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THE THEORETICAL AND EMPIRICAL ANALYSIS OF AGRICULTURAL TRADE OF LDCS

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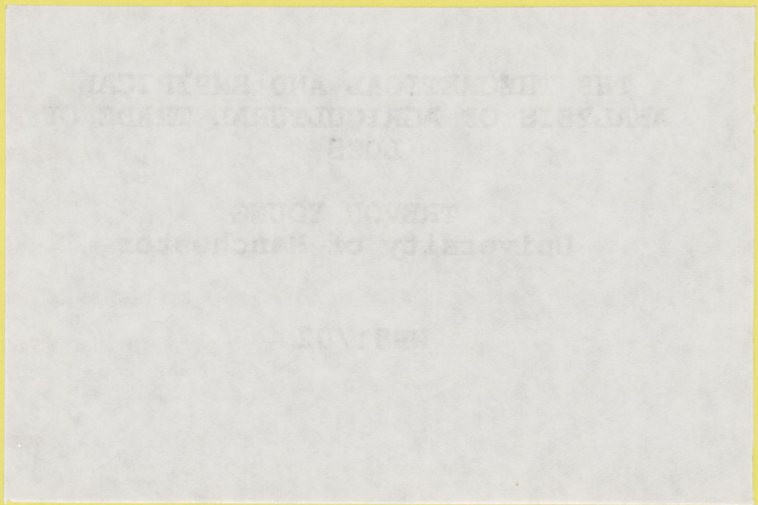

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I INTRODUCTION

The commercial trade policies which a developing country (LDC) pursues have significant effects, intentional or not, on the allocation of resources between sectors and within sectors, on the country's trade performance and on the pace of economic growth. This study will provide an overview of the principal theories of international trade, including recent "new thinking" on the subject, and of empirical analyses relating to agricultural trade flows. More specifically, the objectives of the paper are i) to critically examine the basis for commercial trade policy , with particular attention to its interaction with domestic distortions and the real exchange rate, and its impact on agricultural sector performance, and ii) to assess the advantages and disadvantages of broad trade strategies (often classified as "import substitution" and "export promotion"), taking account of past experience, the current state of international markets in primary products, and the scope for export product diversification.

A number of surveys of the economic literature on trade and development have recently been published (including Gemmell, 1989, Goldstein and Khan, 1985, Greenaway, 1988, Jones, 1986, Stern, 1989), and inevitably this review draws heavily upon these. However, the scope of this study is much narrower; as the focus is the agricultural sector in developing countries, this review can be considerably more selective.

It may be helpful to begin by presenting, as background material, some trade data which highlight recent developments in LDCs' trade and the substantial changes in its commodity structure.

1.1 Trends in Total Exports

The time path of world exports from 1960 is depicted[1] in Fig. 1.1. During the 1960s, a period of comparative stability in exchange rates, interest rates and of sustained economic growth, world exports grew at a steady rate. The first major check came in the mid 1970s by which time the major currencies were floating and the real price of petroleum had risen sharply, slowing growth outside the oil-exporting economies. A more dramatic downturn occurred in 1980. By this time the developed countries were in deep recession, with subsequent sluggish demand in these important export markets. It was also during the early 1980s that there was a serious lapse in the export performance of the LDCs. Up until then, LDCs' exports had kept pace with changes in global trade but thereafter their paths diverged. Significantly, the LDCs did not share in the upturn of world trade which occurred in the second half of the decade. Poor trade performance has been associated, *inter alia*, with the crisis in external indebtedness of LDCs, created by rising interest rates, impaired export earnings and a steep drop in capital inflows.

During the 1980's, export performance of African countries was much worse than that of the LDCs as a group. Fig. 1.2 clearly illustrates that Africa's share of LDCs' total exports has declined steadily since its peak in 1963.

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[1] IMF Financial Statistics provides the data on which Figs. 1.1 and 1.2 have been based.

