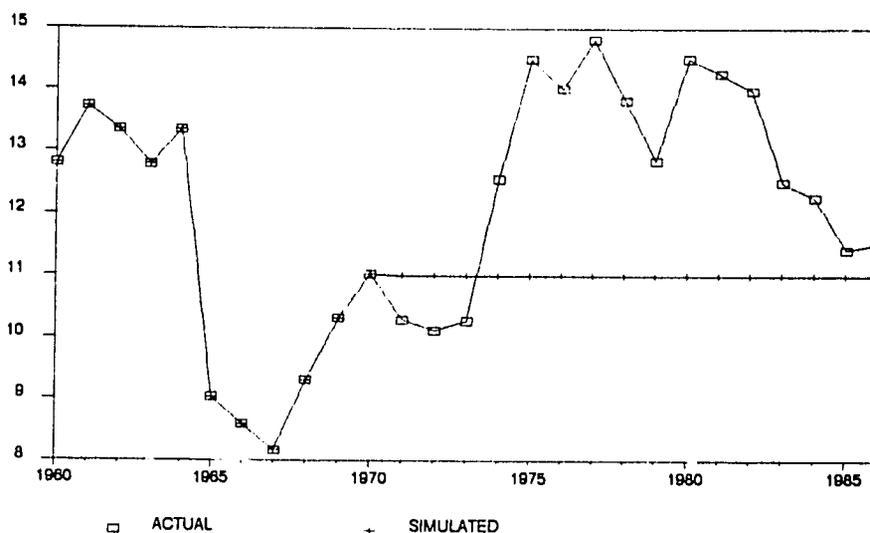
A summary of the simulation results is given Table 12 which shows the values of the ratio  $Z_{ag}/Z_{nt}$  for selected periods, under the various policy simulations. The percentage increases in the ratio are given in Table 13, while

Tables 14 and 15 show the absolute levels of agricultural GDP ( $Z_{ag}$ ) in real terms. These were computed by applying the ratios  $Z_{ag}/Z_{nt}$  under each of the simulated policies and using the actual values of  $Z_{nt}$ . Figure 21 summarises the ratio under the stable macroeconomic policy strategy, and shows that in contrast to the marked decline in the actual relative output of agriculture, the relative position could have been maintained had the economic policies not lead to a significant worsening in the terms of trade facing the sector.

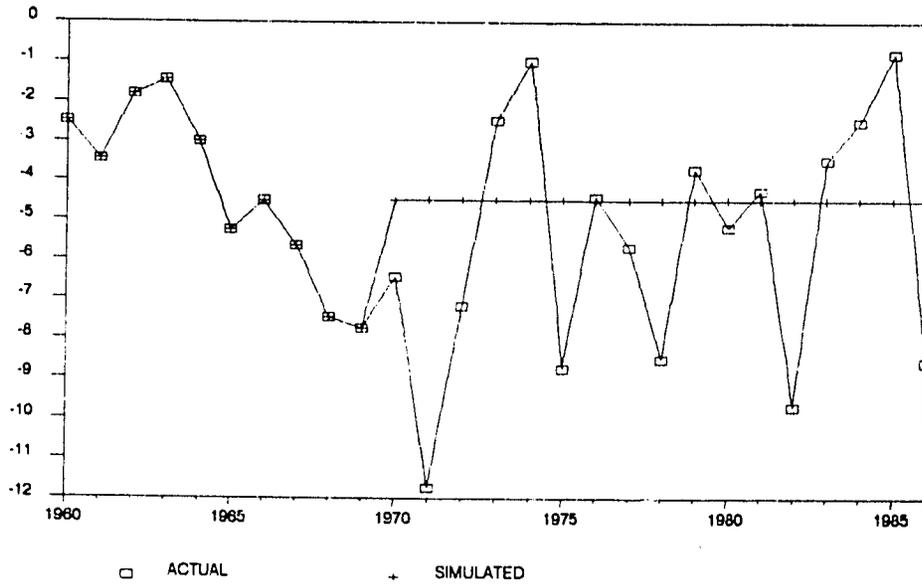
The impact of each of the policies was simulated in turn, and finally all were simultaneously imposed. For convenience this latter strategy is denoted as a "stable macroeconomic policy". The results of the simulations for the real exchange rate are given in Table 10, and in Figures 11 through 15. A corresponding set for the relative output of agriculture ( $Z_{ag}/Z_{nt}$ ) are found in Table 11 and Figures 16 through 20. In this latter set, the relative output using the predicted exchange rate from the first stage are included as a reference series.

The predicted and simulated values of real absolute agricultural GDP are given in Table 16. The predicted values are those from equation (9) found by inserting the predicted value of RER from equation (4). The simulated values were computed on the basis of applying all the simulated policy changes. The predicted output grew at an annual rate of 0.15 percent. On the other hand, real agricultural growth between 1970 and 1986 could have been over 5

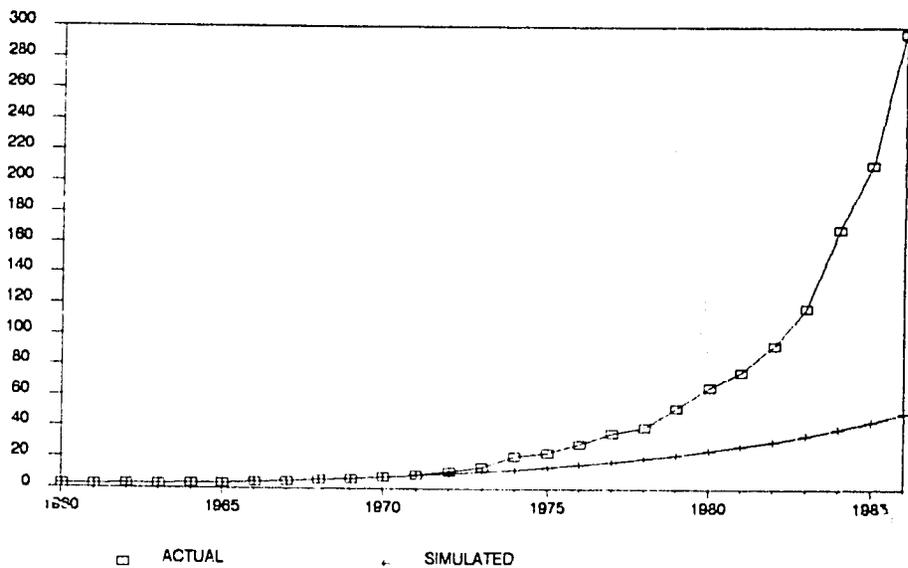
**Figure 8 : Public Consumption - Actual and Simulated Policies  
(percentage of GDP)**



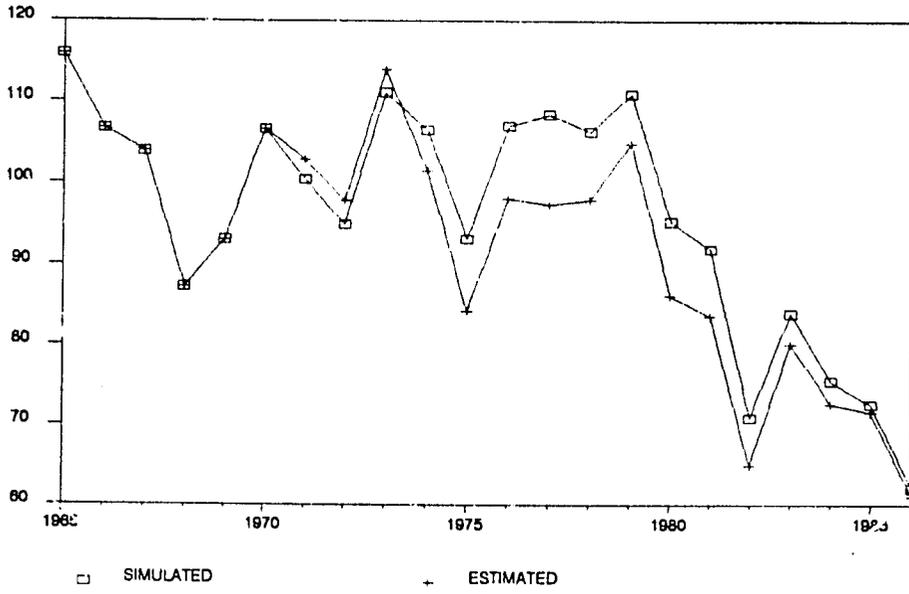
**Figure 9 : Current Account Balance -Actual and Simulated Policies  
(percentage of GDP)**



