AGRICULTURE AND GOVERNMENTS IN AN INTERDEPENDENT WORLD

PROCEEDINGS
OF THE
TWENTIETH
INTERNATIONAL CONFERENCE
OF AGRICULTURAL ECONOMISTS

Held at Buenos Aires, Argentina
24–31 August 1988

Edited by
Allen Maunder, Agricultural Economics Unit, Queen Elizabeth House
University of Oxford, England
and
Alberto Valdés, International Food Policy Research Institute
Washington DC, USA

INTERNATIONAL ASSOCIATION OF
AGRICULTURAL ECONOMISTS
QUEEN ELIZABETH HOUSE
UNIVERSITY OF OXFORD

1989

Dartmouth

JORGE GARCIA GARCIA

The Impact of Trade and Macroeconomic Policies on the Performance of Agriculture in Latin America

Until the mid-1970s, the study of domestic agricultural policy focused on the impact of specific direct interventions in the market of agricultural products. This began to change in the late 1970s when a more general equilibrium approach to the analysis of agricultural policy was introduced. This approach emphasized the effect on agriculture of policies intended to influence the performance of other sectors (for example, industry and government).

This paper reviews the conceptual and empirical work done on the influence of growth strategies and macroeconomic policies on the performance of agriculture in Latin America. The first section reviews the contributions that emphasize the effect of trade policy on agricultural incentives. Then follows a review of the studies that look at the impact of trade and macroeconomic policies, especially fiscal policy, on agricultural incentives. Finally, the third section reviews the literature that examines the effect of trade and macroeconomic policies on rural real wages.

TRADE POLICY AND AGRICULTURAL INCENTIVES

The studies that examine the impact of trade policy on agriculture incentives are based on models of standard international trade theory. This is so because a large proportion of agricultural production in Latin America is traded. The link between the external sector and agriculture takes place through the real exchange rate (Units of Domestic Currency per US dollar* Foreign Price Index/Domestic Price Index). To analyse the effect of commercial policy on the structure of incentive in the agricultural sector two models have been used. One is the non-traded/traded goods model and the other is the elasticity approach to balance of payments disequilibria. The studies using any of the two models compare the effects on relative prices of direct interventions with the effects of general indirect interventions.

The Traded/Non-Traded Goods Model[1]

The model – This model consists of three sectors: importables, exportables and non-traded. For a small economy the international price of importables and exportables is given in the world markets, and the price of the non-traded good is determined by domestic demand and supply. Since the agricultural sector in

most Latin American countries can be categorized as exportable and the industrial sector as importable, one can evaluate the incidence of commercial policy on relative prices of the industrial and agricultural sectors. The non-traded good sector can be associated with the services sector. The incidence of commercial policy is defined as the percentage change in the price of importables and exportables relative to the price of non-traded goods triggered by changes in tariffs.[2] Protection also discriminates against the import competing sector of agriculture if it is not protected.

To estimate the incidence of commercial policy, equation (1) is used.

$$\text{Ln}(P_h/P_x) = c + W\text{Ln}(P_m/P_x) \quad (1)$$

where P_m, P_x, P_h stand for prices of importables, exportables and non-traded goods respectively. W is the incidence parameter of commercial policy, which measures the percentage change in the price of non-traded relative to the price of exportables due to changes in tariffs. Equation (1) indicates that the change in the price of non-traded goods can be expressed as a weighted average of the price of exportables and importables. If there are several categories of tradables, that price would be a weighted average of those categories.[3]

A value of one for W means that the price of non-traded goods changes in the same proportion as the change in the price of importables induced by the change in the tariff. For import competing activities the increase in protection has been null. Thus, although the economic authority can determine the amount of tariffs and subsidies granted to various activities, it cannot control the 'true' protection granted to the activities selected for promotion.

Empirical evidence – Numerous studies have estimated the overall incidence of commercial policy using the above model.[4] Clements and Sjaastad (1984) report studies of incidence for Chile, Uruguay, Argentina, El Salvador, Australia, Brazil and Colombia, with the estimates of W ranging from a low of 53 per cent for Chile to a high of 95 per cent for Colombia. Of the Latin American countries all but Chile can be said to have agriculture as their main export. In the case of Chile, an important part of the agricultural sector, fruits, produces for export markets. Studies by Garcia (1987) for Colombia and by Valdes and Leon (1987) and Franklin and Valdes (1987) for Peru address the issue of the impact of protection on agricultural incentives using this approach.[5] Sapelli (1985) uses the estimated coefficients for Uruguay to determine the extent of taxation of the Uruguayan beef sector due to protectionism.[6]