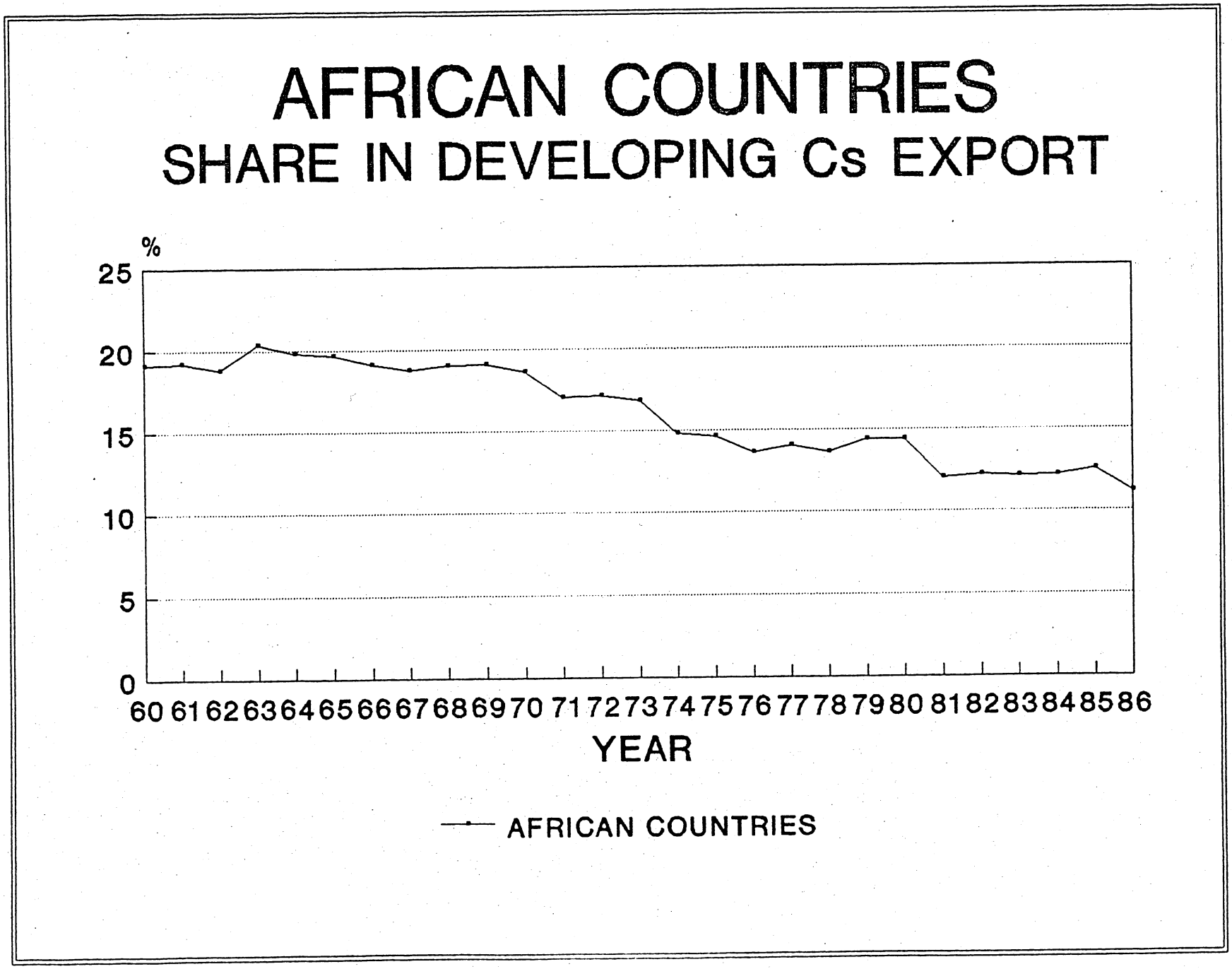

Figure 1.2 : Africa's Share of LDC's Total Exports

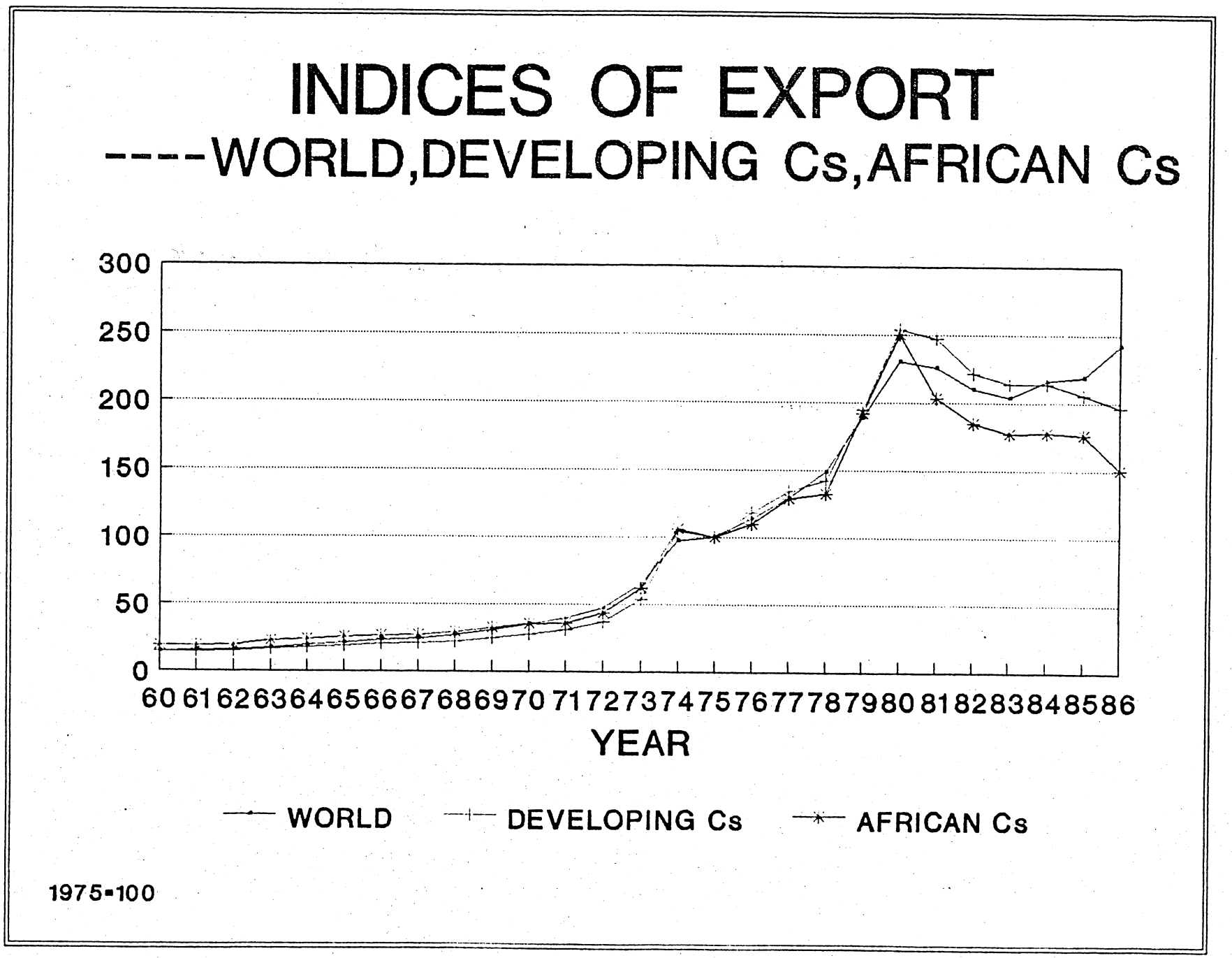

Figure 1.1 : Indices of Total Exports

1.2 Trends in Commodity Trade

Since the mid 1950s there has been a progressive decline in the relative importance of food and agricultural raw materials in world trade and a parallel increase in the exports of fuels and manufactured goods (Table 1.1). The composition of developing countries' exports has mirrored these changes (Table 1.2). In 1965 almost half of LDCs' exports was in agricultural commodities (food, beverages and tobacco, agricultural raw materials); by 1980 these products accounted for just over 25% of their export earnings. This does not imply, however, that most exporters of traditional agricultural products have been able to switch from weak commodity markets. The distribution of commodity exports is still highly concentrated and as few as 8 countries account for about 80% of LDCs' exports of manufactured goods (Greenaway and Milner, 1989).

Table 1.2 also highlights the fact that the LDCs' share of total world trade has fallen; the gains in trade in manufactures and energy have not been sufficient to outweigh the loss of share in trade in agricultural primary products.

1.3 Outline of the Study

The paper is organised as follows. Chapter II presents the main schools of thought regarding international trade and the policy prescriptions which emerge from each. Some consideration is also given to recent advances in this area of theory, which suggest that the orthodox case for free trade must be modified, but not abandoned. The next chapter explores the reasons that governments eschew free trade and the consequences of their interventions. Particular attention is given to a) the role of the real exchange rate, and b) the interaction of trade policies (tariffs, export subsidies etc.) with domestic market distortions. It is possible to establish a hierarchy of the many alternative policy instruments, which indicates the path to "optimal intervention". A general conclusion here is that trade policies should be well down the list of priorities.

In Chapter IV, following an introduction to the broad trade strategies of import substitution and export promotion, specific issues of concern in the formulation of agricultural trade policy are considered. The first of these is the "export pessimism" which seems to have overcome several commentators on the prospects for agricultural trade. When, under current reform programmes, greater economic incentives are given to the production of traditional agricultural exports in the major producing LDCs, the resultant glut on the world market, it is argued, will depress prices and export revenues. This argument is critically examined, together with a related subject, the scope for diversification in agricultural production and export. Another feature of adjustment programmes which has attracted critical comment is "import liberalisation" and this is also briefly touched upon here. Chapter IV concludes with a discussion of appropriate intervention with respect to agricultural trade.

TABLE 1.1 : PRODUCT COMPOSITION OF WORLD EXPORTS[a] (%)

Type of Goods	1955	1960	1965	1970	1975	1981
Food and beverages	21.8	19.4	18.4	14.7	13.2	11.3
Agricultural raw materials	12.9	10.8	8.1	5.8	3.9	3.5
Minerals and Metals	12.2	13.0	12.2	12.7	9.7	7.6
Fuels	11.0	9.9	9.6	9.2	19.3	24.2
Total raw materials	57.9	53.1	48.3	42.4	46.1	46.6
(Total excluding fuels)	(46.9)	(43.2)	(39.7)	(33.2)	(26.8)	(22.4)
Manufactured products	40.5	45.7	50.1	55.5	52.0	52.0
TOTAL EXPORTS[b]	100.0	100.0	100.0	100.0	100.0	100.0

a) Based on export values in current U.S. dollar terms

b) Including products not otherwise classified and statistical discrepancies

Source: UNCTAD, Handbook of International Trade and Development Statistics, Various Issues.