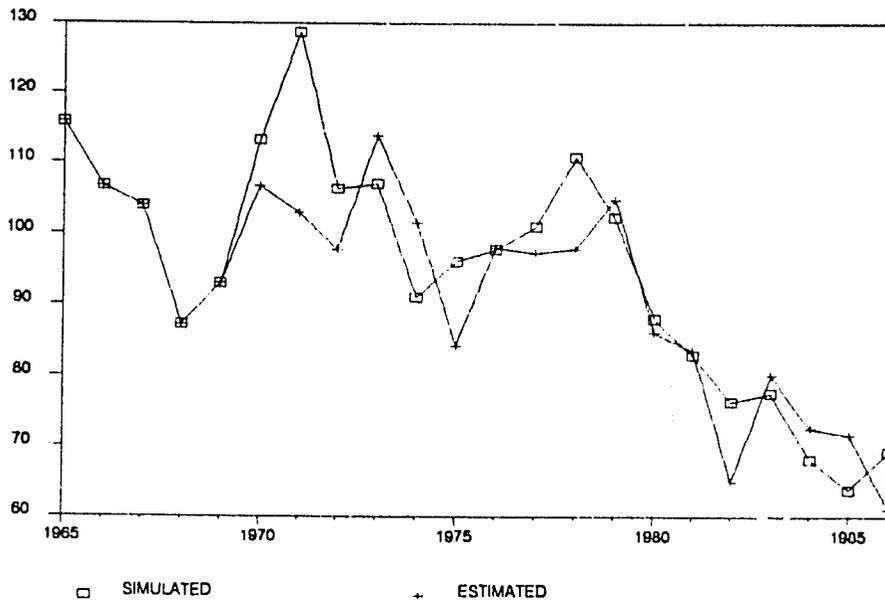
**Figure 10 : Money Growth Rates - Actual and Simulated  
(Billions of Sucres)**



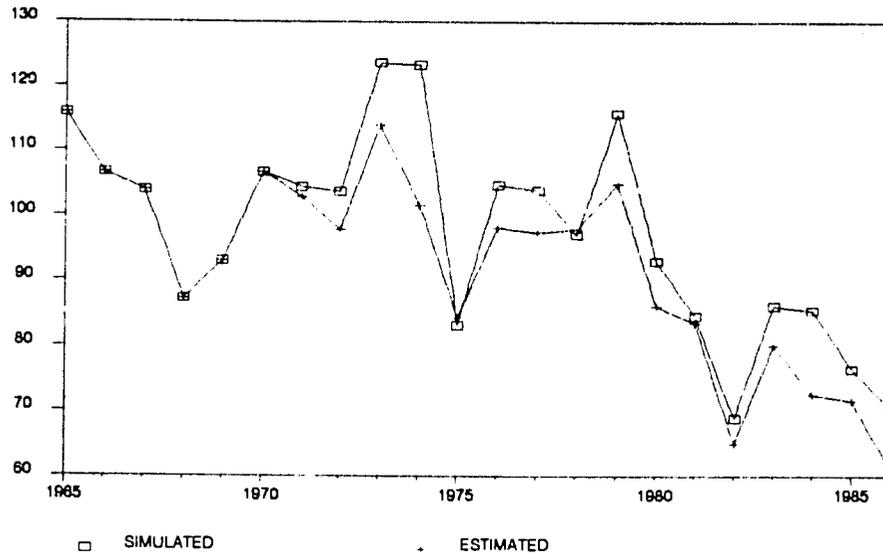
**Figure 11 : Real Exchange Rate  
with Stable Public Consumption**



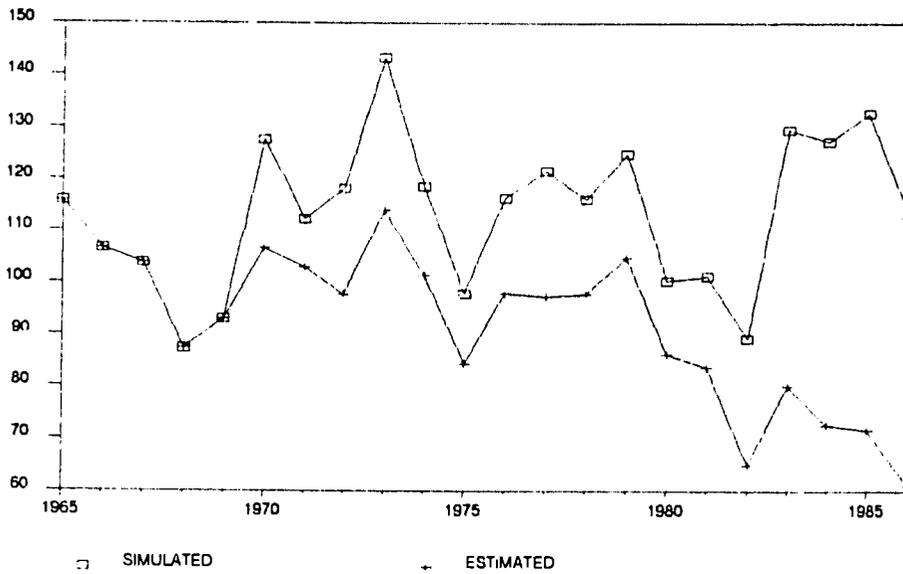
**Figure 12 : Real Exchange Rate  
with Stable Current Account Balance**



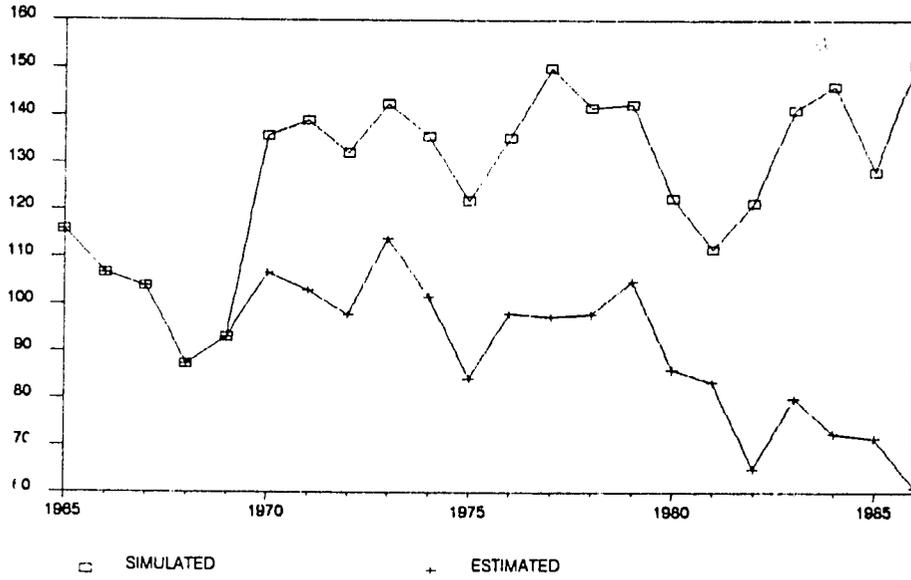
**Figure 13 : Real Exchange Rate  
with Stable Monetary Growth**



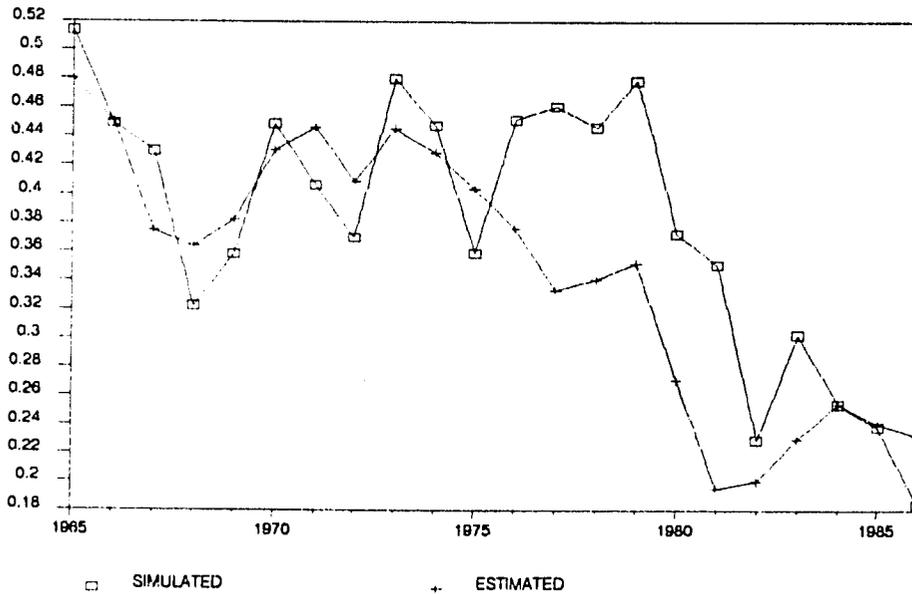
**Figure 14 : Real Exchange Rate  
with No Trade Restrictions**