The study by Garcia covers the period 1953–78, and compares the impact of direct interventions with that of indirect interventions. The first finding of Garcia is that the incidence of protection in Colombia (the value of W) during the period 1970–8 is quite high, around 95 per cent. Garcia then estimates the net taxation for three groups of export products: the tax for coffee at 68–85 per cent for the period 1956–67 and 36 per cent for the 1967–78 period; at around 20–37 for non-coffee export agriculture in the first period and 4 per cent for the latter period; and at around 10–27 per cent for the industrial sector in the first period and as a subsidy of 10 per cent in the latter period. Garcia then compared the extent of overvaluation of the peso (70 and 30 per cent on average for each of the two periods) with the nominal rate of protection for selected food products. He found

that, as a result of direct and general commercial policy interventions, products like milk and wheat were protected during the whole period, while products like rice, corn and sugar were protected in the 1950s and 1960s but unprotected in the seventies. Finally, exports products like cotton and coffee were taxed during the whole period.

The studies for Peru cover similar ground. Valdes and Leon (1987) estimate the effect of protection on exportables, on agricultural and non-agricultural exportables and on agricultural and non-agricultural importables. They find that the overall degree of incidence of commercial policy on exportables is around 0.7, while for agricultural importables and exportables this incidence is estimated at 0.46 and 0.26 respectively. This means that, within agriculture, commercial policy tends to discriminate more against the import competing sector than against exportable agriculture. The uniform tariff equivalent of the tariff and non-tariff barriers to trade were found to increase from an average of 5.4 per cent in 1949–53 to a peak of 256 per cent in 1969–73. As a result of this increase, 'true' protection to import competing activities increased from 2 to 28 per cent while the 'true tax' on exportable activities increased from 3 to 65 per cent.

Franklin and Valdes extend the analysis to establish the impact of protection on the agricultural sector. They find that the effects of the trade policies on the structure of relative prices dominated the effects of direct agricultural price policy in determining the patterns and levels of agricultural output. Simulation analysis is carried out with a scenario of industrial protection policy with free trade for agricultural importables and exportables for the period 1964/8-1969/73, one of intense import substitution (The average equivalent tariff increased from 133 to 256 per cent). In their simulation they find that these policies reduced the relative producer prices of non-tradable food, importable food and agricultural export products by 3, 23 and 35 per cent respectively, while their output increased 3 per cent for non-tradable food, but decreased 4 and 17 per cent for importable foods and exportable products. Industrial production, in turn, increased 18 per cent between these two periods. Thus, the taxation of tradable agriculture caused a major shift of resources out of agriculture, and a minor one towards the production of non-tradables in agriculture. As a result agricultural exports fell and agricultural imports increased substantially.

Sapelli (1985) uses an incidence coefficient of 0.53 for estimating the size of transfers from the beef sector to the rest of the economy, as well as the transfers received by the rest of the economy. He estimates that in 1930 commercial policy generated transfers from exporters equivalent to 9 per cent of GNP, of which 0.3 per cent went to import competing firms and 8.7 per cent to consumers. In 1961 the losses were 19 per cent of GNP for exporters, and the gains were 11.9 per cent of GNP for consumer-taxpayers and 7.1 per cent of GNP for import competing firms. The average transfer from exporters for the period 1956–78, when there was an equivalent tariff of 100 per cent, was 15.6 per cent of GNP. Since the agricultural sector's share of GNP is 16 per cent, and agricultural products are 90 per cent exports, the tax is equivalent to 50 per cent of the sector's output.

TABLE 1 *Average annual direct and total price interventions for selected agricultural products for Latin American countries (in percentages)*

	1975–79		1980–1984	
Argentina	Direct	Total	Direct	Total
Wheat	–25.0	–41.0	–13.0	–50.0
Brazil				
Soybeans	–8.0	–40.0	–19.0	–33.0
Wheat	11.0	33.0	9.0	2.0
Chile				
Grapes	1.0	23.0	0.0	–7.0
Wheat	5.0	–20.0	9.0	–25.0
Dominican Republic				
Rice	20.0	2.0	26.0	7.0

Colombia

	Wheat		Coffee		Cotton	
	Direct	Total	Direct	Total	Direct	Total
1960–65	24.2	–8.3	–7.1	–31.2	1.8	–24.7
1966–70	24.3	–4.8	–17.1	–36.5	7.0	–18.2
1971–75	–8.3	–29.8	–9.3	–30.3	–5.3	–27.2
1976–80	4.9	–22.1	–11.2	–34.0	1.0	–24.7
1981–83	20.2	–23.8	–7.8	–41.4	8.8	–30.9

Source: For Colombia: Garcia, Jorge, The Political Economy of Agricultural Pricing Policies: Colombia 1960–1983 (mimeographed), December 1987, manuscript prepared at the request of the World Bank, Table 1.
For the other countries: Krueger, Anne O., Schiff, Maurice and Alberto Valdés, 1988.

