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# AGRICULTURE AND GOVERNMENTS IN AN INTERDEPENDENT WORLD

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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

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*Real Exchange Rates, Real Interest Rates and Agriculture*

Real exchange rates have been highly volatile over the last 15 years or so; real interest rates also have varied widely. It is the purpose of this paper to outline some of the possible causes and effects of such changes, interrelationships between real exchange rates and real interest rates, and some implications for agriculture, and to provide a background for the country papers that follow in this part of the programme. A broad-brush picture of the United States economy over the last half-dozen years is presented as an introduction.

Over the relevant years, the US has had a large deficit on the current account of the balance of payments, balanced by a capital inflow. Of themselves these equal and opposite flows tell us nothing about causation: that is, whether the capital inflow occurred because it was required to balance the current account deficit or, alternatively, whether the current account deficit was the result of the capital inflow. A common view is that a low US propensity to save combined with a large fiscal deficit and fairly tight monetary policy combined to raise real rates of interest. Without the capital inflow real expenditure in the US would have had to be lower: real interest rates and/or inflation and/or taxes would have been higher. While capital inflow softened the impact on real interest rates in the US, the other side of this coin is that real interest rates were pushed up in the rest of the world. The capital inflow to the US in turn required and supported a current account deficit, which for some years was associated with an appreciated real exchange rate. The capital inflow dampened the rise of US real interest rates, but at the same time caused US producers to be more exposed to foreign competition – the lack of competitiveness that has received so much attention in the US Congress and press. In more recent years the value of the US dollar has fallen and the real exchange rate has depreciated, at least in part because of rapid accumulation of foreign liabilities by the United States. The current account deficit continues, and can be expected to continue unless the relation between production and expenditure in the US changes.

How has this affected agriculture? High real interest rates adversely affect capital intensive industries relative to other industries. Considered as a whole, agriculture in the US is highly capital intensive relative to other broad categories of industries, so the interest rate effect may be judged harmful to US agriculture in factor markets. The capital inflow eased this impact but the appreciation of the real exchange rate made it more difficult for US farmers to compete with foreigners, whether they were exporting or competing on the domestic market.

Overall it would appear that US agriculture was adversely affected by the conjunction of policies. In those countries whose real exchange rates appreciated *vis à vis* the US, agriculture was able to compete more easily with US producers, on the one hand, but to the extent that agriculture was relatively capital intensive in those countries also, it too was harmed (compared with other industries) by the increase in real interest rates. We now look at the concepts in more detail.

## REAL EXCHANGE RATES

Changing the exchange rate alters the relationship between domestic and foreign prices, and so does inflation, at home or abroad. The concept of the real exchange rate attempts to adjust nominal exchange rates for relative inflation to determine the combined effect on incentives to produce, purchase and hold.

This apparently simple idea has led to two rival conceptual and empirical approaches, though to a large extent the differences are related to the questions being addressed. One approach has focused on correction for relative inflation as such; purchasing power parity concepts of exchange rate determination have long addressed related issues. 'Competitiveness' across countries has been a focus. The other has addressed the effect of exchange rate changes, inflation, and other forces on the incentives within a country. The former approach defines and measures the real exchange rate as the nominal exchange rate multiplied by the ratio of foreign to domestic prices; the latter as the ratio of the price of tradable to non-tradable products in the country under consideration.

When changes in real exchange rates are being considered the two measures can give similar results: consider a small economy that cannot affect its terms of trade and assume that the terms of trade remain unchanged, that any trade barriers or subsidies remain constant in *ad valorem* terms, and that import competing goods are close substitutes for imports. With these assumptions the domestic prices of imports and exports are governed by international prices and the nominal exchange rate, and exportable and importable goods (including imports and exports) can be aggregated into a composite good, tradables. Assume also that there are goods which for reasons of transactions costs or trade barriers are not traded internationally. Domestically, there are now two classes of goods: tradables and non-tradables. Those who take this approach measure the real exchange rate as the relation between the prices of these tradable and non-tradable goods,  $p_t/p_n$ .