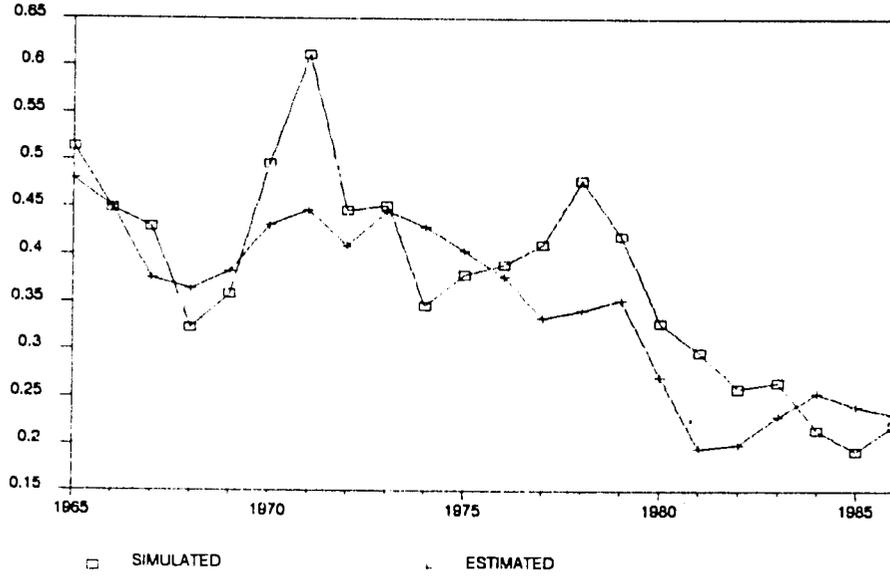
**Figure 15 : Real Exchange Rate  
with Stable Macroeconomic Policies**



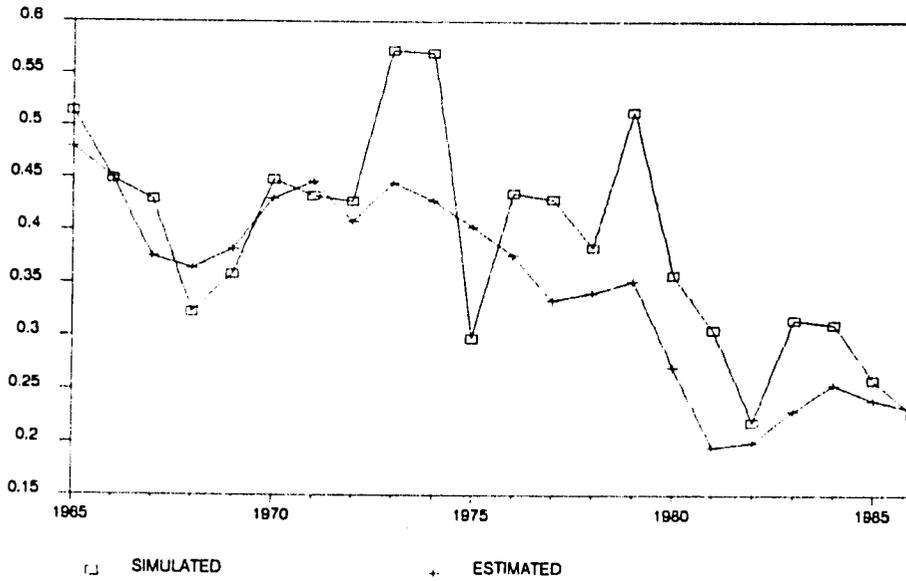
**Figure 16 : Relative Output of Agriculture with Stable Public Consumption  
(Tradable to Home Goods)**



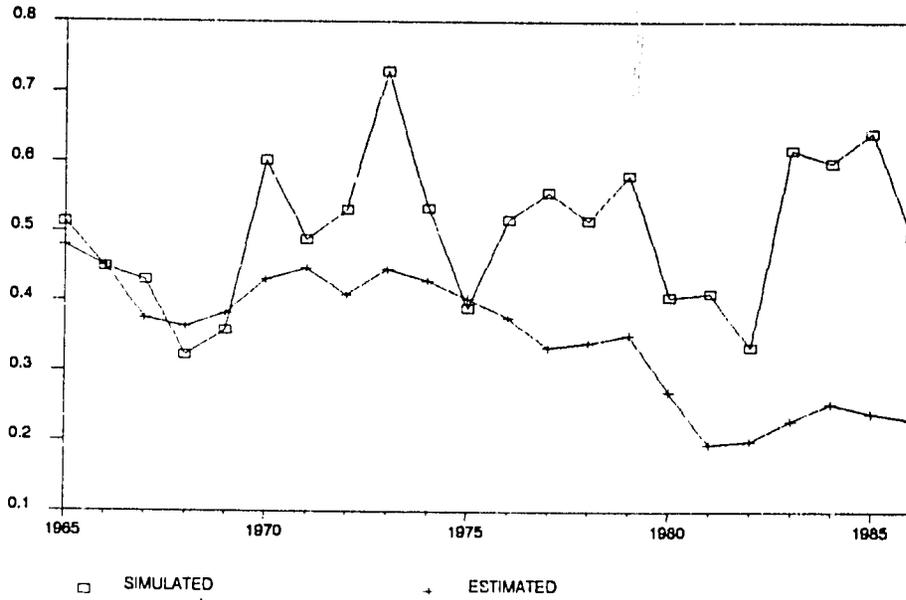
**Figure 17 : Relative Output of Agriculture with Stable Current Account Balance  
(Tradable to Home Goods)**



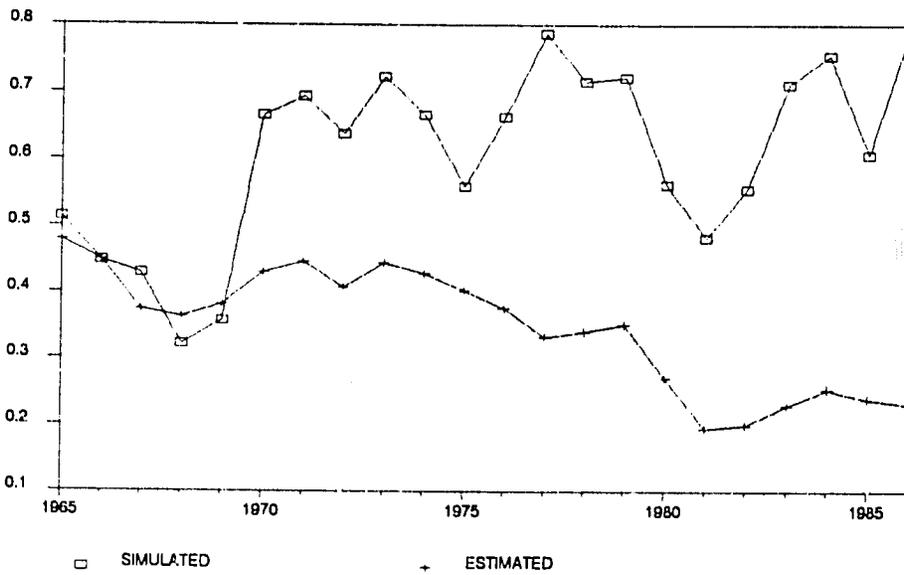
**Figure 18 : Relative Output of Agriculture with Stable Monetary Growth  
(Tradable to Home Goods)**