TABLE 1.2 : EXPORTS OF COMMODITY GROUPS FROM DEVELOPING COUNTRIES: 1965-80* (bill.US$)

	Developing Countries		World		LDCs' Share (%)	
	1965	1980	1965	1980	1965	1980
Food	6.36	31.63	20.89	137.55	30.4	23.0
Beverages and Tobacco	3.19	12.08	3.95	16.45	80.8	73.4
Agric. Raw Materials	4.51	15.28	11.42	53.60	39.5	28.5
Minerals	3.23	16.63	8.61	58.11	37.5	28.6
Energy	0.28	17.28	9.47	246.41	3.0	7.0
Manufactures	10.64	137.57	109.24	1151.82	9.7	11.9
TOTAL	28.21	230.47	163.59	1663.95	17.2	13.8

* Adapted from Bond (1987)

A recurrent theme in the analysis of trade issues is the primary need, when formulating trade policy, for detailed quantitative information on the determinants of trade flows and market shares , on the prospects for individual products and on the country's comparative advantage or disadvantage in their production. Chapter V reviews some empirical analysis in this field. It presents a general discussion of methodological issues, before turning to the analyses of instability and trends of agricultural product prices, and of comparative advantage. However, as most empirical studies of agricultural trade have been concerned with the estimation of "trade equations", the bulk of this chapter is devoted to an overview of modelling work on agricultural trade flows and market shares and of the export demand elasticities which have been estimated for agricultural products.

The paper concludes with a brief summary of some of the main conclusions which emerge from the review.

II THE THEORY OF INTERNATIONAL TRADE

There is a rich array of theories concerning international trade. It is common to classify these into three broad schools of thought or, as Smith and Toye (1979) suggest, into three "stories". These would be:

1. the orthodox or neoclassical approach, the "happy story of mutually beneficial trade",

2. the structuralist perspective, or the "dull and detailed story of structurally biased gains from trade, and

3. the radical paradigm, or the "tragic story of trade-induced global polarity".

Each school has its own set of policy prescriptions. These are in turn:

i) If trade makes countries better off, then obviously trade should be promoted through liberal, outward-looking policies, entailing dismantling of tariff and non-tariff barriers , correction or removal of domestic market distortions at source, etc. Given the importance of price signals in the allocation of resources, a major priority will be "getting the prices right".

ii) Where there are bottlenecks and constraints to smooth allocation of resources, government intervention, in the form of planning, institutional reforms, and direct controls, is required. Changes in structures and institutions of the international economic order are also called for, to reduce or eliminate biases in trade relations.

iii) To eliminate dependency on the "core" of developed countries, barriers to trade should be raised. Each country should withdraw into an autarky of national self-sufficiency, or self-insufficiency.

2.1 An Overview of Trade Theories

2.1.1 The Neoclassical Perspective

The central proposition of neoclassical trade theory is that, given certain assumptions, there are gains from trade and that free trade is superior in terms of economic efficiency to either autarky (no trade) or various degrees of trade restriction (see, for example, Corden, 1986).

The superiority of free trade can be demonstrated by a simple analysis of comparative advantage, for a small country whose terms of trade are given exogenously. In Fig. 2.1 the production possibilities frontier, PP, indicates the combinations of two goods, M and X, which the country can produce, given its endowment of resources and given the state of technology. Assuming perfect competition and full employment arising from input price flexibility, the equilibrium for the closed economy will lie somewhere along PP, which thus represents also the frontier of consumption or absorption possibilities. Point B signifies such an equilibrium. However, by opening the country to international trade, consumption possibilities can be expanded. With an international price ratio of RR, production equilibrium would be attained at point A, where the marginal rate of transformation in domestic production is equal to the marginal rate of transformation in international exchange. But the set of free trade consumption possibilities is also

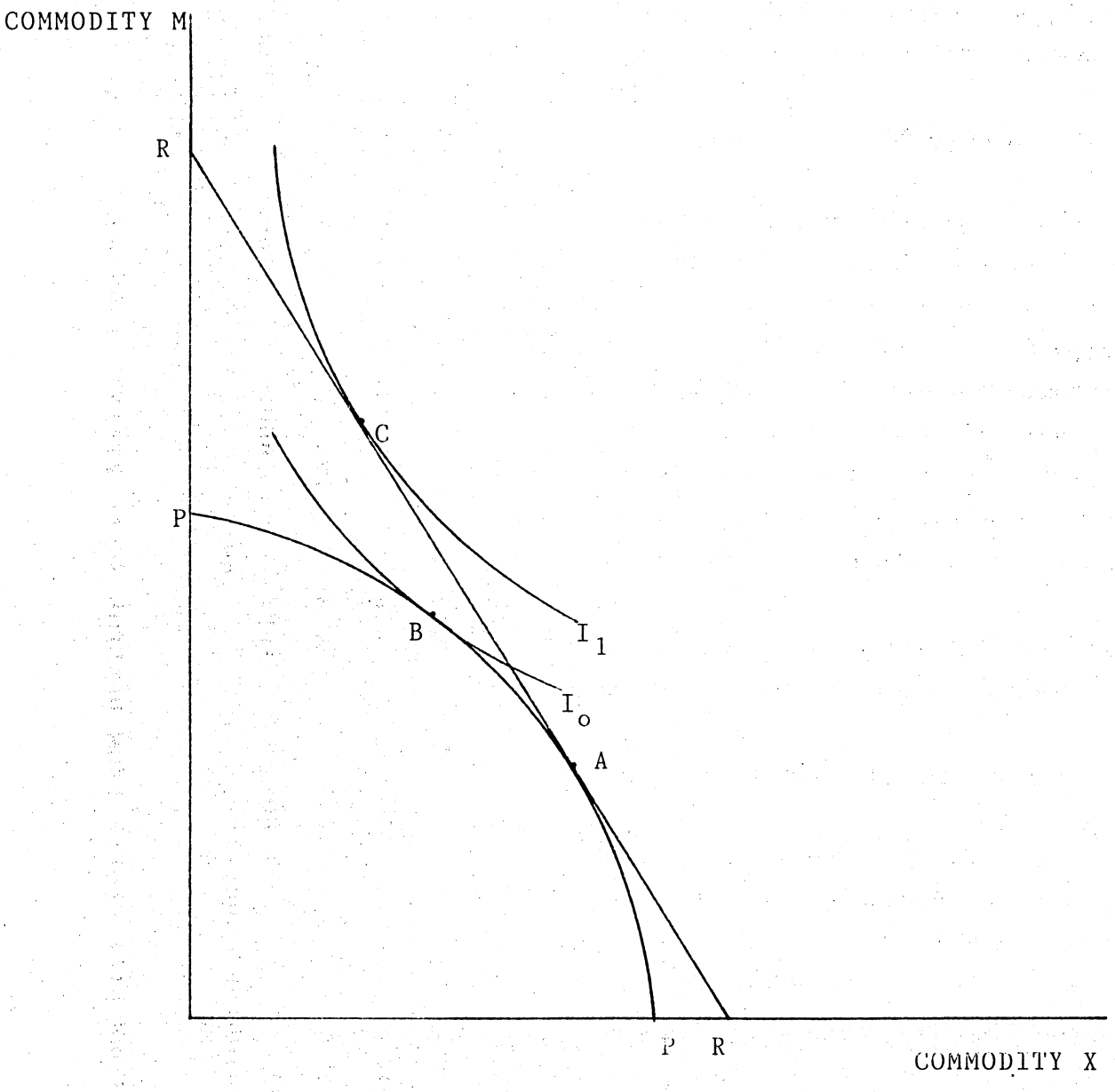

FIGURE 2.1 : The Gains From Trade

represented by RR, offering greater choice than before. The actual free trade consumption equilibrium would be a point such as C, where the marginal rate of substitution in consumption (the slope of the (higher) community indifference curve) is equal to the marginal rate of transformation in international exchange. Hence while world prices diverge from autarky or restricted trade prices, there are potential gains from trade.