The elasticities approach model

This approach has been used as the reference point of a recent World Bank comparative study on the political economy of agricultural pricing policies.[7] The Latin American countries are Argentina, Brazil, Colombia, Chile and the Dominican Republic.[8] Another study covering similar ground and applying a similar methodology is that by de Oliveira (1983) for Brazil.[9]

The World Bank sponsored studies distinguish between the effects of direct and indirect policy interventions. Direct interventions are those that directly affect the price of a product or its inputs. Indirect interventions are those that affect the real exchange rate via commercial policy and macroeconomic policies. Direct plus indirect interventions are called total interventions.

The calculated 'equilibrium' exchange rate incorporates the effect of commercial and macroeconomic policies.[10] This fills the gap left by the empirical application of the traded/non-traded goods model which assumes current account balance. The main results of the World Bank sponsored studies as they relate to effects on relative prices are surveyed below.

Table 1 presents the divergence between prevailing relative prices and prices in the absence of direct and total interventions for selected products. From the

information in the table it is clear that direct interventions sometimes favoured agricultural producers and by large amounts. However, indirect interventions magnified the negative effects of direct interventions or reduced substantially the positive effect of direct interventions, in most cases swamping the positive effects of interventions to such a degree as to produce negative total effects.

The strongest cases of taxation occurred in Brazil and Argentina. The taxation of agriculture in Brazil, Colombia and the Dominican Republic is due more to indirect interventions, while in Argentina direct interventions also play an important role.

The study by de Oliveira on Brazil estimates the value of transfers for the agricultural sector as a whole for the period 1950–74. He estimates the free trade equilibrium exchange rate and constructs an index of that rate, as well as an index of implicit exchange rates for agricultural output – total and by categories – and inputs (fertilizers and agricultural machines). Having these indices and assuming no divergence between foreign and domestic prices in a base year (1950), he calculates the relative rate of implicit tax incidence (or subsidy if that were the case) on output and inputs. De Oliveira then computes the effective tax incidence of agriculture which is the net rate of income lost by the sector measured in terms of value added. He finds that in 1950–2 there was a small subsidy on agricultural production (less than 2 per cent), that in 1953–7 the taxation of Brazilian agriculture was 11.2 per cent of value added, and between 1958-74 the taxation of agricultural value added was on average 36 per cent, reaching a peak of 48.4 per cent in 1964. As a result of this taxation, the contribution of agriculture to GDP was substantially undervalued by around 20 to 70 per cent of the measured values.

MACROECONOMIC POLICIES, AGRICULTURAL INCENTIVES AND GROWTH

This section deals with the issue of the impact on agricultural incentives of macroeconomic policies, especially fiscal policy, and terms of trade changes. The literature on this subject is very limited. This is surprising given the substantial macroeconomic disruptions that have taken place in the Latin American countries in the 1970s and 1980s.

Static models

This section reviews the experience of Colombia with the coffee boom and fiscal policy management for the period 1967-83. The effects of commodity booms and government expenditures on the agricultural sector are felt through the real exchange rate. Although the Colombian case is only one in many, it illustrates quite well the experience of many Latin American countries. Commodity booms and expansionary fiscal policies are common in Latin America. This has been the case for Mexico, Venezuela and Ecuador with the oil boom in the 1970s, and for the Central American countries with the coffee boom. For some countries these booms triggered a frenetic race of government expenditure and accumulation of

external debt which overvalued the national currencies with a negative impact on the agricultural sector. This section is based on the study by Garcia and Montes (1987) for IFPRI.[11]

The Colombian coffee boom was characterized first by a substantial increase in the external price of coffee and later by a large increase in the volume of coffee exports. The developments on the fiscal side were characterized by an increase in government investment and expenditure which was financed initially through foreign borrowing and later, in an increasing proportion through money creation. The increase in coffee prices produced an increase in the real income of Colombians which increased expenditure on non-traded commodities and on export and import competing goods. The increase in expenditure produced an excess demand for non-traded commodities which resulted in an increase in relative price, encouraging production in the non-tradable sector and discouraging it in the non-coffee tradable sector. Moreover, the higher price of coffee drew resources towards the coffee sector and away from other tradable sectors and the non-traded sector, thereby contributing to increase the excess demand for non-traded, thus driving its price up.

The effect of government expenditure on relative prices is not as clear as those of an increase in the price of coffee. If the increase in government expenditure is entirely financed through taxes, an excess demand for non-traded goods develops if the marginal propensity of the government to spend in non-traded goods is larger than the corresponding marginal propensity of the private sector. Very likely, this latter situation will prevail with the increase in government expenditure leading to a rise in the price of nontraded goods.