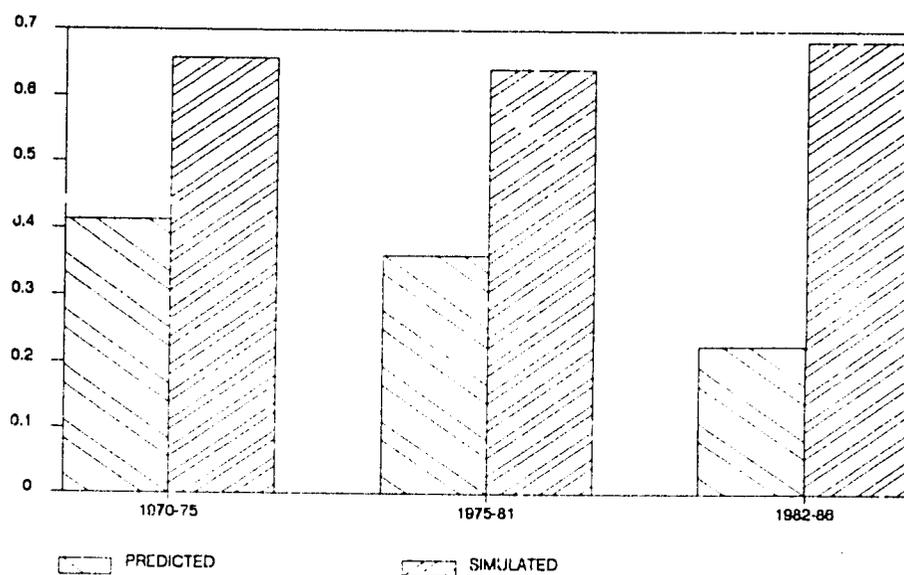
**Figure 19 : Relative Output of Agriculture with Stable Current Account Balance  
(Tradable to Home Goods)**



**Figure 20 : Relative Output of Agriculture with Stable Macroeconomic Policies  
(Tradable to Home Goods)**



**Figure 21 : Actual and Simulated Relative Output - Relative Performance of Agriculture (Zag/Znt)**



percent annually, had a more stable set of macroeconomic policies prevailed. Agriculture's share of total GDP, while still showing some decline would have remained at a very much higher level (Table 17).

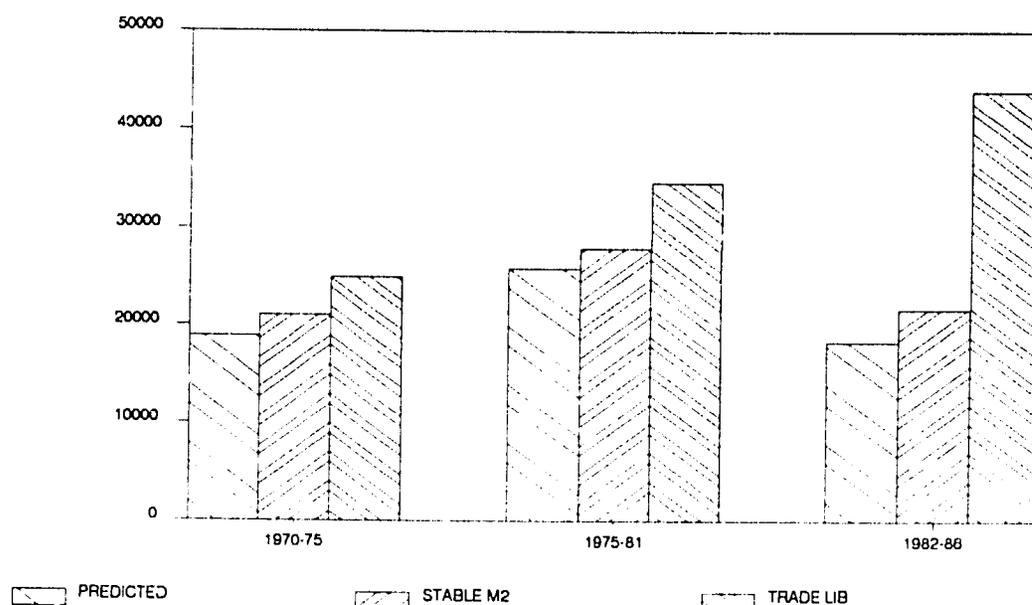
## 7. FURTHER TRADE POLICY SIMULATIONS

Of particular note is the severely depressing effect of trade policy. Trade liberalization would have resulted in a major absolute increase in real agricultural GDP (Figure 22). Because of the apparent importance of trade policy, further simulations were carried out. These were based on a steady phasing out of trade interventions over the period 1970 to 1986. Each year the import protection and export taxes were successively reduced so that by 1986 free trade prevailed. The simulated values for both  $(1 + t_m)$  and  $(1 - t_x)$  are given in Table 18, while the actual and simulated values of the import protection are shown in Figure 23.

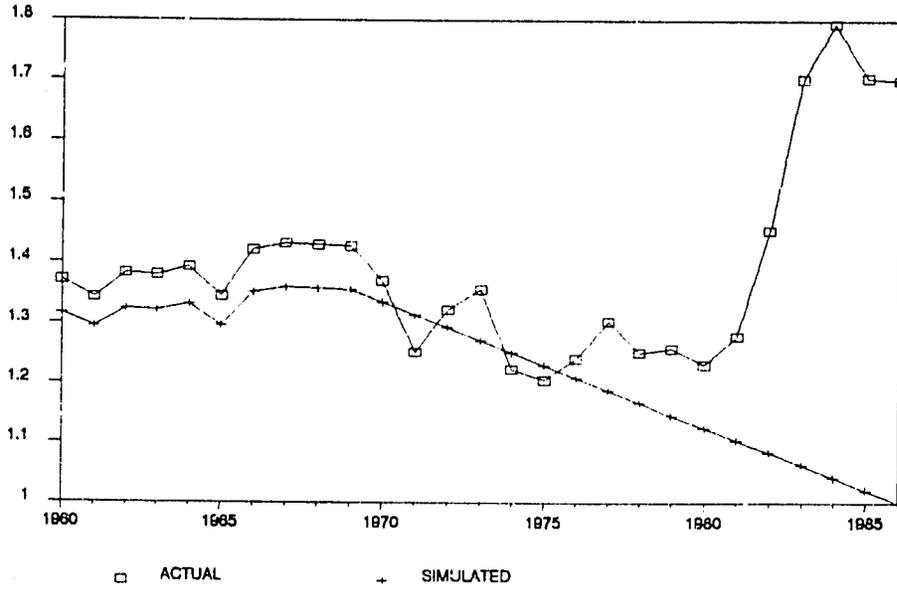
With this pattern of trade liberalization, the simulated value of the real exchange rate was computed, using the actual values of other independent variables. These values were then used to simulate the relative value added in agriculture, and compared with the predicted values from the estimating equations (Table 19). With this pattern of phased reduction in trade interventions, agricultural GDP would have increased almost threefold relative to value added in home goods, compared to the levels which actually prevailed.

The extent to which the import protection policies pursued by Latin American countries represents a tax on their agricultural sectors has been a topic that has received considerable attention, both theoretically and empirically (Sjaastad, 1980; Clements and Sjaastad, 1984). The present model can be used to throw some further light on this question for the case of Ecuador. The following question was posed: given the various macroeconomic policies that were pursued, what would the level of the import protection had to have been in order for the relative output of the agricultural sector to have been maintained?