In such an economy the domestic price of tradable goods can change only if the world prices of tradable goods change, or if the exchange rate changes. The price of non-tradables on the other hand is free to change with any of the factors that affect supply and demand of those goods, including domestic inflation. Thus apart from changes in the foreign price level due to changes in the price of foreign non-tradables, changes in the real exchange rate measured as  $e.p^*/p$  (where  $e$  is the domestic currency price of a unit of foreign currency, and  $p$  and  $p^*$  are the domestic and foreign price levels, respectively) can occur only if  $p_t/p_n$  changes ( $p$  is a weighted average of  $p_t/p_n$ ).<sup>1</sup>

However, if import-competing goods are not close substitutes for imports or if the *ad valorem* impact of trade barriers or subsidies changes, the domestic

prices of tradable goods will not be tied firmly to the world market and changes in  $p_t/p_n$  may not reflect changes in  $e.p^*/p$  accurately (Harberger, 1986, pp. 387–94; Balassa, 1987, pp. 2–3; Edwards, 1987, Appendix 1). Similarly, if there is no clear distinction between tradable and non-tradable goods the very idea of the price relation between tradables and non-tradables starts to break down; this difficulty has led some authors to use domestic wages as a proxy for non-tradables. Further, if a country can influence its terms of trade, then domestic influences can change the prices of tradables as well as non-tradables. And if the terms of trade change, importables and exportables can no longer be added together easily to form ‘tradables’, though this provides no more of a problem than the index number difficulties that are involved in calculating  $p$  and  $p^*$ .

Such considerations generally lead empirical workers to use some direct measure of  $e.p^*/p$  rather than  $p_t/p_n$  even though their focus is on domestic resource allocation. But should  $p^*$  include non-tradables as well as tradables? Should the foreign prices be wholesale or retail? How should the price levels and exchange rates of various trading partners and competitors be weighted to yield a multilateral exchange rate? Williamson (1985, Figures A1–A3) provides a menu of eight different real exchange rates. One important choice for  $p$  is between production and consumption based measures (for example, the implicit deflator of GDP and the CPI, respectively) – the difference between them will reflect changes in the terms of trade. The former would provide the means to calculate a real exchange rate for domestic producers and the latter for domestic purchasers.

One feature of some measures of real exchange rates may be noted. If one country’s nominal exchange rate appreciates against another, the latter’s exchange rate must, by definition, have depreciated. Similarly, if one country’s real exchange rate, defined as  $e.p^*/p$  (with the two price indexes covering non-tradables as well as tradables) appreciates against another, the latter’s real exchange rate, similarly defined, must depreciate. But it is quite possible for *all* countries’ real exchange rates, defined as the ratio of the prices of tradables to non-tradables (or by  $e.p^*/p$ , if  $p^*$  covers only tradables) to change in the same direction. This could occur if throughout the world productivity were increasing more rapidly in tradables than in non-tradables. In each country the relative price of non-tradables could rise – that is, the real exchange rate appreciate.

The choice between the concepts depends partly upon the purpose at hand; here we wish to analyse, without empirical estimation, the effects of changes in real interest rates and capital flows on the structure of an economy and for this purpose the tradable/non-tradable approach is fruitful.

## EFFECTS ON REAL EXCHANGE RATES

In Figure 1 the Salter (1959) dependent economy model is presented. Tradables are shown on the horizontal axis, non-tradables on the vertical. AB is the production transformation curve. Community preferences are represented by an indifference map, it being convenient to view the preference map as incorporating investment as well as consumption demand. OZ is the Engel curve for the price ratio  $RR'$ . At point C the net demand for tradables is zero, so the trade

account is balanced; there is also zero excess demand for non-tradables. C is thus a point of internal and external balance. The equilibrium real exchange rate  $p_t/p_n$  is shown by the price line RR' that is tangent at C.

Some impacts on the real exchange rate are now considered.

### *Demand shift*

An exogenous shift in demand towards non-tradables will tend to appreciate the real exchange rate, making tradables (including tradable agricultural products) cheaper to buy, but discouraging their production.

### *Productivity growth*

If productivity growth is Hicks-neutral, the new production transformation curve is simply a larger copy of the one in Figure 1. In this case whether the real exchange rate appreciates or depreciates is determined solely by the income elasticities of demand; if expenditure growth is biased towards non-tradables, the real exchange rate will appreciate. Growth that is not Hicks-neutral will itself affect the real exchange rate: a bias towards tradables will tend to appreciate the real exchange rate. (The 'Scandinavian model' which underlay wage negotiation in Sweden for many years was based on the assumption of such a bias.)