As a result of these two forces, incentives to produce in the non-coffee tradable activities (agriculture and industry) fell considerably and they explain, in part, the declining performance of the Colombian economy since the mid-1970s.[12] In addition, world economic conditions deteriorated and the export boom that had been facilitated by the expansion of world trade and demand came to a halt. Moreover, the increase in rates of interest in the world economy was transmitted to the Colombian capital market and strengthened the recessionary impact of the other effects, with differential impact on the categories of traded and non-traded commodities.

To estimate the impact of these various influences on the relative price of traded versus non-traded activities for the overall economy and for categories of agricultural products, Garcia and Montes develop a general equilibrium model in which there are three categories of goods (coffee, non-coffee tradables and non-tradables) and in which the effects of government expenditure and the real interest rate are considered explicitly in the aggregate expenditure function.

To measure the impact of these forces on the real exchange rate (Price of Tradables/Price of Non-tradables), an exchange rate equation is estimated in which its determinants are the external terms of trade, the size of government (Government expenditure relative to GDP), real income per caput and the real interest rate. Real income per caput serves as an overall measure of the extent of capital accumulation over the period, and also as a measure of the relative growth of aggregate demand. Garcia and Montes estimate a real exchange rate (relative price) equation for the whole economy and for various categories of tradable commodities, agricultural ones included.

TABLE 2 *Determinants of relative prices of non-coffee tradable and agricultural tradable commodities*

Equation	Period	Dependent Variable	Constant	Log Per Caput GDP (T–1)	Real Interest Rate (T–1)	Log PC (T–1)	Log TTBS (T–1)	Government B(T–1)	Variable B	R2 Adjusted	Autocorelation	Durbin Watson
(1)	1965–1983	Log PNC	4.2810 (33.1333)*	–0.2567 (–6.8147)*	0.009 (6.4617)*	0.1952 (6.6509)		0.42597 (3.5772)*		0.911	0.34 (1.1660)	2.272
(2)	1968–1983	Log PXNC	4.9487 (23.634)*	0.2347 (5.4009)*	–0.0071 (–2.589)**	–0.1828 (–3.4196)		–0.4794 (–2.368)**		0.6506		2.208
(3)	1969–1983	Log PXANC	5.3618 (9.339)*	0.9799 (5.612)	–0.0203 (–3.834)		–0.6724 (–3.3769)*		–1.1645 (–2.9747)*	0.865	0.1601 (8.421)	1.588
(4)	1969–1983	Log PTANC	5.6117 (10.951)*	0.8029 (4.922)*	–0.0168 (–3.571)*		–0.6208 (–3.456)*		–1.1811 (–3.206)	0.852	0.2134 (0.447)	1.45 2.15

Notes:
* means significant at 99 per cent
** means significant at 98 per cent
PNC is the price of non-tradables/price of non-coffee tradables
PXNC is the price of non-coffee exportables over the price of nontraded
PXANC is the price of non-coffee agricultural exports over the price of nontraded
PTANC is the price of non-coffee agricultural tradables over the price of nontraded
PC is the price of coffee over the price of non-coffee tradables
TTBS is the implicit price of exports of goods and services over the price of imports of goods and services.
G is government expenditure/GDP
T–1 refers to the variable lagged one period

The estimated equations are presented in Table 2. For equation (1) the dependent variable is measured as the price of non-tradable over the price of non-coffee tradables. For equations (2)–(4) the dependent variable is measured as the price of each category of tradable over the price of non-tradable. The signs of the coefficients of the variables government size and terms of trade show that these two variables have a negative impact on the relative price of tradables. The negative impact of government expenditure on the price of noncoffee tradables also gives some support to the idea that the government's propensity to spend on non-traded commodities is higher than its propensity to spend on traded commodities. Garcia and Montes also make tests on the determinants of relative prices for other categories of agricultural commodities and find similar results as those presented in Table 2.

The works of Cavallo and Mundlak (1982), Cavallo (1985) and Mundlak, Cavallo and Domenech (1987) estimate a global real exchange rate equation for Argentina.[13] Mundlak, Cavallo and Domenech, and Cavallo find that the share of government consumption in total income, the deficit of the public sector which is financed by borrowing as a proportion of total income and the rate of growth of the money supply in excess of the rate of nominal devaluation, allowing for foreign inflation and real growth, all have negative effects on the real exchange rate. Therefore, since the Argentinian agricultural sector is an exportable sector, the above variables have a negative effect on agricultural incentives.

Comparative dynamics models

The study of the impact of trade and macroeconomic policies on agricultural growth using comparative dynamic models has been very limited. This is so because of the enormous amount of data and time required to do the analysis. The first attempt covering the period 1940–72 was done by Cavallo and Mundlak (1982) for Argentina. This work has been extended to cover the period 1913–84.[14] A second study along the same lines is the one for Chile by Coeymans and Mundlak.[15] The most recent study on Argentina deals with three sectors (agriculture, nonagriculture excluding government and the government sector) while the Chilean study incorporates five sectors (agriculture, mining, manufacturing, services and government).