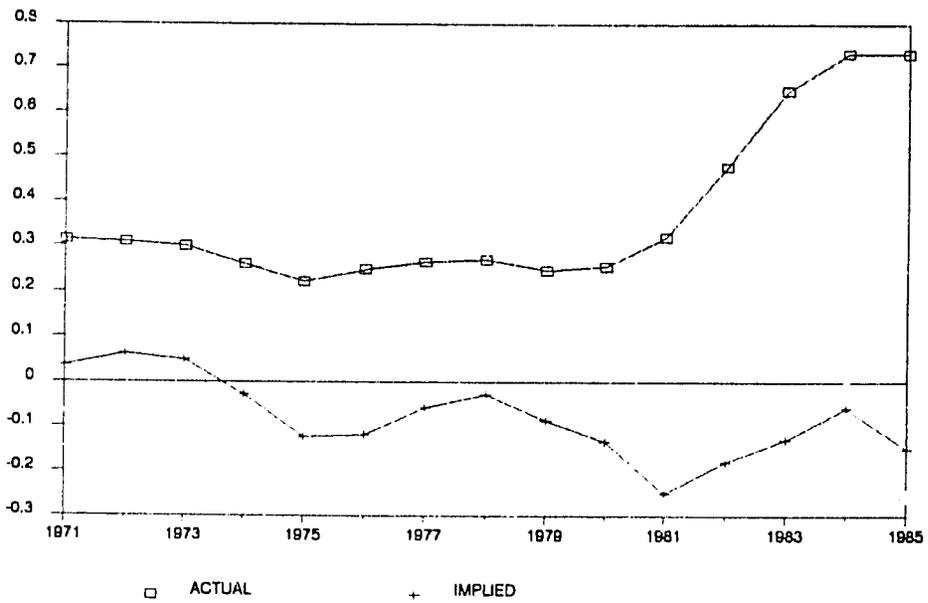
**Figure 22 : Value of Agricultural GDP - Predicted and Simulated (Millions of 1975 Sucres)**



**Figure 23 : Simulated Trade Policy  
Import Protection (1 + tm)**



**Figure 24 : Import Protection and Agriculture - Actual and Implied  
Three year Moving Average of tm**



The first step was to estimate the average value for 1960 -69 of  $Zag/Znt$ . This was found to be 0.587. The second step is to use the estimate of equation (9) to calculate the value of the real exchange rate which would have sustained this relative output for the agricultural sector. This was found to be 1.26 (or  $\ln RER = 0.228$ ). The estimated form of equation (4) can now be solved for the value of  $tm$  that would have been needed if the relative position of the sector were to have been sustained at the level prevailing in the 1960s.

The results are given in Table 20, and shown in Figure 24. As is clearly evident, the level of protection to importables would have had to have been negative, not positive and increasing over time. In other words, rather than an increasing level of positive protection, importables would have had to have been taxed (through subsidies to imports), rather than protected, in order for there to have been a neutral policy environment for the agricultural sector. The need for this was lessened in the years after 1981 as other policy elements became less discriminatory. But the conclusion is clear; agriculture, already burdened with other policies which discriminated against it, was further taxed by a policy of protecting importables, at the very time when reduced protection would have been called for.

## 8. CONCLUDING OBSERVATIONS

This paper has examined the influence of macroeconomic policy on the agricultural sector in Ecuador. The central variable has been the real exchange rate which represents the relative profitability of producing traded goods. As the agricultural sector comprises largely traded goods it is highly susceptible to changes in this rate. The impact of fiscal, monetary exchange rate and commercial policies for the exchange rate was analyzed. The relation between these exchange rate movements and the relative output of the agricultural sector formed the second step in a simple model. Through their influence on the real exchange rate, these macroeconomic variables were shown to explain much of the decline in the relative output of agriculture that occurred between 1971 and 1981.

Had the macroeconomic management been such as to avoid the sharp reduction in incentives to production facing the sector, real growth could have exceeded 5 percent annually between 1970 and 1986. Real output in 1986 would have been almost three times what was actually achieved. These estimates are conservative in the sense that they reflect responses to relative price movements around a given production possibility frontier. It is highly probable that a different structure of incentives involving less distortions would have had dynamic effects and led to greater investment in productive capacity. The impact on investment has not been explored here.

Nor have the implications for income distribution. This in no way implies that questions of factor markets, investment and growth are not viewed as crucial elements for policy analysis. In fact, these issues are being addressed within the Agricultural Sector Reorientation Project. The present study had more modest aims, and used a simple framework to examine the effect of trade and macroeconomic policies on the performance of agriculture in general, relative to other sectors.

This study has focused on the domestic policy elements, on the grounds that there is much that Ecuador can do to influence the relative sectoral incentives quite apart from changes in external circumstances. The marked discriminatory effect of commercial policy on agriculture demonstrated by the results in this study surely constitutes strong support for the proposition that domestic macroeconomic policy actions have a direct bearing on the performance of the sector.

However this in no way precludes the importance of world market conditions in altering the incentives for Ecuadorean agriculture, nor the role that the country should play in multilateral fora to seek the reduction of distortions to world agricultural trade imposed largely by the industrialized countries.

While there appeared to be a recovery in the conditions facing agriculture starting in 1981, the study uses annual data ending in 1986 and so encompasses a relatively short period. As argued by Whitaker and Alzamora (unpublished, 1988) there is a need to extend the work to cover recent changes in policy in the period 1986 to 1988. However, the significant decline in the relative output of agriculture over the 1970s is very consistent with the

hypothesis that the relative profitability of the sector had been eroded by the economic policies prevailing in that period.

In part this is reflected by the impact of the petroleum boom. But, as pointed out by Whitaker (pers. comm.), the decline in the relative importance of agriculture was already occurring in the 1960s as a result of growing protection to the agricultural sector. Further analysis is needed to disaggregate the impact of the industrial protection from the effect of the petroleum boom.

One of the major policy issues facing Ecuador is the management of unanticipated shocks to its economy. These come from a range of sources including natural and climatic phenomena, and changes in world commodity prices. For example, had the relatively short lived nature of the petroleum boom been envisaged in 1973, the country may have adopted a more judicious approach to burgeoning public consumption and foreign borrowing, such that key economic signals did not discriminate so strongly against the agricultural sector. This is not necessarily to imply the need for public policy intervention; there would be serious misgivings about the ability of bureaucrats to outperform private economic agents in their management of instability. It does suggest however that the public policy environment should be such as to give the economy the greatest degree of flexibility possible in order to adjust to these shocks. In addition to having implications for economic efficiency and equity, the country's economic development strategy conditions the range and magnitude of responses to variability. High dependence on imported raw materials, high levels of foreign debt, subsidies to imported food, fixed interest and exchange rates, controls on capital movements, and a reliance on petroleum taxation for a large part of public revenues are policies which have probably limited the economy's ability to respond to shocks. The extent to which this has added further to the disincentives for the tradable sector and agriculture specifically, remains an important item on the research agenda.

## TABLES

TABLE 1 : ECUADOR : ANNUAL AVERAGE RATES OF REAL GDP GROWTH: BY SECTOR : 1960 - 1986

SECTOR	Percent per Annum				
	1950-1986 %	1960-71 %	1972-79 %	1980-83 %	1984-86 %
1. Agriculture, Livestock, Fisheries	3.2	3.4	2.3	-2.1	8.5
2. Petroleum	-	-	18.3	9.7	7.9
3. Manufacturing	7.1	8.2	11.1	2.9	-0.0
4-9. Other Categories	5.1	4.8	9.3	-1.0	2.5
TOTAL GDP (at Market Prices)	5.6	4.6	9.1	0.7	3.7

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TABLE 2 : ECUADOR : GROWTH RATES OF AGRICULTURAL OUTPUT

Years	1975 Producer Prices				
	Traditional Exports %	Highland Food Crops %	Coastal Crops %	Livestock Products %	Total %
1965-71	3.4	2.2	6.2	5.0	5.3
1972-79	0.1	-11.6	5.7	4.5	0.4
1980-83	-11.2	9.1	-11.5	2.5	-3.1
1984-86*	9.2	0.2	10.5	10.0	8.6
1980-86*	0.5	3.2	6.1	3.0	3.3
1965-86*	1.3	-2.2	6.3	4.6	2.9

\* Livestock 1966-1985

TABLE 3 : ECUADOR : AVERAGE PARTICIPATION OF TRADED GOODS

Period	SECTOR		TOTAL ECONOMY
	Agriculture	Non-Agriculture	
	%	%	%
1965-69	77.4	18.3	33.0
1970-74	77.6	28.3	38.9
1975-79	81.3	33.1	40.3
1980-84	82.5	34.5	40.5
1985-86	83.2	37.6	43.3