### *An exportable resources boom*

Analysis of the effects of development of new export industries (for example, a new mineral deposit) requires a distinction between the booming export and pre-existing tradable goods. The production transformation frontier will shift outwards with a bias towards tradables. The real exchange rate will tend to appreciate and this will discourage production of the older tradables (this is the so-called Dutch disease effect). Due to the higher income, demand will increase for non-tradables as well as for tradables, but the production of non-tradables could fall, owing to competition for factors of production by the booming export sector (Snape, 1977; Corden and Neary, 1982).

### *Trade barriers*

When changes in trade barriers are examined, a distinction is again required between categories of tradables. Assume an import tariff is imposed; the domestic price of the protected products will tend to rise relative to non-tradables and other tradables. It is to be expected that the real exchange rate will then appreciate, encouraging imports and discouraging exports (Clements and Sjaastad, 1984). Barriers to imports in this way effectively tax agricultural exports in many primary producing countries (Krueger, Schiff, and Valdes, 1988; World Bank, 1986).

### *Monetary expansion with a fixed nominal exchange rate*

The model illustrated in Figure 1 is a real model, but some of the consequences

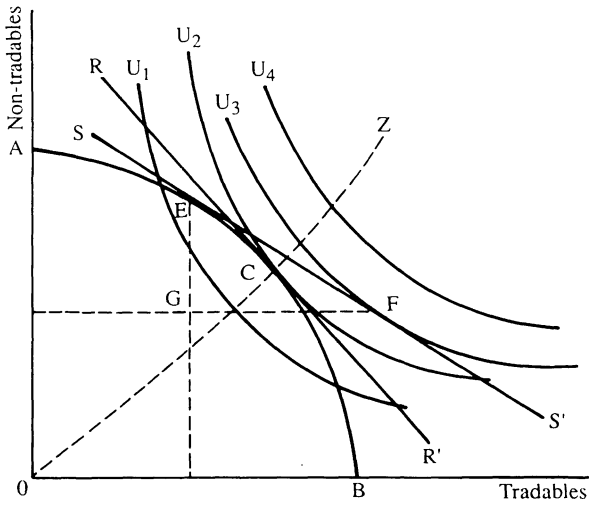


FIGURE 1

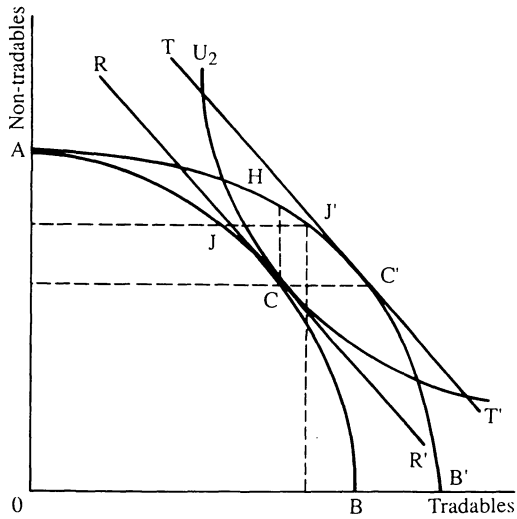


FIGURE 2

of monetary expansion may be added to it, still assuming the absence of capital flows. The monetary expansion will bring domestic inflation; at a fixed nominal exchange rate the prices of tradable goods are anchored by world prices. The price of non-tradable goods can rise, however. The situation is now a disequilibrium, as shown in Figure 1, with the production of non-tradables being encouraged but demand discouraged, and the opposite for tradables. (The real exchange rate is shown by  $SS'$ , production is at point E and expenditure at F.) Again, this has been a means by which agricultural exports have been discriminated against by the governments of many countries that are well suited for agriculture. The result is a balance of trade (and balance of payments) deficit of GF and excess production of non-tradables of EG. A higher real absorption level (shown by the indifference curve  $U_3$ ) than is sustainable has been reached; to restore equilibrium a change in the real exchange rate *and* a decline in real absorption are required.

### *Capital inflow*

Assume a capital inflow of  $BB'$  (see Figure 2) which, as the capital in real terms can be transferred only in tradables, creates a goods availability frontier  $AB'$  that is everywhere a horizontal distance of  $BB'$  to the right of the production frontier  $AB$ .<sup>2</sup> Thus if the real exchange rate were to remain unchanged ( $TT'$  is parallel to  $RR'$ ) production would remain at C while the supply of goods would be at  $C'$ . As long as the income elasticity of demand for non-tradables is positive, the demand for them will increase and their price will rise. Thus the equilibrium demand point will be in the segment  $HC'$  of the availability frontier, provided that neither good is inferior: call the point  $J'$ . The real exchange rate will have appreciated, the demand for both goods will have risen, and production will be at  $J'$ , the output of non-tradables having increased and that of tradables decreased.