To simplify the exposition on the structure and working of these models the most basic model of the economy is used. The economy has two sectors: agriculture and non-agriculture. Growth takes place through factor accumulation and technical change. The economy is assumed to be a price taking economy in world markets, but the extent of transmission of external events depends on the degree of tradability of each sector.

The main feature of these models is that they recognise that it takes time for product and factor market to reach equilibrium. Therefore, factor markets are in disequilibrium in a static sense, so that at any time, t, factor prices are not equal in all occupations. Changes in production from one period to the next occur because there is growth of resources and resources move between sectors. This requires one to model the process of resource allocation across sectors. The

second important point is that technology is endogenous and determined by economic variables.

Differentials in factor returns (wages and return to capital) trigger factor movements between agriculture and nonagriculture. Given labour supply, wage differentials determine the allocation of labour between agriculture and non-agriculture and off-farm migration. Capital moves between sectors through the allocation of investment, a process determined by the differentials in the rates of return to capital in agriculture and non-agriculture. These models require a large amount of econometric work, a survey of which is beyond the scope of this paper and we proceed now to review the most relevant simulation results for Argentina and Chile.

The model for Argentina covering the period 1913–84 was used to simulate the effect of a trade liberalization programme and macropolicy management. The first simulation exercise determined the effect on the real exchange rate of eliminating export taxes and reducing import tariffs to 10 per cent, plus other assumed values for certain macroeconomic variables. The simulations concluded that the real exchange rate would have been 35 per cent higher, on average, and the relative prices of agricultural and non-agricultural output would have increased 32 and 11 per cent respectively. The authors find that the long-term supply response is larger in the agricultural than in the nonagricultural sector, 1.43 for agricultural output and 0.6 for nonagricultural output. The long-run elasticity for capital is 1.78 in agriculture whereas it is 0.77 in nonagriculture, with 1.18 for labour in agriculture and -0.3 in nonagriculture.

Other policy simulations assessed the overall effect of trade liberalization with three alternative sets of policies. The first set of policies were those that actually occurred except for export taxes which were assumed to be zero for the whole period. The second set of policies assumed that the import and financial market sides of the economy were also opened, that public expenditures were reduced to a sustainable level in the future, that there are no fiscal deficits and that the rate of monetary expansion equalled the external rate of inflation plus the rate of devaluation plus the rate of growth of the economy. The third set of policies was the same as the second but a lower level of public expenditures was imposed. The main results of this simulation exercise are that the sole elimination of export taxes does not have any noticeable effect on economic growth or in the composition of output. However, when imports and financial markets are liberalized, agricultural output increases 33 per cent while nonagricultural output falls 3 per cent. Real wages in both agriculture and nonagriculture fall, respectively, 11 and 4 per cent relative to their base run values. The largest impact is felt with the third policy simulation, when agricultural, nonagriculture and total output are 58, 6 and 12 per cent higher than their base run values. Capital in agriculture, nonagriculture and the whole economy is 64,11 and 15 per cent higher relative to the base run values. Labour employment is 32 per cent higher in agriculture and 4 per cent lower in nonagriculture, for a total 1 per cent increase relative to the base run value. Real wages are 12 and 1 per cent higher in agriculture and nonagriculture relative to the base run values. The returns to capital are 570 and 27 per cent higher in agriculture and nonagriculture relative to the base run values.

In the case of Chile the simulations performed consisted of increasing,

separately, agricultural prices, and the real exchange rate. For given investment and labour supply, a 10 per cent increase in agricultural prices produces a 27 per cent increase in the capital stock in agriculture, an 86 per cent increase in agricultural employment, and increases in the rates of return to agricultural capital and labour. Total output declines because resources are taken away from other activities. Output would expand if the assumption on the fixity of investment and labour supply were relaxed.

For the 10 per cent increase in the real exchange rate the authors assume that the right policies were taken such as to make a 10 per cent nominal devaluation successful in real terms. Because of the different degrees of tradability, the devaluation results in different changes in the relative price of each sector (6.8 and 8.5 per cent for agriculture and mining and less than 3 per cent for manufacturing). After 8 years, agricultural output increases 16 per cent while mining output increases 9 per cent. The effect on manufacturing is insignificant, despite the fact that the sector is quite price responsive, due to its low tradability and the lack of an overall expansion effect. Employment in agriculture increases 24 per cent while capital increases 8 per cent. Real wages in agriculture would increase 20 per cent while returns on capital would change by a small amount.