Note that any trade intervention would lower welfare from its free trade level and so both import-substitution (say, with the aid of import taxes) and export-promotion (e.g. with export subsidies) are to be avoided.

The well-known result that there are potential gains from trade does, however, rest on a number of assumptions. These include, as noted above, perfect competition and price flexibility in input markets, but also absence of externalities, distortionary domestic taxes, increasing returns to scale. (Modifications to the standard result will be considered in Section 2.2).

Differences in comparative advantage arise where there are differences in factor endowments between countries. The Heckscher-Ohlin theory demonstrates that, with two countries, two commodities and two factors of production, each country will specialise in the production of the commodity which is relatively intensive in the use of its relatively abundant factor. (For developing countries, it is usually presumed that the abundant factor is labour.) From the standpoint of any one country, trade will have the effect of increasing demand for the abundant factor, thus bidding up its price, and increasing the supply of the scarce factor, thereby reducing its price. It is in this way that trade could be expected to reduce factor price differences between countries: indeed under specific assumptions, full equalisation of factor prices would result from free trade in commodities. Among the key assumptions here are that each country has equal access to the same technology and that factor endowments are immobile internationally.

The neoclassical story is essentially a static one, with relatively little attention to the effects of trade on factor accumulation and productivity growth. A number of potential sources of dynamic gains have been suggested (Kirkpatrick, 1989), including increased foreign capital inflows, access to new technology, economies of scale from enlarged markets, better entrepreneurship from exposure to foreign competition etc. However, as Bhagwati and Srinivasan argue (1979, p.14), "Contrary to the enthusiasm of many proponents of liberalized regimes, there is no systematic evidence on their side either of dynamic efficiencies... and no general conclusions seem warranted".

Some Variations on the Neoclassical Theme

The Heckscher-Ohlin theorem (that a country will export (import) those goods which use a relatively large proportion of its abundant (scarce) factor) was been tested in the 1950s for the USA by Leontief with a contrary result (the Leontief Paradox) that "America's participation in the international division of labour is based on its specialization of labour intensive, rather than capital intensive lines of production." (Leontief, 1956, p.86). A vast literature on possible explanations of the paradox followed. One aspect of the debate which is particularly pertinent in the present context concerned the influence of skill (or human capital) on trade composition.

The importance of skill as a separate factor of production is central to the **product cycle theory** of international trade. Three stages of demand for a commodity can be distinguished (Hirsch, 1967). In the first stage, demand is small and large scale production is not feasible. The input of skilled labour in the production process is large relative to the inputs of capital and unskilled labour. In the second stage, as demand increases, more capital will be used as input, while management, cost control techniques and engineering skills for designing new techniques for large scale production increase in importance. In the third and final stage, product standardization takes place and large amounts of capital and unskilled labour are combined with small amounts of skilled labour.

The argument may be taken a step further by distinguishing between various types of goods for which particular trade theories would be applicable. Thus, for **Heckscher-Ohlin goods**, production functions are identical in all countries, since the technology is known and universally available and marginal productivities do not depend on location. Although these characteristics are sometimes assumed in the cross-country analysis of agricultural products, they are more often taken to be features of **mature product cycle goods** and applicable particularly to trade in manufactures between developing and developed countries.

On the other hand, **new product cycle goods** are goods that are manufactured as a result of recent innovations and R & D efforts. Here production functions vary from country to country and the cost of international transfer of technology (which now enters the calculation of comparative costs) is likely to be high. Export of such goods is likely to remain restricted to the more advanced industrial countries. This is so not only on the supply side but, according to Linder (1961), in terms of the demand for these goods too.

Linder suggested that manufactured goods are produced by domestic entrepreneurs in response to domestic demand, which in turn is closely related to the level of domestic per caput income. The entrepreneurs will also export these new products to countries that appear to have similar demands, i.e. to countries at a similar stage of development. It would then follow that trade in manufactured goods would be most intense among countries with similar per caput incomes. This prediction is contrary to the orthodox view that it is the differences between countries, in terms of resources and technologies, that drives international trade.

Balassa (1977) was also interested in the composition of trade for economies at different levels of development. In his **stages** approach to comparative advantage, "intercountry differences in the structure of exports are in a large part explained by differences in physical and human capital endowments". As countries grow, their exports become less labour intensive. This enables LDCs at relatively low levels of development to expand their exports by taking over from those graduating to more capital intensive ones[2].

[2] For further discussion, see Stein (1984).

2.1.2 The Structuralist Perspective

Structuralism emerged as a reaction to the neoclassical paradigm. It is associated with the writings of, *inter alia*, Lewis, Myrdal, Nurske, Prebisch, and Singer in the 1950s and 1960s, although some of the structural hypotheses had a much longer pedigree. Relative prices were considered to have negligible consequences for the allocation of resources. Given the numerous bottlenecks and constraints in LDCs, the market mechanism was inflexible and unresponsive. Market imperfections were not mere oddities but the norm, and so the neoclassical model was largely inapplicable. The rigidities in LDCs' markets called for intervention, in terms of planning and administrative controls, as the means of improving resource allocation.

Structuralists viewed international trade as asymmetric in its treatment of developing and developed countries. Prebisch and Singer were the best-known proponents of the thesis that the gains from trade were biased against low-income countries. This bias resulted in a secular decline in the terms of trade of primary producers (assumed to be synonymous with LDCs) *vis-a-vis* producers of manufactured goods. The main beneficiaries of technical progress which raised the productivity in primary exports were consumers in the developed countries and, given Engel's Law, income elasticities of demand for primary products would be less than those for manufactures. The long term downward trend in terms of trade, it was argued, would produce a transfer of income from poor to rich countries. Nurske added to this export pessimism, arguing that the prospects for primary exports for LDCs were poor (problems of low income elasticities, protectionism in DCs, increasing competition from synthetics) but so too were those for exporting manufactures (problems included protectionism, increasing returns and learning).

The central policy issue is how to intervene in international markets in order to improve the terms on which LDCs trade, compensating for their structural disadvantages. The volume of empirical information on specific aspects of commodity markets which underpinned negotiations in international fora, such as UNCTAD, provided the "dull and detailed" nature of the story, suggested by Smith and Toye.

The notion that the foreign trade sector (and lack of foreign exchange) could be a separate constraint to economic growth was formalised in the "two-gap" models in the 1960s. Specifically, if an economy faces a fixed growth rate for its exports, the import bill comprises "essential" consumption goods, and the import content of domestic output is given, then investment could be constrained by the available foreign exchange, even if domestic savings were sufficient to meet the desired rate of economic growth. The model has, however, been criticised for the assumption that exports are insensitive to changes in relative prices, thus reflecting the export pessimism already noted. While there is no denying that external phenomena, such as the oil crisis of the 1970s which created major difficulties for oil-importers, are important determinants of economic growth, slow growth in export earnings can also be attributed to trade policies which are under the country's direct control.