If the transfer of resources had been a gift from abroad, rather than capital inflow, this would be the end of the story. But a capital inflow needs to be serviced. Servicing requires a transfer of tradables abroad that will have effects opposite to those described above. The real exchange rate will then depreciate compared with a situation of no servicing.

## REAL INTEREST RATES

Just as with the real exchange rate there are many concepts and measurements of the real interest rate. It can be defined as the actual risk-free rate of interest discounted by the expected rate of inflation. There are of course no risk-free rates of interest to observe, nor can one directly observe expected inflation. Thus it is common for *ex ante* real rates of interest to be identified with nominal rates of interest on government securities or similar loans, deflated by the current rate of inflation. But this is a rough and ready proxy. *Ex post* real rates of interest are often calculated using realized rates of inflation.



## INTERACTIONS OF REAL EXCHANGE RATES AND REAL INTEREST RATES

### *Increase in saving*

Without capital flows between countries real interest rates and real exchange rates will be related mainly through the relative tradable and non-tradable components of investment and consumption expenditures and, in the longer run, by the impact of investment on the production of tradables and non-tradables. Suppose that the residents of a country become more frugal, so that there is a shift from present to future consumption; saving and investment would increase. In the absence of capital flows between countries, real interest rates would fall and the effect on the real exchange rate would depend on the shares in consumption and investment of tradables and non-tradables. If investment has a high tradables component, the equilibrium real exchange rate would depreciate. Over time, the increase in investment would affect the production frontier, which in turn would affect the real exchange rate.

On the other hand, if capital flows exist (and making the small country assumption that the country is a price-taker with respect to real interest rates as well as the terms of trade), the real interest would be unchanged by the burst of frugality. Instead, net capital outflow would increase (or inflow decrease), implying a reduced present supply of tradables, and the real exchange rate would depreciate. The international intertemporal trade that is the essence of capital flows will tend to equalize real interest rates across countries, at the 'cost' of real exchange rate movements. The manner in which the change in the real exchange rate may come about is discussed in the next section.

### *Fiscal expansion*

Assume that at full employment the government expands its expenditure, increasing its budget deficit and financing it by borrowing from the private sector (assume also that private saving does not rise to pay for future taxes to meet the interest payments on the borrowing: that is the neo-Ricardian theorem does not hold). Without capital inflow the real rate of interest will increase and, as in the previous case, the effect on the real exchange rate will depend on the composition of different types of expenditure.

When we allow for capital flows, the saving to finance the additional fiscal deficit would be supplied from abroad at constant real interest rates rather than from at home at higher real interest rates. The capital inflow (through its *alter ego*, the current account deficit) supplies additional resources to meet the additional expenditure; crowding out of private expenditure does not occur – at least not until the foreign debt has to be serviced.

The appreciation of the equilibrium real exchange rate can come about in different ways according to whether the nominal exchange rate is fixed or not. Under a floating regime the additional supply of foreign exchange on the market will itself appreciate the nominal exchange rate and, for a given price of non-tradables, thereby appreciate the real exchange rate. If the nominal exchange rate is fixed, the capital inflow will bring a balance of payments surplus, that is an

accumulation of official reserve assets. Unless this is sterilized by the monetary authority, inflation will result, but only in the price of non-tradables for the price of tradables is tied to world prices. If the monetary authority tries to sterilize the balance of payments surplus, the real appreciation may be held at bay for some time, but only by real interest rates being above world levels. Capital will continue to flow in. It is a disequilibrium that cannot continue forever, as many governments have found. Thus under both exchange rate regimes the real exchange rate will appreciate; capital mobility substitutes a real appreciation of the exchange rate for an increase in the real interest rate.

What are the effects of the real appreciation on industries within the overall category of tradables? In the short run it is convenient to think of labour as being the only mobile factor of production, other factors being industry-specific. Under such an assumption, the expansion of non-tradable production will tend to contract all other industries. But if we allow for other factors of production to move also, and for the factor mixes to change, then while the production of tradables as a whole will decrease, it is quite possible for the production of some goods within this category to increase, and even for the production of a major category of tradables such as importables or exportables to increase. For example, if the factor intensity of importables lay between non-tradables and exportables, but closer to the former, the expansion of the non-tradable sector may lead to a substantial contraction of the production of importables and, because of the cheapening of the factors of production used intensively by exportables, an *expansion* of the production of exportables.