TRADE AND MACROECONOMIC POLICIES: THEIR IMPACT ON REAL WAGES IN AGRICULTURE

A model and some empirical evidence

Research on the impact of trade and macroeconomic policies on rural labour incomes in Latin America has been scanty. One reason for this is the lack of adequate data on rural labour markets. Another reason has been the microeconomic emphasis on the analysis of agricultural policy. The first attempts at analysing rural labour markets, framed under a more general equilibrium approach, have been done through migration functions which explain migration as the result of economic decisions by the migrant.[16]

The approach presented in this section, rather than focusing on the explanation of migration, attempts to explain rural real wages and to determine the impact of trade and macroeconomic policies. To do this a simple model of supply and demand for labour in the agricultural sector is used. The empirical evidence, using this model, is illustrated with the cases of Colombia, Brazil and Chile.[17]

In Latin America urban unemployment coexists with a relatively high real wage in the manufacturing sector, as well as with a more competitive and informal urban labour market. Despite relatively high and sometimes rising rates of urban unemployment labour has flowed continuously out of agriculture towards the urban sector because people expect to get a higher paid urban job. The probability of succeeding in getting a job in the urban sector will depend, among other things, on the rate of urban unemployment.[18] Another element that will affect the supply of rural labour is the size of the population in the rural sector. Therefore, the supply of labour in the rural market can be considered to be a function of real wages in the agriculture and urban sectors, the rate of urban

unemployment and the size of the rural population. On the demand side, the demand for labour is negatively related to the real wage, and positively related to the stock of capital and to the price of agricultural output relative to its price in the nonagricultural sector.

In symbols, the above arguments can be presented as follows. Let L^S and L^D denote the supply and demand for agricultural labour, W_a the real wage in agriculture, W_u the real urban wage in the sector in which migrants from agriculture are more likely to find employment, U the rate of urban unemployment, PA/PNA the price of agricultural output (PA) relative to the price of output in the nonagricultural sector (PNA), N_r the size of the rural population and K_a the capital stock in the agricultural sector. The supply of and demand for labour in agriculture are given respectively by:

$$L^S = L^S (W_a, N_r, U, W_u) \quad (2)$$

and

$$L^D = L^D (W^a, PA/PNA, K_a) \quad (3)$$

In equilibrium,

$$L^S (W_a, N_r, U, W_U) - L^D E (W_a, PA/PNA, K_a) = 0 \quad (4)$$

From (4), W_a can be derived as a function of U, W_U, PA/PNA, N_r and K_a to obtain equation (5) below.

$$W_a = W_a (PA/PNA, K_a, U, W_U) \quad (5)$$

From the discussion on the determinants of the demand for and supply of agricultural labour one could expect that

$$dW_a/d(PA/PNA; dW_a/dk_a; dW_a/dW_U > 0$$

and

$$dW_a/dU \text{ and } dW_a/dN_r < 0$$

Thus, the real wage in agriculture is a positive function of the relative price of agricultural output, the capital stock in agriculture and of the urban real wage, while it is a negative function of the size of the rural population and of the rate of urban unemployment.

The rural real wage equation estimated for Colombia follows the above model and covers the period 1968–83. The real urban wage rate is the real wage in the construction sector. The capital stock in the agricultural sector is approximated by the ratio of real value added to total employment in agriculture.

The estimated equation is:

$$\log W_a = 32.80 + 0.5395 \log PA/PNA + 1.46 \log K_a + 0.2686 \log W_u - 0.9399U - 4.2474 \log N_r \quad R2 = 0.995 \quad \text{Durbin-Watson } 2.29$$

All the estimated coefficients are significant at the 99 per cent level, and their sign supports the hypothesis about the determination of real agricultural wages. One important result is on the role played by relative prices. This points out the

negative effect on real wages of those policies that depress agricultural prices.

The study on Chile, following a similar approach, uses other variables to explain the behaviour of real agricultural wages. The explanatory variables, with a positive effect on real wages are labour demand in fruit, vineyard and livestock production, area in crops and a nonagricultural wage index, and with a negative effect labour force and the price of fertilizer.[19]

The study on Brazil estimates a demand for labour function which depends on the price of agricultural output, on tractor and land rental prices and on agricultural GDP, and finds that the only significant coefficients are the land rental price and agricultural GDP.[20]

Impact on real wages

The studies on Colombia and Chile examine the impact of trade and macroeconomic policies on real agricultural wages. Only the result of the effects of total interventions are reported. It is found that in Colombia the loss to agricultural workers due to the presence of total interventions (trade and macroeconomic policies) represented, on average, 15 per cent of their actual rural wage in the period 1960–83. It should be pointed out that this is an underestimation, since very likely depressed agricultural prices discouraged the accumulation of capital in agriculture and as a result the capital: labour ratio in agriculture was lower than it would be otherwise, pulling real wages down. In the case of Chile a more complete model of interactions among sectors was developed. After taking these interactions into account, it was found that for the period 1960–81, in the absence of interventions, real agricultural wages would have been on average 5.5 per cent higher than actual wages.[21]

CONCLUSIONS

The main conclusions to come out of this survey are the following:

(1) The performance of the agricultural sector of Latin America has been determined, to a large extent, by policies of a general impact, like trade and macroeconomic policies, rather than by policies specific to the sector.