Apart from an association with the "two-gap" model, structuralists have tended to eschew formal modelling. Moreover, with the ascendancy of the neoclassical paradigm in the late 1960s and 1970s, a more defensive position was taken, with more attention given to piecemeal criticism of the neoclassical approach than to the pursuit of theoretical elegance of their own.

Among their specific concerns were:

(i) the static nature of the neoclassical theory. In particular, the validity of the assumption of a static technology, to which there is equal access, has been questioned. The ability to obtain and adopt a continually changing technology is viewed as an important determinant of development. Comparative advantage will also be expected to change over time and adjustment to changing patterns of demand is unlikely to be smooth. Instability in export earnings and constraints to long run structural adjustment may accompany over-specialisation in a narrow range of products.

(ii) imperfections in international markets. A significant part of world trade is intra-firm (i.e. the buyer and seller are branches of the same transnational firm), with the result that transactions do not take place at open-market prices. In addition, examples of market concentration, non-price competition and product differentiation are readily found. These all run counter to the neoclassical assumption of competitively determined world prices.

(iii) the distribution of gains from trade. Concern was not restricted to the consequences for countries with unequal bargaining power, but extended to the degree of foreign participation (in the ownership of factors of production, control of marketing and distribution channels etc.).

2.1.3 The Radical Perspective

The radical perspective, although taking a number of forms, is primarily concerned with trade-induced polarity in a global capitalist system.[3] International trade between the "core" of developed countries and the "periphery" of underdeveloped countries impedes economic progress of the latter. Trade is considered exploitative because more current labour is embodied in the goods exported by LDCs than in those they import with equal value. This has been dismissed (Riedel, 1988, p.32) as "nothing other than a tautological restatement of the fact that developing countries have a comparative advantage in relatively labour intensive products".

Although early writers were concerned with the impact of colonial trading links and of the neo-colonialism which replaced them when political independence was achieved, more recently attention has been focused on the role of foreign capital and transnationals in the development of low-income countries, as well as on the nature of domestic interest groups which have benefited from association with foreign capital.

[3] "One has moved completely from Mancunian to Manakin economics". (Smith and Toye, 1979, p.16).

2.1.4 Towards a Synthesis

The choice between these approaches to the analysis of international trade might be based on theoretical, empirical or theological reasoning. Smith and Toye (1979), however, suggest that there is scope for "intelligent eclecticism". The historical analysis of the radical school may help to explain the structural differences between developed and developing countries, which the structuralists take as given. Technological and institutional gaps, if they exist, can be used to explain the unequal distribution of the benefits of trade internally and internationally. Comparative advantage, together with dynamic and national security considerations, would be an element in the design of a country's foreign trade strategy.

2.2 Some Recent Developments

The orthodox models of trade typically assume a constant returns to scale technology, homogeneous products and a competitive structure. But more recently international trade theory has explored a number of new directions. Some theorists have argued that **uncertainty** clouds the case for unfettered trade. If one sector in the economy is subject to risk (and the agricultural sector would be an obvious candidate), then activity in that sector will be discouraged unless it is protected[4]. In certain circumstances (including the absence of insurance markets) autarky may be superior to free trade. On the other hand, Corden (1986) argues that the introduction of uncertainty has the same sort of effect as an adverse change in the terms of trade, viz. the gains from trade are reduced but are still positive. Uncertainty generates costs to producers and consumers but once they have adjusted to these, trade offers more opportunities than autarky.

Recent pro-trade arguments have been based on the premise that trade allows the benefits of **increasing returns** to be captured. It is recognised that much trade , especially between similar countries, reflects specialisation to take advantage of increasing returns. For example, a model developed by Markusen and Melvin (1981), increasing returns, rather than differences in factor endowments or productivity, provides the basis for trade. Specifically, the analysis is undertaken for two countries of differing absolute size but with the same factor proportions and tastes, and for two commodities, one of which is produced with increasing returns. In this case, economies of scale give a comparative advantage to the large country in the production of the good with increasing returns to scale.

The potential gains from trade are much larger where increasing returns exist and in this sense the case for free trade is even stronger. However, "an individual country acting alone may have reasons not to adopt free trade. New trade models show that it is *possible* (not certain) that such tools as export subsidies, temporary tariffs, and so on, may shift world specialisation in a way favourable to the protecting nation" (Krugman, 1990, p.3).

There has also been increasing recognition of the role of **monopolistic competition** and **intra-trade**, as well as increasing returns. By moving from the competitive model towards monopolistic competition,

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[4] For example, Helpman and Razin (1980), using a general equilibrium framework with financial markets, compare policy instruments, designed to protect the import-competing sector, in the presence of uncertainty. They show that a subsidy to domestic equities is preferred to both a tariff and an import quota.

where the number of participants in a particular industry is small and "supernormal" profit opportunities exist at least in the short run, the superiority of free trade is less obvious and the possibility of strategic behaviour is admitted. The question then is whether a national government can do anything to shift oligopoly rents from foreign to domestic firms and whether it is in the national interest to intervene in order to ensure that outcome. An added complication is that trade policies which confer domestic benefits at the expense of foreign competitors invite retaliation. The problem of predicting effects in a complex strategic environment takes the new trade theorists into the realm of game theory and the application of industrial organisation models to international trade[5]. As yet, no simple guidelines for policy have emerged.

The observed phenomenon of **intra-industry trade** (a two-way trade often in differentiated products within the same industry) has spawned a large theoretical literature on trade in differentiated products under imperfect competitive conditions.[6] Although this form of trade is most often observed among developed countries; it is of interest here because of its growing importance in the trade, especially in manufactured goods, of developing countries.

The mechanisms of intra-industry trade may be conceptualised as follows (Ocampo, 1986). Consider an economy with two sectors: one producing homogeneous products under competitive conditions and one producing diversified products under monopolistic competition. In the latter, each design is produced by one firm, with increasing returns to scale and with mark-up pricing on the variable cost of production. The size of the mark-up will vary inversely with the elasticity of substitution between designs.

In terms of international trade, specialisation between homogeneous goods and diversified goods sectors or among diversified goods sectors will depend on factor proportions. If factor endowments are different, inter-industry trade will prevail. But if factor endowments are similar, intra-trade, with countries exchanging different designs produced in the same sectors, will occur.

The benefits from intra-industry trade would include a widening of choice from greater variety and dynamic gains from scale economies permitted by enlarged markets. Lower prices could also result if greater variety increases the elasticity of substitution between designs and so lowers the mark-up. With regard to the interests of developing countries, Greenaway and Milner (1989) suggest that although intra-trade of a "North-South" nature may be restricted by relative endowments and country size, the ability to exchange the benefits of scale may be increasingly important in "South-South" trade.

The analysis of intra-trade has thrown up a number of special cases in which the unilateral imposition of a tariff may be an optimal policy even for a small country. But few generalisations on appropriate policy intervention can be offered. The possibility of retaliation, which invariably reduces welfare, must also be considered. Moreover, "the possibilities of 'rent-snatching' or for scale benefits from

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[5] For a detailed discussion, see Krugman (ed.)(1986) and Krugman (1990, ch.14).

[6] Among the principal contributors are Dixit and Norman (1980), Helpman (1981), Krugman (1981) and Lancaster (1980).

import substitution are in many cases likely to be limited in most developing countries" (ibid., p.l8).