One other point should be mentioned. The split of government expenditure between tradables and non-tradables may be quite different from that of private expenditure (Harberger, 1986, p. 373). The capital inflow may be earmarked by the government for imports of capital equipment and if this occurs without changing the tradable/non-tradable split of other expenditures (which is a strong assumption), then the expenditure point in Figure 2 would be C', and the real exchange rate would be unchanged (it would be changed, however, by the servicing of the debt in the future). On the other hand, if government expenditure is predominantly on non-tradables there may be a substantial appreciation of the real exchange rate.

The above changes, and those described for the frugal economy in the previous section, may be termed the spending effects of capital movements, following Corden and Neary (1982) and Corden (1984) in their analysis of a resources boom. There is another effect which can be termed factor augmentation. In the absence of capital inflow, the real interest rate would have been higher and some private investment would have been crowded out by the government expenditure. Compared with this alternative the capital inflow augments the stock of real capital and favours the production of capital intensive products; let us assume they are tradables. For any given demand pattern and trade imbalance, this in turn will raise the relative price of non-tradables, that is, appreciate the real exchange rate. Of course, not all production in the tradables category will necessarily be capital intensive. That which is not will be adversely affected by the change in the real exchange rate but will not benefit from the decrease in the price of a factor of production which it uses intensively.

### *Monetary expansion*

In the above discussion of fiscal expansion it was assumed that the expenditure was funded by the government borrowing from the non-banking sector. If it had been financed by money creation, the expanded money supply would imply too large a money stock for the output at existing prices. In the presence of capital flows and at a fixed exchange rate, spending the excess money on tradables, non-tradables and domestic and foreign assets would increase the price of non-tradable goods and domestic assets and yield a balance of payments deficit. Though the nominal exchange rate remains fixed, the real exchange rate would appreciate; if continued inflation is expected the nominal interest rate would have to rise to maintain equality of the real interest rate to the world real interest rate. The situation is not sustainable; as long as the money creation continues, the real exchange rate will remain appreciated and the balance of payments deficit will continue. Depreciation of the nominal exchange rate would be appropriate but unless there is a reduction of real absorption relative to production, the balance of payments deficit and the effective taxation of tradable production will continue. A common response in such circumstances is to raise barriers to imports; again, unless real absorption declines relative to production, it will not cure the problem, and in addition it will bring *further* appreciation of the real exchange rate for other tradables, penalizing them more. In many developing countries agriculture has been disadvantaged in this manner.

With a flexible exchange rate and monetary expansion, the exchange rate will depreciate so as to reduce the real value of domestic money in terms of foreign goods, services and assets. Provided the exchange rate depreciates in line with the monetary expansion and all markets adjust at similar speeds (this point is returned to below) the real exchange rate will not change. But the exchange rate depreciation will continue if monetary expansion is expected to continue – expectations are crucial and changes in policy can run into implementation difficulties if they are not regarded as credible.

### *Changes in world real interest rates*

Real interest rates rose in the early 1980s as the US expanded its budget deficit in the presence of a tight monetary policy. Other capital importing countries experienced a reduced (net) inflow of new capital, an increase in its cost and (where interest rates on old loans were changed) an increase in the servicing cost of existing debt. Referring to Figure 2 and applying it to net debtor countries with capital inflow, the availability frontier moves inwards equidistantly with respect to the horizontal axis, due to both the reduced inflow and the increased cost of the existing debt. Both changes require a real depreciation of the exchange rate and reduced real absorption; such changes are particularly difficult to implement in countries that have an inflationary history. The depreciation of the real exchange rate favours tradable production, exportable and import-competing. (To the extent that imports are already constrained by non-tariff barriers, however, the effect on imports of the real exchange rate movement is nullified.) Secondary effects on the equilibrium real exchange rate would occur through the

interaction of the increased real interest rates with the relative capital intensity of tradables and non-tradables, as outlined above.

## FLOWS, STOCKS AND PORTFOLIOS

To this point the analysis has paid little attention to the role of portfolio adjustments, an aspect of exchange rate determination that has been at the forefront of the literature in recent years. To some extent this literature grew out of a realization that the Mundell-Fleming analysis of the 1960s, in which a role was envisaged for monetary policy in influencing capital flows so as to secure external balance under a fixed exchange rate, had a gap – attention had not been given to the growing stock of international indebtedness that such a policy would imply for a country consistently inducing capital inflow, or to the growing asset holdings of incipient surplus countries (see Krueger, 1983, ch.4).