(2) The conduct of these trade and macroeconomic policies has been such as to affect negatively agricultural incentives. Thus, the negative effect of these policies has most of the time swamped the effect of those direct policy interventions which have been specifically geared to promote and favour the agricultural sector.

(3) By implementing policies that led to a reduction of agricultural incentives and by trying to force an industrialization process with the purpose of modernizing the economy and accelerating economic growth, policy makers have reduced considerably the standard of living of the population. The implemented policies have led to a lower standard of living for the average individual by discouraging investment and depriving it of

the benefits of capital accumulation compared to a situation in which such distortions had not been introduced. Although the studies surveyed did not address the issue of accumulation of human capital, it is very likely that lower real incomes discouraged investment in human capital since the expected streams of future labour incomes resulting from these policies were lower than they would have otherwise been.

(4) One important issue which also emerged was the impact of fiscal policy. Throwing money at the problems has always been thought of as a solution to them. Excessively expansionary fiscal policies have usually been transmitted into expenditure in non-traded goods, especially labour services, with the effect that they have produced a decline in the real exchange rate, discouraging economic activity in the tradable sectors of the economy.

(5) The agricultural sector is highly responsive to changes in economic incentives. Since incentives for agriculture have been depressed by trade and macroeconomic policies, the superficial appearance to policy makers is that agricultural producers are backward people unable to use modern technologies or adapt themselves to changing economic conditions. As a result the solutions suggested to move the agricultural sector have been in the direction of more state intervention, which in many cases leads to a further deterioration of incentives and of the investment climate in agriculture.

(6) The size of the transfers from agriculture to the rest of the economy is not small. In the case of Brazil reported here, these reached sometimes 40 per cent of the value of agricultural output or 8 per cent of GDP if agriculture's share in GDP is taken to be 20 per cent on average. This can represent almost half the savings of a high savings country.

(7) The trade and macroeconomic policies implemented have contributed to poverty in the rural sector. By depressing agricultural prices, the demand for labour has been pulled down and agricultural wages have fallen between 15 per cent in Colombia and 5 per cent in Chile. By promoting poverty, these policies have generated important processes of migration from the rural to the urban sector, thus contributing to the problem of urban unemployment.

NOTES

[1]A presentation of this model can be found, among others, in Corden, W. M. (1971) and Dornbusch, Rudiger (1974) and (1980).

[2]The theoretical analysis as well as the significance of the empirical application of this model to estimate the incidence of commercial policy was first presented in Sjaastad, Larry A. (1980).

[3]For the process of aggregation over various categories see Garcia, Jorge Garcia (1981), Chapter 4.

[4]These studies are reviewed in Clements, K. W. and Sjaastad, L. A. (1984), Chapter 3.

[5]Garcia, Jorge Garcia, op. cit., Valdes, Alberto and Leon, Javier (1987), Franklin, David and Valdes, Alberto (1987).

[6]Sapelli, Claudio (1985), pp. 11–16.

[7]A review of some of the results of these studies has been done by Alberto Valdes (1986).

[8]The authors of these studies were Adolfo Sturzeneger for Argentina, Jose L. Carvalho and

Antonio Salazar Brandao for Brazil, Jorge Garcia Garcia and Gabriel Montes for Colombia, Hernan Hurtado, Eugenia Muchnik and Alberto Valdes for Chile, and Duty Green and Terry Roe for the Dominican Republic.

[9]De Oliveira, Joao do Carmo (1983). This paper is based on his PhD thesis (1981).

[10]The formula used to derive the 'equilibrium' exchange rate (E*) is the following:

$$E^* = E_o\,[(DQ_o + DQ_1)\,/(E_sQ_s + N_dQ_d) + 1],$$

where DQ is the actual or sustainable deficit in current account in the presence of trade restriction, DQ_1 is the current account deficit induced by the elimination of trade restriction, E_o is the prevailing nominal exchange rate, E_s and N_d are the elasticities of supply and demand for exports and imports respectively, and Q_s and Q_d are the quantities supplied and demanded in the presence of trade restrictions.

[11]Garcia Jorge Garcia and Llamas, Gabriel Montes (1987). This is in part an out growth of Garcia, (1983) and Montes (1984). Some of the issues dealt with in the Garcia-Montes report are also presented in Thomas Vinod *et al.* (1985).

[12]Another shock was that produced by the large exports of illegal drugs. The effect of this other boom on the Colombian economy was not measured in Garcia Garcia and Montes Llamas' work. A recent estimate of the size of these activities is that by Hernando J. Gomez (1988).