2.3 Concluding Remarks

The orthodox theory of international trade suggests that, under "first best" conditions, any trade intervention, whether import substituting or export promoting, will lower welfare relative to that under free trade. But recent advances in theory have modified the orthodox story. The case for free trade has not been overthrown but many now view it as "a reasonable rule of thumb...a useful target in the practical world of politics" (Krugman, 1986) rather than an optimal strategy in all circumstances. The (more complex) theoretical arguments must be weighed with empirical evidence and political considerations.

When "first best" conditions do not pertain, the principles of appropriate intervention have to be considered. This is the subject of the next chapter. One conclusion is that even when intervention to tackle domestic market failure is undertaken, the case for free trade is not destroyed. A central theme is that trade policies are to be avoided.

Finally, we should touch upon the relationship between trade and growth, although strictly the issue is an empirical one as much as one of economic dogma. The positive influence of an outward-looking trade strategy on economic growth is a popular theme in recent literature (including World Bank publications) although the supporting empirical evidence is by no means overwhelming. Stern (1989, p.633)[7] neatly summarises the position: "there is no single formula or gospel which for trade (as with planning) necessarily leads to, or is required for rapid growth. We do seem able to say, however, that cutting oneself off from or greatly restricting trading opportunities is generally associated with slower growth".

[7] This conclusion is in turn based on two recent studies of comparative growth experience: Chenery et al. (1986) and Morris and Adelman (1988).

III THE ANALYSIS OF TRADE POLICIES IN LDCs

The previous chapter reviewed international trade theory where the focus was primarily on trade between countries with immobile factors of production or differential productivity in different uses. In this chapter, another class of models is considered, namely those concerned with "commercial policy", the set of policies adopted to discriminate between domestic goods and goods of foreign origin. Both approaches deal with "real" variables- exports, imports, relative prices of goods and factors of production, etc. This leaves a third class of models[8] which focus on exchange rate theory and so entail an examination of payments arrangements for international transactions. In this modelling work a key question is the extent to which the exchange rate is a real variable. This class of models will not be presented in detail here. However, the Appendix offers a very brief summary of some of the main theoretical approaches in this area and section 3.3 below introduces the notion of the real exchange rate.

Whatever the various theoretical arguments may be, developing countries vitiate the free trade dictum. Trade interventions, with a strong bias towards protectionism, are commonplace. The nature and consequences of trade policies which directly or indirectly bear on the agricultural sector are the subjects of this chapter. The chapter is organised as follows. After a brief discussion of the principal arguments for intervention, the main instruments of trade policy and the real exchange rate, which now occupies a central role in the evaluation and design of economic policies, are considered. The chapter concludes with a review of the interaction between trade policies and domestic distortions, and of the fiscal consequences of trade taxes. Discussion of alternative trade strategies for development (import substitution and export promotion), and experience of them, is postponed until Chapter IV.

3.1 Objections to Free Trade

Governments may choose to intervene in the operation of free markets on purely political grounds. For example, protection of agriculture has often been justified by appeal to some strategic objective. Orthodox economic theory has little to offer in the analysis of this type of intervention and so the brief outline of arguments for intervention which follows, concerns only those of an economic nature.[9]

1. Unemployment

If under free trade the country would have unemployment (i.e. production would take place within the frontier PP in Fig. 2.1), protection may be seen as a way of ensuring full employment.

The unemployment argument for trade policy intervention rests on the claim that the true opportunity cost (or shadow wage) of labour may be low and substantially below the marginal costs of domestic firms. This may well be the case in certain LDCs, where firms may have to pay wage rates far in

[8] This classification follows Krueger (1983).

[9] Some additional economic reasons for intervention (viz. the correction of distortions) are considered in section 3.4.

excess of what labour could earn elsewhere. A tariff in these circumstances would increase demand for labour in the protected industry, as additional production of import substitutes would be encouraged.

There are however two counters to this argument. Firstly, the issue is whether a tariff is the appropriate means of combating unemployment. In the case of nationwide unemployment, a more direct response would be a subsidy for employment, applied at least on the marginal worker in each industry. The tariff is also a form of employment subsidy but one which subsidizes only the industry engaged in the production of domestic importables and which subsidizes all factors of production, not just labour. Furthermore, the tariff is also a consumption tax on importable goods, creating another distortion there. Secondly, the argument can easily be misapplied and used to justify a host of protective measures.

From a macroeconomic perspective, a case for tariffs as a means of stimulating employment rests on rigidity of both money wages and the exchange rate. With flexible exchange rates, the imposition of a tariff would initiate a move towards a balance of payments surplus, which would then be offset by an appreciation in the exchange rate. No employment benefit would be enjoyed, since the net demand for domestic output would be virtually unchanged, but a market distortion in favour of import competing industries would remain in place (Winter, 1985).

2. **Distribution of Income**

The free trade solution will be associated with a particular distribution of income which may be considered socially undesirable. Protection could then be used to increase the economic welfare of some groups (e.g. farmers) at the cost of others (e.g. consumers). Again a more direct means of reaching this objective is obvious. A straight transfer of income from the group "privileged" under free trade to the "disadvantaged" group would achieve the desired result without any of the defects associated with trade policy. The tariff as a means of income distribution should be considered only when the first best policy of lump sum transfers is infeasible.

3. **Terms of Trade**

The free trade case assumes that the country is unable to influence the terms of trade at which it trades. However, where a country is sufficiently "large" to influence world prices, it could restrict its trade to exploit its potential monopoly or monopsony power. The country would seek to impose the "optimum tariff" (the gain from an improvement in the terms of trade to be set against the loss in consumers' surplus from lower consumption). The possibility of foreign retaliation must of course be taken into account.

There are examples for which this argument would be relevant e.g. US purchases of coffee, but in the on-going debate about protectionism the practical significance of the terms of trade argument may not be great.

4. **Infant-Industry**

One of the oldest and most popular arguments for protection is the infant-industry one. An industry may have high costs in the early stages of its existence, but over time, it would become competitive, either through a decrease in costs or positive externalities. The validity of the argument rests on the assumed short-term nature of the cost disadvantage of the industry, on non-capturable externalities, and on the

temporary nature of protection. (Krueger, 1986)

It should be noted that gains from "learning by doing" and economies of scale in production, although widely held to be an important element in the argument, are not sufficient to make a case for intervention. If medium term profits would be large enough to recoup initial losses and provide a rate of return as high as other investments, the private market would support the investment. One must therefore invoke the existence of some distortion in the private market to justify government intervention. A common argument relates to some form of capital market distortion, such as incomplete information. But, whereas the existence of these distortions would suggest that intervention is appropriate, the first-best policy would not be protection from imports but the removal of the distortion at source. Failing that, a second best policy, such as the introduction of credit guarantees, would be preferred.

Tariffs can provide a secure shelter that permits long-run development but they can also protect inefficient and complacent industries. As Greenaway and Milner (1989) point out, there is no shortage of "failed" infant industries.

5. **Dumping**

This is the argument that a country has the right to impose a tariff, if confronted by a trading partner which subsidises ('dumps') its exports. For example, the use of export subsidies to bridge the gap between internal support prices under the E.C.'s Common Agricultural Policy and world prices has been criticised for causing severe trade and food security problems for LDCs in the 1980s and so encouraging retaliatory action (Watkins, 1991)[10]. The free trader would counter that the country gains from the cheap imports and can reallocate displaced domestic labour to produce something else. But, if the short-run opportunity cost of domestic production is very low when subsidised imports enter, the case for an anti-dumping duty is strengthened.