The implications of capital flows for changes in the level of capital stocks and for portfolio holdings needed to be addressed. For countries prone to external deficits the real interest rate/real exchange rate combination not only needed to attract new capital inflow, but had to be such that foreigners would continue to hold the existing stock of debt. To attract more and more capital, interest rates may have to rise.

In addition, with changing assessments of a country's economic situation and prospects, portfolio adjustments could require substantial changes in the real value of the rest of the world's holdings of a country's liabilities, and of the domestic/foreign split of the asset holdings by that country's residents. Such changing assessments could then bring very rapid changes in holdings of international reserves under a fixed exchange rate regime; under flexible exchange rates the adjustment could take place through appreciation and depreciation of the currency. To the extent that all prices change together, nominal exchange rates could be expected to move to their new equilibrium levels; the effects on real exchange rates would depend on the nature of the cause of the reassessment of the country's prospects. For example, if the economic 'shock' were an unexpected monetary expansion in the country, there may be a depreciation of the nominal exchange rate but no change in the real exchange rate.

The likelihood that all markets would not adjust at the same speed has received much attention, following Dornbusch (1976). Two implications are relevant: first, that short-run equilibrium nominal exchange rates may overshoot their longer term equilibrium levels; second, that real exchange rates may change in the short run even though such a change is not warranted in the longer term.

The overshooting hypothesis arises from the idea that asset markets adjust more rapidly than commodity markets. If there is an unanticipated monetary expansion in a country and money is neutral with respect to real variables, it can be anticipated that prices will rise in proportion to the monetary expansion in the long run, and the nominal exchange rate will depreciate. But if the prices of goods and services are sticky in the short run, during that period the real supply of money will rise, leading to a fall in real (and nominal) interest rates. Interest rate arbitrage across countries will ensure that in the short run the exchange rate must depreciate

further than its long-run level, so that expectations of *appreciation* of the currency will offset the domestic/foreign interest rate differential.

If the prices of all goods and services were equally sticky over the course of these adjustments then the real exchange rate would not change. But if the domestic prices of tradable goods are governed by international prices and the nominal exchange rate, as we have been assuming, then it is only non-tradable prices that will be sticky domestically, and the real exchange rate will depreciate in line with the overshooting of the nominal exchange rate (Edwards, 1987, pp. 18–19). To the extent that the longer term path of the real exchange rate is not correctly anticipated, unnecessary resource reallocation may occur; even if it is anticipated correctly, some reallocation would occur in response to the transitory price signals.

A similar idea has been advanced in the context of an appropriate sequencing of liberalization in a country that has barriers to trade and capital flows (Edwards, 1984; 1985, pp. 110–14). Liberalization of trade can be expected normally to require real depreciation. Liberalization of capital movements for a country with monetary stability and a relatively low stock of capital is likely to bring strong capital inflow as portfolios are being adjusted. Under a fixed exchange rate this capital inflow will increase international reserves and exert an inflationary monetary impulse, the inflation bringing real exchange rate appreciation. Under flexible exchange rates the portfolio adjustment would bring appreciation of the nominal and real exchange rates and, as with the fixed nominal exchange rate, provide the wrong signals from a longer term point of view. Under both exchange rate regimes, pressure for the re-imposition of protection is likely, for recently protected producers of tradables will be facing reduced protection and an appreciated real exchange rate. For these reasons it has been suggested in some quarters that liberalization of capital movements should occur after trade liberalization; it is argued that the movements of the real exchange rate with portfolio adjustments will be less disturbing after the trade liberalization has been digested.

## CONCLUSION AND IMPLICATIONS FOR AGRICULTURE

Rather than provide a detailed application to agriculture, the circumstances of which vary from country to country, a framework has been provided into which industries can be fitted according to the extent to which they are tradables, and among tradables as to whether they are protected by import barriers or not, and as to their relative dependence on capital. In the introduction there was a quick application to US agriculture, which is to a large extent tradable and capital intensive. Not all agricultural products are tradable, of course (fresh milk for example being a non-tradable for many countries), nor are all capital-intensive, even in the US.

Several recent and important studies are particularly relevant. Krueger, Schiff and Valdés (1988) summarize the results of the World Bank's research project on the Political Economy of Agricultural Pricing Policies. Authors of 18 country studies estimated the effects on the real exchange rate of unsustainable capital flows and all barriers and subsidies for trade, and the implications for agriculture.