TABLE 4 : EXCHANGE RATES (SUCRES PER \$US) and TRADE TAXES

YEAR	REAL RATE	OFFICIAL RATE	EQUIVALENT RATES		IMPLIED TRADE TAXES	
	(1975=100)		IMPORTS	EXPORTS	IMPORTS	EXPORTS
	Pt/Ph	En	Em	Ex	(1 + T <sub>m</sub> )	(1 - T <sub>x</sub> )
					Em/En	Ex/En
1960	105	15.0	20.6	15.0	1.37	1.00
1961	111	16.0	24.2	18.0	1.34	1.00
1962	118	18.0	24.9	18.0	1.38	1.00
1963	111	18.0	24.8	18.0	1.38	1.00
1964	116	18.0	25.1	18.0	1.39	1.00
1965	111	18.0	24.2	15.8	1.34	0.88
1966	107	18.0	25.6	16.0	1.42	0.89
1967	96	18.0	25.8	16.2	1.43	0.90
1968	94	18.0	25.7	16.4	1.43	0.91
1969	97	18.0	25.7	16.0	1.43	0.89
1970	104	20.9	28.6	18.1	1.37	0.87
1971	106	25.0	31.3	21.1	1.25	0.84
1972	101	25.0	33.1	23.1	1.32	0.92
1973	106	25.0	33.9	23.8	1.36	0.95
1974	104	25.0	30.6	24.4	1.22	0.97
1975	100	25.0	30.1	24.7	1.21	0.99
1976	96	25.0	31.0	24.5	1.24	0.98
1977	89	25.0	32.6	24.9	1.30	1.00
1978	90	25.0	31.3	24.2	1.25	0.97
1979	92	25.0	31.5	24.2	1.25	0.97
1980	78	25.0	30.8	24.1	1.23	0.96
1981	64	25.0	32.0	24.3	1.28	0.97
1982	65	30.0	43.6	30.0	1.45	1.00
1983	71	44.1	75.1	46.3	1.70	1.05
1984	76	62.5	112.2	69.5	1.79	1.11
1985	73	69.6	118.5	91.2	1.70	1.31

Source : Keeler, Scobie and Greene (1987)

TABLE 5 : GROSS DOMESTIC PRODUCT

YEAR	AGRICULTURE (Zag)	NON-TRADED (Znt)	GDP IMPLICIT DEFLATOR
	BILLIONS OF SUQUES		
1960	4112	7475	34.7
1961	4423	7961	35.1
1962	4891	8314	35.7
1963	5163	9084	37.9
1964	5351	10317	39.4
1965	5634	11072	40.9
1966	5961	12186	43.5
1967	6574	13887	45.5
1968	6847	15457	47.5
1969	7268	17100	51.0
1970	8386	19718	55.7
1971	9180	22700	59.9
1972	10535	26018	61.3
1973	12241	32988	64.9
1974	17377	44774	90.9
1975	19333	58716	100.0
1976	22614	73149	112.9
1977	27671	93094	132.7
1978	28499	112855	143.2
1979	31657	129885	166.3
1980	35570	170282	198.7
1981	41631	203065	227.2
1982	50356	239073	267.7
1983	73005	297509	371.3
1984	110003	407777	516.9
1985	147956	561435	676.8
1986	205641	737187	809.0

Source : Banco Central del Ecuador

TABLE 6 : BASIC FISCAL AND MONETARY DATA

YEAR	GROSS DOMESTIC PRODUCT (GDP)	GOVERNMENT CONSUMPTION (CG)	MONEY SUPPLY (M2)	CURRENT ACCOUNT BALANCE (CAB)	FOREIGN PRICE INDEX (MUV)
	BILLIONS OF SUQUES				
1960	14.13	1.81	2.20	-35	45.7
1961	15.08	2.07	2.38	-52	46.5
1962	16.10	2.15	2.68	-29	47.3
1963	17.43	2.23	2.85	-25	46.5
1964	19.41	2.59	3.20	-58	47.5
1965	20.72	1.87	3.29	-109	47.8
1966	22.59	1.94	3.85	-102	49.5
1967	25.24	2.05	4.46	-143	50.0
1968	27.41	2.55	5.56	-205	49.7
1969	30.15	3.11	6.30	-234	52.2
1970	35.02	3.86	7.74	-226	55.6
1971	40.05	4.12	8.83	-470	58.6
1972	46.86	4.74	10.97	-337	63.7
1973	62.23	6.39	14.04	-153	73.9
1974	92.77	11.65	21.03	-91	90.0
1975	107.74	15.62	23.08	-945	100.0
1976	132.92	18.63	28.82	-587	101.4
1977	166.39	24.66	35.96	-947	111.5
1978	191.35	26.45	39.74	-1630	128.2
1979	233.95	30.03	52.18	-856	145.2
1980	293.34	42.56	66.17	-1527	159.2
1981	348.67	49.74	75.70	-1484	160.0
1982	415.71	58.15	93.63	-4036	157.8
1983	560.27	70.06	118.01	-1935	153.7
1984	812.63	99.63	169.28	-2012	151.0
1985	1111.67	126.97	211.42	-861	152.9
1986	1366.31	157.40	295.81	-11737	163.9

Source : Scobie and Jardine (1988a)  
MUV = unit value of manufactured exports from developed to  
developing countries (World Bank, unpublished data)

TABLE 7 : ACTUAL AND PREDICTED VALUES OF THE REAL EXCHANGE RATE

YEAR	REAL EXCHANGE RATE	
	ACTUAL	PREDICTED
1960	105.06	102.45
1961	111.16	107.03
1962	117.94	96.36
1963	111.07	94.77
1964	115.81	95.52
1965	111.07	115.83
1966	105.87	106.69
1967	95.60	103.90
1968	93.90	87.25
1969	96.74	93.03
1970	104.02	105.65
1971	106.31	102.89
1972	100.75	97.80
1973	106.18	113.94
1974	103.74	101.49
1975	100.00	84.22
1976	95.83	98.04
1977	89.04	97.31
1978	90.24	97.87
1979	92.02	104.83
1980	78.49	86.14
1981	64.35	83.59
1982	65.31	64.98
1983	71.01	86.11
1984	75.57	72.61
1985	72.97	71.63
1986	71.43	61.04

TABLE 8 : ACTUAL AND PREDICTED VALUES OF THE RELATIVE OUTPUT OF AGRICULTURE

YEAR	ACTUAL (Zag/Znt)	PREDICTED VALUES USING		3 YEAR MOVING AVERAGE OF PREDICTED VALUES USING PREDICTED REAL EXCHANGE RATE
		ACTUAL REAL EXCHANGE RATE	PREDICTED REAL EXCHANGE RATE	
1960	0.55	0.44	0.42	
1961	0.55	0.48	0.45	0.42
1962	0.59	0.53	0.38	0.40
1963	0.57	0.48	0.37	0.37
1964	0.52	0.51	0.37	0.42
1965	0.51	0.48	0.51	0.45
1966	0.49	0.45	0.45	0.46
1967	0.47	0.37	0.43	0.40
1968	0.44	0.36	0.32	0.37
1969	0.43	0.38	0.36	0.38
1970	0.43	0.43	0.45	0.41
1971	0.40	0.45	0.42	0.42
1972	0.40	0.41	0.39	0.44
1973	0.37	0.45	0.50	0.43
1974	0.39	0.43	0.41	0.41
1975	0.33	0.40	0.30	0.37
1976	0.31	0.38	0.39	0.36
1977	0.30	0.33	0.39	0.39
1978	0.25	0.34	0.39	0.40
1979	0.24	0.35	0.44	0.38
1980	0.21	0.27	0.32	0.35
1981	0.21	0.20	0.30	0.27
1982	0.21	0.20	0.20	0.26
1983	0.25	0.23	0.28	0.24
1984	0.27	0.25	0.24	0.25
1985	0.26	0.24	0.23	0.22
1986	0.28	0.23	0.18	

TABLE 9 : SIMULATED VALUES OF INDEPENDENT VARIABLES

YEAR	GOVERNMENT CONSUMPTION (CG/Y)	CURRENT ACCOUNT BALANCE (CAB/Y)	MONEY SUPPLY (M2)	TRADE TAXES	
				IMPORTS (1+tm)	EXPORTS (1-tx)
1960	12.81	-2.48	2.20	1.37	1.00
1961	13.73	-3.45	2.38	1.34	1.00
1962	13.35	-1.80	2.68	1.38	1.00
1963	12.79	-1.43	2.85	1.38	1.00
1964	13.34	-2.99	3.20	1.39	1.00
1965	9.03	-5.26	3.29	1.34	0.88
1966	8.59	-4.52	3.85	1.42	0.89
1967	8.16	-5.67	4.46	1.43	0.90
1968	9.30	-7.48	5.56	1.43	0.91
1969	10.32	-7.76	6.30	1.43	0.89
1970	11.02	-6.45	7.74	1.00	1.00
1971	11.00	-4.50	8.68	1.00	1.00
1972	11.00	-4.50	9.74	1.00	1.00
1973	11.00	-4.50	10.94	1.00	1.00
1974	11.00	-4.50	12.28	1.00	1.00
1975	11.00	-4.50	13.78	1.00	1.00
1976	11.00	-4.50	15.46	1.00	1.00
1977	11.00	-4.50	17.36	1.00	1.00
1978	11.00	-4.50	19.48	1.00	1.00
1979	11.00	-4.50	21.86	1.00	1.00
1980	11.00	-4.50	24.54	1.00	1.00
1981	11.00	-4.50	27.54	1.00	1.00
1982	11.00	-4.50	30.92	1.00	1.00
1983	11.00	-4.50	34.70	1.00	1.00
1984	11.00	-4.50	38.95	1.00	1.00
1985	11.00	-4.50	43.71	1.00	1.00
1986	11.00	-4.50	49.06	1.00	1.00