3.2 Tariffs, Quotas and Export Subsidies

Before elaborating on the effects of trade strategies on the agricultural sector, the devices of trade intervention should be examined in more detail. Consider the familiar, small country diagram of Fig. 3.1. The country may import any amount of the commodity at the world price P_w (the foreign supply of the product (S_w) is perfectly elastic) and under free trade this would be established as the ruling market price. Given the domestic demand (D) and supply (S) schedules illustrated, q_s would be produced domestically and $q_s q_d$ would be imported.

If an ad valorem tariff were imposed on imports, the domestic market price would rise to $P_w(1+t)$, domestic supply would increase to $q'_s q'_d$. The gains in tariff revenue (bced) and in domestic 'producers' surplus' ($P_w abP_w(1+t)$) would however be insufficient to outweigh consumer losses ($P_w fdP_w(1+t)$); there

[10] Under GATT rules, the sale of manufactured goods at prices below their cost of production is outlawed. However, equivalent rules do not apply to farm produce. This is one of issues which has arisen in the Uruguay Round but it is unlikely that the E.C. or the U.S.A. will countenance a ban on dumping, given current problems of surplus disposal.

would be a net welfare loss represented by the triangles abc and def. These are sometimes interpreted as the "production cost" and "consumption cost" respectively. In Krueger's (1986, p.145) words, "production cost in this case represents the additional (international) value of goods and services that could be available for society's consumption were there free trade and the resources diverted by the tariff into this industry reallocated to their best alternative uses".

If, instead, a quota (of $q'_s q'_d$) on imports were imposed, then the outcome in terms of domestic consumption, supply and market price would be the same; in these aspects the quota and the tariff are equivalent.

Several qualifications to this result must be made. Firstly, the equivalence of the tariff and quota breaks down if there is some element of monopoly in domestic import-competing production, in trading, or in foreign supply, or if the imposition of the quota confers monopoly power on buyers or sellers. Secondly, with a tariff in place, changes in the world prices are reflected in proportionate changes in the domestic price; the same proportionate degree of nominal protection is maintained over time. On the other hand, when a quota is imposed, fluctuations in the world price are not transmitted to the domestic market; the nominal rate of protection varies over time.

Perhaps the most significant difference, however, concerns the distributional consequences of each of the two devices. As already noted, revenue of bced accrues to the government when a tariff is imposed. With a quota, this area represents the value of the import licenses, i.e. those with a license would purchase the commodity on the international market (at P_w) and sell it on the domestic market at $P_w(1+t)$. How this value is distributed will depend on the mechanism employed to allocate import licenses. To take two simple cases, if the government allocates them to domestic traders, without charge, on a "first come, first served" basis, the importers obtain the "premium"; alternatively the government could auction the licences to the highest bidder and so extract this "surplus" value as government revenue.

Since import licenses represent a valuable property right, time and resources may be used to influence their allocation. Krueger introduced the term 'rent-seeking' to refer to the practice of lobbying for quantitative restrictions;[11] the rent being sought is the quota premium associated with the restriction. Since the lobbying process does not expand the (fixed) supply of the property rights, these resources are, in effect, wasted.

Another form of quantitative restriction which has grown in importance in recent years, is the voluntary export restraint (VER). Thailand's voluntary restriction of cassava exports to the E.C. is just one example. VERs are implemented by exporting countries under pressure from importing countries and with the tacit understanding that without such a curtailment in exports, an import quota will be imposed. A VER will improve the terms of trade of the exporting country and so would be preferred to an import quota designed to reduce imports by the same amount.

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[11] The use of the term has expanded to include all types of activities in which a group in the private sector attempts to persuade the government to implement policies which increase the income of the group.

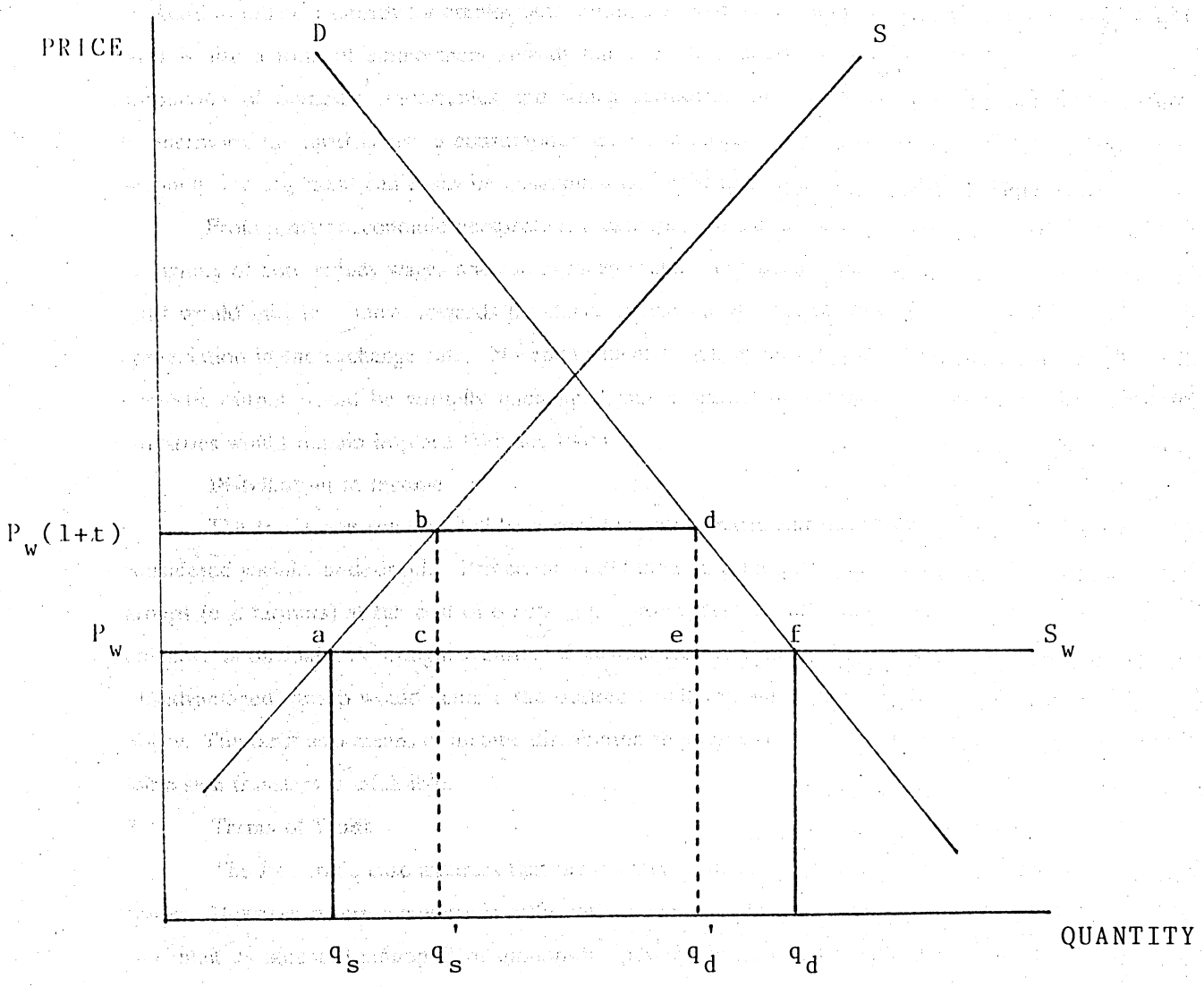

Figure 3.1 : Tariffs and Quotas

Finally, it should be noted that export subsidies also distort patterns of trade and production and that for the purposes of analysis they can be treated in a complementary way to import tariffs. Instead of causing domestic resources to switch into import substituting production, they switch resources into production for export, and instead of restricting trade, they promote it beyond the free trade point.