Valdés (1986) outlines the theory and surveys a number of empirical studies of effects of trade and macroeconomic policies on real exchange rates and agriculture in South America. Two major long-term studies for Argentina and Chile respectively, are Mundlak, Cavallo and Domenech (1987) and Coeymans and Mundlak (1987). For most of the developing countries covered in the studies, major agricultural products are exportables, the production of which has been taxed through appreciated real exchange rates. These in turn are attributable to industrial protection, inflation and, for some years, to unsustainable capital inflow. In more recent times the drying-up of capital inflow and debt servicing commitments have tended to push the real exchange rate in the opposite direction. However the difficulties of adjustment to these external shocks, and other forces, have aggravated inflation. To the extent that nominal exchange rate adjustments have lagged behind inflation and have been resisted by import barriers, the real exchange rate depreciations warranted by capital flow and debt servicing considerations have been thwarted. But I leave that to others.

## NOTES

The statements, analysis, conclusions and mistakes in this paper are entirely those of the author and should not be attributed in any manner to the World Bank.

<sup>1</sup>The weights used in calculating  $P_1$  depend, *inter alia*, on whether the focus is on domestic production or consumption.

<sup>2</sup>The small country assumption implies constant terms of trade so that effects on the terms of trade, much debated in the context of the 'transfer problem', are not relevant.

## REFERENCES

- Balassa, Bela, 1987, 'Effects of Exchange Rate Changes in Developing Countries', DRD Discussion Paper No. 291, Development Research Department, The World Bank, Washington, DC.
- Clements, Kenneth W., and Sjaastad, Larry A., 1984, *How Protection Taxes Exporters*, Thames Essay No. 39, Trade Policy Research Centre, London.
- Corden, W. M., 1984, 'Booming Sector and Dutch Disease Economics: Survey and Consolidation', *Oxford Economic Papers*, Vol. 35, November pp. 359–80.
- Corden, W. M. and Neary, J. Peter, 1982, 'Booming Sector and De-industrialization in a Small Open Economy', *The Economic Journal*, Vol. 92, December pp. 225–48.
- Coeymans, Juan Eduardo, and Mundlak, Yair, 1987, 'Agricultural and Sectoral Growth: Chile, 1962–82', International Food Policy Research Institute, Washington, DC.
- Dombusch, Rudiger, 1976, 'Expectations and Exchange Rate Dynamics', *Journal of Political Economy*, Vol. 84, No. 6, December, pp. 1161–76.
- Edwards, Sebastian, 1984, *The Order of Liberalization of the External Sector in Developing Countries*, Essays in International Finance, No. 156, International Finance Section, Princeton University.
- Edwards, Sebastian, 1985, 'Real Exchange Rate Misalignment in Developing Countries: Analytical Issues and Empirical Evidence', CPD Discussion Paper, No. 1985–43, The World Bank, Washington, DC.
- Edwards, Sebastian, 1987, 'Real Exchange Rate Misalignment in Developing Countries', University of California, Los Angeles, Department of Economics Discussion Paper, No. 442.
- Harberger, Arnold C., 1986, 'Economic Adjustment and the Real Exchange Rate', Chapter II of Sebastian Edwards and Liaquat Ahamed (eds.), *Economic Adjustment and Exchange Rates in Developing Countries*, University of Chicago Press.
- Krueger, Anne O., 1983, *Exchange Rate Determination*, Cambridge University Press.

- Krueger, Anne O., Schiff, Maurice and Valdés, Alberto, 1988, 'Measuring the Impact of Sector-Specific and Economy-Wise Policies on Agricultural Incentives in Developing Countries', *The World Bank Economic Review*, Vol. 2, No. 3, September.
- Mundlak, Yair, Cavallo, Domingo and Domenech, Roberto, 1987, 'Effects of Trade and Macroeconomic Policies on Agriculture and Economic Growth: Argentina, 1913-84', International Food Policy Research Institute, Washington DC.
- Salter, W. E. G., 1959, 'Internal and External Balance: The Role of Price and Expenditure Effects', *The Economic Record*, Vol. 35, August, pp. 226-38.
- Snape, Richard H., 1977, 'Effects of Mineral Development on the Economy', *The Australian Journal of Agricultural Economics*, Vol. 21, No. 3, pp. 147-56, (reprinted in Lloyd, P.J. (ed.), *Mineral Economics in Australia*, Allen and Unwin, Sydney, 1984).
- Valdés, Alberto, 1986, 'Impact of Trade and Macroeconomic Policies on Agricultural Growth: The South American Experience', Chapter X of *Economic and Social Progress in Latin America, 1986 Report*, Inter-American Development Bank.
- Williamson, John, 1985, *The Exchange Rate System*, Institute for International Economics, Policy Analyses in International Economics, No. 5, Washington DC. (Revised June).
- World Bank, 1986, *World Development Report*, Oxford University Press for the World Bank.