[13]Mundlak, Cavallo and Domenech (1987), Table 3, and Cavallo (1985).

[14]Cavallo and Mundlak, (1982), and Mundlak, Cavallo and Domenech (1987). A forerunner of Cavallo and Mundlak is Yair Mundlak (1979).

[15]Coeymans and Mundlak, (1984) and (1987).

[16]An early analysis of this issue is Sahota, Gian S. (1968). For more recent studies see Cavallo and Mundlak, pp. 38–39, and Coeymans, (1982) and (1983).

[17]For Colombia see Garcia and Llamas, (1988), Chaptor 6. For Chile see Hurtado, Muchnik and Valdes (1987), Chapter 4. For Brazil see Brandao and Carvalho (1987), Chapter 7.

[18]See Todaro (1969).

[19]See Hurtado, H. *et al.* (1987) Table 4.7.

[20]See Salazar, Brandao and Carvalho (1987), Table 7.20.

[21]See Hurtado, H. *et al.*, Table V11–6.

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DISCUSSION OPENING – HERMINIO BLANCO

A survey paper should be concise, but informative. But in his search for brevity, I feel that Jorge Garcia has failed to explain sufficiently some of the crucial issues in this literature.[1] Additionally, one of the main contributions of a survey should be to compare the main findings in the literature. In this sense, the author should have made an effort to diagnose the plausible causes for the wide disparities among the estimates of the W parameter across countries, and for the different behaviour of the rural labour markets in Brazil, Chile and Colombia.

I have some specific comments as follows:

It is hard to understand the definition of the nominal exchange rate 'equilibrium' value, since this value is determined in the assets market. In particular, how does the calculated 'equilibrium' exchange rate incorporate the effects of commercial and macroeconomic policies? Furthermore, the reader deserves some explanation of how the inclusion of the 'equilibrium' exchange rate '... fills the gap left by the empirical application of the trade/non-traded goods model which assumes current account balance'.

Some of the final conclusions lack empirical support. For instance: '... by trying to force an industrialization process . . ., policy makers have reduced considerably the standard of living of the population'; 'throwing money to the problems has always been thought as a solution to them'; 'the agricultural sector is highly responsive to changes in economic incentives'; '. . . the superficial appearance to policy makers is that agricultural producers are backward people unable to use modern technologies . . .'; '. . . more state intervention which in many cases leads to a further deterioration of incentives and of the investment climate in agriculture'.

The following statements seem inaccurate: 'of the Latin American countries all but Chile can be said to have agriculture as their main export'; 'the effects of commodity booms and government expenditures on the agricultural sector are felt through the real exchange rate'.[2] Contrary to the conclusion in the last section of the paper, policies that depress agricultural prices will not necessarily have negative effects on rural real wages, since they may have indirect positive effects through some of the other variables included in the model.

Speaking more generally, the perception that I get from this survey is that there is a substantial literature on the effects of trade and macroeconomic policies on the performance of agriculture. This literature should provide a solid basis to move forward into more sophisticated modelling and statistical methods. Specifically, the research agenda should attempt to improve on the old practice of estimating a linear regression which is loosely derived from a *static deterministic* model.

As potential avenues for research, let me propose the following: introduce intertemporal stochastic optimization models for the agricultural product and input markets;[3] and the estimation procedures for monthly studies could be improved substantially, by allowing a much less restrictive lag structure.[4] In addition, the issue of parameter invariance across different macroeconomic regimes and the robustness of the simulations results should be examined in the light of the Lucas econometric critique. At the very least, it is necessary to test the stability of parameters across subsamples. For instance, it is unlikely that the parameters of the Cavallo-Mundlak comparative dynamics model for Argentina remained invariant during the 1913–84 period. Furthermore, it is hard to believe that a substantial reform such as a programme of financial liberalization would not alter the parameters of their model.

The estimation of the effects of macroeconomic uncertainty on the performance of the agricultural sector is potentially interesting, since these effects could have been erroneously imputed to other variables. The variability of relative prices, which increases in periods of high inflation, could also be an important determinant of the behaviour of the agricultural sector.

NOTES

[1]The topics requiring further explanations are: (1) the elasticities approach model to the balance of payments disequilibria; (2) the 'equilibrium' exchange rate; (3) the 'enormous amount of data . . .' and the '. . . large amount of econometric work . . .' required to implement the comparative dynamics models; (4) the method utilized to estimate the impact of macroeconomic policies on real agricultural wages; (5) the reason for focusing on relative prices instead of focusing on productive performance indexes.

[2]Some of these effects may be transmitted directly resulting in an increase in the demand for agricultural products.

[3]One of the basic contributions in this topic is by Sargent (1978).

[4]The widespread use of vector autoregressive models in macroeconomics is a sign of the usefulness of this statistical technique. For a seminal work in this area see Sims (1980).

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