TABLE 10 : ACTUAL AND SIMULATED VALUES OF THE REAL EXCHANGE RATE

YEAR	ACTUAL EXCHANGE RATE 1975=100	UNDER SIMULATED POLICIES				TRADE POLICY	ALL POLICIES
		GOVERNMENT CONSUMPTION	CURRENT ACCOUNT	EXCESS MONEY SUPPLY	TRADE POLICY		
1960	105.06	102.45	102.45	102.45	102.45	102.45	
1961	111.16	107.03	107.03	107.03	107.03	107.03	
1962	117.94	96.36	96.36	96.36	96.36	96.36	
1963	111.07	94.77	94.77	94.77	94.77	94.77	
1964	115.81	95.52	95.52	95.52	95.52	95.52	
1965	111.07	115.83	115.83	115.83	115.83	115.83	
1966	106.87	106.69	106.69	106.69	106.69	106.69	
1967	95.60	103.90	103.90	103.90	103.90	103.90	
1968	93.90	87.25	87.25	87.25	87.25	87.25	
1969	96.74	93.03	93.03	93.03	93.03	93.03	
1970	104.02	106.65	113.30	106.65	127.64	135.60	
1971	106.31	100.42	128.73	104.35	112.88	139.02	
1972	100.75	94.87	106.30	103.64	118.23	132.10	
1973	106.18	111.13	106.96	123.68	143.37	142.49	
1974	103.74	106.49	91.02	123.35	118.57	135.60	
1975	100.00	93.09	96.12	83.14	97.91	121.94	
1976	95.83	107.05	97.79	104.68	116.34	135.27	
1977	89.04	108.43	100.97	103.88	121.61	150.07	
1978	90.24	106.32	110.83	96.99	116.21	141.70	
1979	92.02	110.94	102.27	115.75	124.90	142.39	
1980	78.49	95.24	88.04	92.93	100.43	122.43	
1981	64.35	91.86	82.96	84.54	101.26	111.69	
1982	65.31	70.89	76.34	68.96	89.27	121.46	
1983	71.01	83.93	77.56	86.08	129.59	141.22	
1984	75.57	75.52	68.20	85.40	127.30	146.27	
1985	72.97	72.62	63.83	76.51	132.80	128.12	
1986	71.43	62.07	69.28	70.49	113.16	150.82	

TABLE 11 : SIMULATED RELATIVE PERFORMANCE  
OF THE AGRICULTURAL SECTOR (Zag/Znt)

YEAR	UNDER SIMULATED POLICIES					3 YEAR MOVING AVERAGE	
	GOVERNMENT CONSUMPTION	CURRENT ACCOUNT	EXCESS MONEY SUPPLY	TRADE POLICY	ALL POLICIES	SIMULATED WITH ALL POLICIES	PREDICTED USING PREDICTED REAL EXCHANGE RATE
1960	0.42	0.42	0.42	0.42	0.42		
1961	0.45	0.45	0.45	0.45	0.45		
1962	0.38	0.38	0.38	0.38	0.38	0.42	0.42
1963	0.37	0.37	0.37	0.37	0.37	0.40	0.40
1964	0.37	0.37	0.37	0.37	0.37	0.37	0.37
1965	0.51	0.51	0.51	0.51	0.51	0.42	0.42
1966	0.45	0.45	0.45	0.45	0.45	0.45	0.45
1967	0.43	0.43	0.43	0.43	0.43	0.46	0.46
1968	0.32	0.32	0.32	0.32	0.32	0.43	0.40
1969	0.36	0.36	0.36	0.36	0.36	0.37	0.37
1970	0.45	0.50	0.45	0.60	0.67	0.45	0.38
1971	0.41	0.61	0.43	0.49	0.69	0.57	0.41
1972	0.37	0.45	0.43	0.53	0.64	0.67	0.42
1973	0.48	0.45	0.57	0.73	0.72	0.63	0.44
1974	0.45	0.35	0.57	0.53	0.67	0.63	0.43
1975	0.36	0.38	0.30	0.39	0.56	0.65	0.41
1976	0.45	0.39	0.43	0.52	0.66	0.63	0.37
1977	0.46	0.41	0.43	0.56	0.79	0.67	0.36
1978	0.45	0.48	0.38	0.52	0.72	0.72	0.39
1979	0.48	0.42	0.51	0.58	0.72	0.74	0.40
1980	0.37	0.33	0.36	0.41	0.56	0.67	0.38
1981	0.35	0.30	0.31	0.41	0.48	0.59	0.35
1982	0.23	0.26	0.22	0.33	0.56	0.53	0.27
1983	0.30	0.27	0.32	0.62	0.71	0.58	0.26
1984	0.25	0.21	0.31	0.60	0.75	0.67	0.24
1985	0.24	0.19	0.26	0.64	0.61	0.69	0.25
1986	0.18	0.22	0.23	0.49	0.79	0.72	0.22

TABLE 12 : SUMMARY OF THE RELATIVE PERFORMANCE OF AGRICULTURE UNDER SIMULATED POLICIES (Zag/Znt)

YEAR	PREDICTED USING PREDICTED REAL EXCHANGE RATE	SIMULATED POLICIES				
		GOVERNMENT CONSUMPTION	CURRENT ACCOUNT	EXCESS MONEY SUPPLY	TRADE POLICY	ALL POLICIES
PRIOR TO THE SIMULATION						
1960 - 69	0.41	0.41	0.41	0.41	0.41	0.41
FOLLOWING THE SIMULATION						
1970 - 75	0.41	0.42	0.45	0.46	0.55	0.66
1975 - 81	0.36	0.42	0.39	0.39	0.48	0.64
1982 - 86	0.23	0.24	0.23	0.27	0.54	0.68
1970 - 85	0.34	0.37	0.36	0.38	0.53	0.66

TABLE 13 : PERCENTAGE DIFFERENCE BETWEEN PREDICTED AND SIMULATED VALUES OF THE RELATIVE PERFORMANCE OF THE AGRICULTURAL SECTOR

YEAR	GOVERNMENT CONSUMPTION %	CURRENT ACCOUNT %	EXCESS MONEY SUPPLY %	TRADE POLICY %	ALL POLICIES %
1960	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00	0.00
1962	0.00	0.00	0.00	0.00	0.00
1963	0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.00	0.00	0.00
1965	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.00	0.00	0.00
1967	0.00	0.00	0.00	0.00	0.00
1968	0.00	0.00	0.00	0.00	0.00
1969	0.00	0.00	0.00	0.00	0.00
1970	0.00	10.46	0.00	34.40	48.46
1971	-3.92	44.56	2.33	15.44	64.08
1972	-4.88	14.69	10.02	36.64	63.99
1973	-4.03	-9.88	14.45	45.95	44.48
1974	8.23	-16.41	37.84	29.16	61.07
1975	17.92	24.30	-2.10	28.13	83.87
1976	15.56	-0.43	11.38	32.52	69.84
1977	19.48	6.26	11.34	44.30	103.97
1978	14.61	22.71	-1.47	32.66	83.84
1979	9.76	-3.98	17.71	33.41	65.51
1980	17.97	3.66	13.29	28.73	78.34
1981	16.79	-1.23	1.87	37.11	61.10
1982	15.43	30.38	10.28	68.65	179.91
1983	7.05	-5.19	12.54	120.63	154.13
1984	6.69	-9.79	30.60	151.90	216.60
1985	2.27	-17.28	11.43	176.11	160.29
1986	2.80	23.16	26.72	176.11	342.97