## DISCUSSION OPENING — CARLOS ALFREDO RODRIGUEZ

Professor Snape has dealt in a very competent way with a wide variety of issues relating to the effects of Real Exchange Rates and Real Interest Rates on the relative performance of the agricultural sector. Given the time constraint I shall deal exclusively with issues relating to the Real Exchange Rate (RER). I am in full agreement with the theoretical foundations used by the author to deal with the RER concept. Therefore, rather than commenting on specific points made, I will use my time to expand on some of those points I consider most relevant for the purposes of this conference.

The RER, broadly defined, attempts to capture the external competitiveness of a country in foreign trade. There are competing measures for this concept, as Professor Snape clearly points out. I tend to favour the use of the measure constructed to mean the relative price of the tradable goods in terms of the non-tradable. As such, the RER is a relative price between two broadly defined categories of products. This definition allows one to proffer two basic considerations that are the basis of my comments:

First, relative prices, as we know, have equilibrium levels determined by market forces. Attempts to fix relative prices at non-equilibrium levels gives rise to disequilibria elsewhere in the economy. Economic analysis indicates that the RER is determined by the aggregate relationship between output and expenditure in a country. A rise in expenditure relative to income must generate a trade deficit that must be accompanied by a real appreciation in order to allow the transfer of resources away from the traded sector. The real appreciation is the consequence and not the cause of the trade deficit.

This point has important policy implications since, very often, countries try to improve in the external accounts by implementing a real devaluation without taking the required additional measure of reducing aggregate expenditure relative to output. Such policy forces the Central Bank to purchase the extra foreign exchange with newly printed money with the end result that as inflation increases, the expenditure reduction is accompanied by an increase in the inflation tax. In summary: use of the RER devaluation to improve the external

accounts leads to more inflation unless a fiscal adjustment is simultaneously implemented.

My second point has to do with the fact that the real exchange rate is the relative price between two aggregates of products. It serves its purposes so far as there are no changes in the relative prices between the goods included in the aggregation. This does not happen when we discuss the effects of commercial policy in which case the concept of a unique real exchange rate loses meaning.

Consider a country like Argentina that normally imposes import duties and export taxes. Such action tends to reduce both the demand for imports and the supply of exports. The result is that the ratio of the nominal exchange rate to the price deflator of domestic goods need not appreciably change. We may say that the real exchange rate remains approximately at the free trade level. However, the real exchange rate relevant for analysis of the protection given to the import competing sector has risen by the amount of the import duty. Similarly, the real exchange rate relevant for the export sector (agriculture in our case) is lowered by the amount of the export tax. We therefore see that the policy discussed does not have significant impact on the RER as usually defined but has enormous effects on income distribution and the sectoral allocation of resources. In consequence, we feel that the RER is a poor indicator of sectoral competitiveness when there are changes in either commercial policy or external prices of traded goods. This suggests that one should use, for those purposes, at least two RER, one for exports and one for imports, and that those measures should have in the numerator the internal prices of the traded goods as they already incorporate the effects of commercial policy measures.

One last point has to do with the incidence of export and import taxes and their effects on the relevant sectoral RER. An import duty raises the import RER and lowers the export RER. The same effect is obtained with an export tax. In consequence, both export taxes or import taxes have the same effect of producing a lower export real exchange rate. This is a well known theoretical result associated with what is called the 'Lerner Symmetry Theorem' and also with the concept of 'anti-export bias'. It is surprising, however, how little exporters complain about the imposition of import duties as compared with their reactions against export taxes. Both taxes are the same thing: they are indirect taxes on the generation of foreign exchange. As with any indirect tax in a particular market, part of the tax falls on the producer (the exporter) and part falls on the user (the importer).

In summary, for the purposes of discussing agricultural policy in countries exporting these products, I recommend the use of the specific RER that measures the competitiveness of this sector and the recognition that this measure is affected both by export taxes and by import duties.