TABLE 14 : ABSOLUTE LEVELS OF GROSS DOMESTIC PRODUCT  
IN AGRICULTURE (Zag) UNDER SIMULATED POLICIES

YEAR	UNDER SIMULATED POLICIES					3 YEAR MOVING AVERAGE	
	GOVERNMENT CONSUMPTION	CURRENT ACCOUNT	EXCESS MONEY SUPPLY	TRADE POLICY	ALL POLICIES	SIMULATED WITH ALL POLICIES	PREDICTED USING PREDICTED REAL EXCHANGE RATE
	MILLIONS OF 1975 SURES						
1960	9831	9331	9831	9331	9831		
1961	11031	11031	11031	11031	11031		
1962	9589	9589	9589	9589	9589	10150	10150
1963	9570	9570	9570	9570	9570	10063	10063
1964	10546	10546	10546	10546	10546	9902	9902
1965	14986	14986	14986	14986	14986	11701	11701
1966	13652	13652	13652	13652	13652	13061	13061
1967	14033	14033	14033	14033	14033	14224	14224
1968	11237	11237	11237	11237	11237	12974	12974
1969	12871	12871	12871	12871	12871	12714	12714
1970	17122	18914	17122	23012	25419	16509	13743
1971	16622	25010	17704	19972	28386	22225	15765
1972	15385	18551	17794	22100	26525	26777	16866
1973	21978	20639	26209	33422	33086	29332	18792
1974	23482	18136	29907	28022	34946	31519	20257
1975	21058	22197	17483	22880	32834	33622	20818
1976	28364	24440	27337	32526	41685	36488	21366
1977	32014	28471	29834	38665	54655	43058	23066
1978	32592	34896	28020	37725	52279	49540	26592
1979	36605	32021	39257	44493	55196	54043	29527
1980	30421	26730	29213	33194	45987	51154	29191
1981	28001	23680	24424	32874	38626	46603	27704
1982	18369	20749	17551	26840	44546	43053	21892
1983	23527	20662	24525	48032	55382	46185	20561
1984	20878	17653	25557	49295	61957	53962	19092
1985	19914	16106	21698	53763	50681	56007	20278
1986	15429	18486	19020	41444	66463	59709	18017

TABLE 15 : SUMMARY OF ABSOLUTE LEVELS OF  
GROSS DOMESTIC PRODUCT IN AGRICULTURE  
(Zag) UNDER SIMULATED POLICIES

PERIOD	GOVERNMENT CONSUMPTION	CURRENT ACCOUNT	EXCESS MONEY SUPPLY	TRADE POLICY	ALL POLICIES	3 YEAR MOVING AVERAGES	
						SIMULATED WITH ALL POLICIES	PREDICTED USING PREDICTED REAL EXCHANGE RATE
MILLIONS OF 1975 SUCRES							
PRIOR TO THE SIMILATION							
1960 - 69	11735	11735	11735	11735	11735	12366	12059
FOLLOWING THE SIMILATION							
1970 - 75	19274	20574	21037	24901	30199	29994	18977
1975 - 81	29865	27491	27938	34622	45895	46277	25620
1982 - 86	19623	18731	21670	43885	55811	53966	19487
1970 - 86	23633	22785	24274	34606	44040	42705	21862

TABLE 16 : ESTIMATED GROWTH OF PREDICTED AND SIMULATED REAL GROSS DOMESTIC PRODUCT IN AGRICULTURE

YEAR	PREDICTED VALUE	SIMULATED VALUE
	(Zag')	(Zag SIM ALL)
MILLIONS OF 1975 SUCCES		
1970	20839	27951
1971	20871	29433
1972	20903	30994
1973	20935	32638
1974	20968	34368
1975	21000	36191
1976	21033	38110
1977	21065	40130
1978	21098	42258
1979	21131	44499
1980	21163	46859
1981	21196	49343
1982	21229	51960
1983	21262	54715
1984	21295	57616
1985	21328	60671
1986	21361	63888
ANNUAL AVERAGE GROWTH RATE	0.15% p.a.	5.17% p.a.

TABLE 17 : AGRICULTURAL SECTOR AS A SHARE OF TOTAL GROSS DOMESTIC PRODUCT (Zag/Z)

YEAR	3 YEAR MOVING AVERAGES		RATIO SIMULATED : ACTUAL
	ACTUAL	SIMULATED ALL POLICIES	
	%	%	1975=100
1971	23.1	41.1	96.9
1972	21.7	40.0	100.4
1973	20.3	36.9	99.1
1974	18.8	34.3	99.5
1975	17.9	32.9	100.0
1976	17.2	33.1	104.8
1977	16.2	33.3	112.0
1978	15.0	32.9	119.4
1979	13.5	33.2	134.0
1980	12.5	33.9	147.2
1981	12.1	35.5	160.4
1982	12.4	36.9	162.5
1983	12.9	36.6	154.6
1984	13.3	36.4	149.2
1985	14.0	37.7	146.9

TABLE 18 : SIMULATED VALUES OF TRADE POLICY VARIABLES UNDER PHASED REDUCTION OF TRADE INTERVENTIONS

YEAR	IMPORT TARRIFS (1+tm)	EXPORT TAXES (1-tx)
1960	1.37	1.00
1961	1.34	1.00
1962	1.38	1.00
1963	1.38	1.00
1964	1.39	1.00
1965	1.34	0.88
1966	1.42	0.89
1967	1.43	0.90
1968	1.43	0.91
1969	1.43	0.89
1970	1.40	0.90
1971	1.37	0.90
1972	1.34	0.91
1973	1.31	0.92
1974	1.28	0.92
1975	1.26	0.93
1976	1.23	0.93
1977	1.21	0.94
1978	1.18	0.95
1979	1.16	0.95
1980	1.13	0.96
1981	1.11	0.97
1982	1.09	0.97
1983	1.06	0.98
1984	1.04	0.99
1985	1.02	0.99
1986	1.00	1.00

TABLE 19 : REAL EXCHANGE RATE AND RELATIVE GROSS DOMESTIC PRODUCT OF AGRICULTURE UNDER PHASED REDUCTION OF TRADE INTERVENTIONS

YEAR	SIMULATED REAL EXCHANGE RATE	RELATIVE OUTPUT (Zag/Znt)		
		USING PREDICTED REAL EXCHANGE RATE	USING SIMULATED REAL EXCHANGE RATE	RATIO SIMULATED : PREDICTED 1975 = 100
1960	1.02	0.42	0.42	99.8
1961	1.07	0.45	0.45	99.8
1962	0.96	0.38	0.38	99.8
1963	0.95	0.37	0.37	99.8
1964	0.96	0.37	0.37	99.8
1965	1.16	0.51	0.51	99.8
1966	1.07	0.45	0.45	99.8
1967	1.04	0.43	0.43	99.8
1968	0.87	0.32	0.32	99.8
1969	0.93	0.36	0.36	99.8
1970	1.03	0.45	0.42	93.8
1971	0.92	0.42	0.35	82.4
1972	0.98	0.39	0.39	99.7
1973	1.20	0.50	0.55	108.9
1974	1.01	0.41	0.41	98.6
1975	0.84	0.30	0.30	100.0
1976	1.02	0.39	0.41	105.8
1977	1.08	0.39	0.45	117.8
1978	1.04	0.39	0.43	110.7
1979	1.14	0.44	0.50	113.9
1980	0.93	0.32	0.36	112.4
1981	0.95	0.30	0.37	122.4
1982	0.85	0.20	0.31	154.0
1983	1.24	0.28	0.58	206.0
1984	1.24	0.24	0.57	240.5
1985	1.31	0.23	0.65	269.6
1986	1.13	0.18	0.49	275.7

TABLE 20 : LEVEL OF TARIFF PROTECTION  
 CONSISTENT WITH CONSTANT RELATIVE  
 GROSS DOMESTIC PRODUCT IN AGRICULTURE

YEAR	3 YEAR MOVING AVERAGES FOR $t_m$	
	ACTUAL LEVEL OF TARIFF PROTECTION	IMPLIED LEVEL OF TARIFF PROTECTION
1971	0.31	0.03
1972	0.31	0.06
1973	0.30	0.05
1974	0.26	-0.03
1975	0.22	-0.12
1976	0.25	-0.12
1977	0.26	-0.06
1978	0.27	-0.03
1979	0.25	-0.09
1980	0.26	-0.13
1981	0.32	-0.25
1982	0.48	-0.18
1983	0.65	-0.13
1984	0.73	-0.06
1985	0.73	-0.15

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