3.3 The Real Exchange Rate

Trade policies and other economy-wide measures affect the agricultural sector through the real exchange rate. Whereas the nominal exchange rate is a measure of the relative price of monies (a nominal concept), the real exchange rate measures the relative price of two goods, i.e. it is defined as the ratio of the prices of tradables and non-tradables[12][13]. It provides a measure of profitability or competitiveness of a country's tradable goods sector and a long term signal to appropriate resource allocation. Its definition is rooted in the small, open economy model in which the trade account (the excess supply of tradable goods) depends on the relative domestic price of tradables and non-tradables. More formally, it may be represented as:

$$RER = e.\frac{P_T}{P_N} \qquad (3.1)$$

where e is the nominal foreign exchange rate (domestic currency per unit of foreign currency); P_T is the world price of tradables (in foreign currency); and P_N is the price of non-tradables.

RER, interpreted as the cost of domestically producing tradable goods, is an indicator of a country's competitiveness in international markets. A decline in RER, i.e. a real exchange rate appreciation[14], reflects an increase in the domestic cost of producing tradables. With constant relative prices in the rest of the world, this represents a deterioration in the country's international competitiveness. On the other hand, a rise in RER, a depreciation in the real exchange rate, denotes an improvement in the degree of international competitiveness.

Changes in a country's competitiveness may be due to permanent or sustainable changes in its economy, such as technological progress, changes in the external terms of trade, changes in taxation, etc.,

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[12] Tradables comprise both exportables (actual exports and substitutes for exports sold domestically) and importables (imports and domestically produced goods which are 'import-competing'). Non-tradables or "home goods" are those goods and services whose prices are determined by changes in domestic demand and supply.

[13] Sometimes this ratio is inverted i.e. RER is defined as the ratio of the prices of non-tradables to tradables. See Dornbusch and Helmers (1988).

[14] Here the somewhat awkward convention of Edwards (1988a) and others is followed: a decline in RER in equation (3.1) is translated as an appreciation of the real exchange rate.

and so represent a movement to a new equilibrium.

More specifically, trade policy in the form of import tariffs and export taxes affect the real exchange rate through changes in the domestic demand and supply of tradables and non-tradables. To illustrate this, it is useful to define effective RER indices for exports and imports:

$$\begin{aligned} RER_x &= RER.(1 - t_x) \\ RER_m &= RER_x.(1 + t_m)/(1 - t_x) \end{aligned} \qquad (3.2)$$

where t_x denotes the implicit export tax and t_m is the implicit import tariff (Dorosh and Valdes, 1990). The imposition of an import tariff stimulates demand for non-tradables by raising the domestic price of importables relative to the domestic price of home goods and exportables. Subsequently the price of non-tradables must rise relative to the price of exportables and the (revised) price of importables, to restore equilibrium in the home goods market. The real exchange rate for exportables appreciates (as the price of exportables relative to the price of home goods falls)[15]. The extent of these changes can be measured by an elasticity termed the **incidence parameter**, and defined as the negative of the percentage change in the relative price of exportables to non-tradables for a given percentage change in the domestic price of importables relative to exportables.

The external terms of trade (the relative world price of exports to the world price of imports) affects the real exchange rate through a direct impact on prices and a change in real income. A worsening of the terms of trade raises the domestic price of importables and increases the demand for non-tradables; as with a tariff, this leads to an appreciation in the real exchange rate. The income effect arises because an increase in the price of imports reduces purchasing power of export revenues and reduces real income. The effect of this on the real exchange rate will depend on how the relative demands for tradables and non-tradables are altered. Dorosh and Valdes suggest that, in general, a depreciation of the real exchange rate might be expected. The net effect of a worsening in the terms of trade is then ambiguous, but it is usually presumed that the income effect will dominate and the real exchange rate will depreciate. Some changes in RER may indicate real exchange rate disequilibrium, or misalignment. An **equilibrium RER** represents that relative price of tradables to non-tradables which is consistent with a sustainable long run equilibrium in a country's external account, *viz.* when income and expenditure are equal, and the markets of both traded and home goods are in balance. It is not an immutable number, but rather it will change when its fundamental determinants change. Moreover, there will be a path of the equilibrium RER through time (Edwards, 1988a).

Whereas the equilibrium real exchange rate is a function of real variables only, the actual real exchange rate responds to both real and monetary variables. At a given point in time, the actual real exchange rate will reflect the values of the fundamentals and aggregate macroeconomic pressures from a fiscal deficit and/or an excess supply of money. Large and persistent differences between the two rates

[15] Introducing an export subsidy would have an analogous effect.

indicates misalignment of the real exchange rate[16]. There is increasing agreement among economists and policymakers that maintaining the real exchange rate at the "wrong" level significantly reduces a country's welfare.

For applied work, the researcher must find empirical counterparts of P_T and P_N in equation (3.1) above. A number of price indices have been suggested as proxies: the consumer price index, the wholesale price index, the GDP deflator, and a wage rate index. (Kirkpatrick and Diakosavvas, 1989, outline the advantages and disadvantages of each). There is little general agreement among practitioners, but a quite common choice (Edwards, 1988a) is:

$$RER = e.\frac{WPI^{us}}{CPI^{d}} \qquad (3.3)$$

where WPI^{US} is the wholesale price index in the U.S. (as a proxy for the foreign price of tradables), and CPI^{d} is the domestic cost of living index (a proxy for the domestic price of non-tradables). An increase (decrease) in RER reflects a real currency depreciation (appreciation). An important limitation of this index is that strictly it is a bilateral real exchange rate.

It has been common, at least until the implementation of policy reforms in the 1980s, for exchange rates of LDCs to be overvalued. This arose in part because of expansionary fiscal and monetary policies designed to promote economic growth. The inflation which accompanied these interventions was often more rapid than that experienced by trading partners. The combination of differential inflation rates and fixed or nearly fixed exchange rates resulted in a real currency appreciation and loss of international competitiveness. An additional contributing factor was the choice of trade strategy. Import substitution (discussed in Chapter IV), with its high tariffs and quotas on the importation of industrial goods, served to raise the domestic price of industrial goods relative to international prices and the official exchange rate overvalued local currency relative to its real purchasing power.

In many LDCs, the output of the agricultural sector has a larger tradable component than that of other sectors in the economy, and so agriculture is more exposed to changes in the real exchange rate. An appreciating currency can retard agricultural growth and, in particular, can discourage the production of agricultural tradables. The exporter receives less in local currency than would otherwise be the case; at the same time, since the price of food imports is artificially low, local production of import-competing food products is curtailed. These losses of domestic production are then reflected in falling employment and fiscal revenues.

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[16] Edwards (1988a) analyses the interaction between macroeconomic policies and real exchange rate behaviour under different exchange rate regimes.

3.3.1 Determinants of the Real Exchange Rate

Given the central role which the RER has in resource allocation, and hence in policy evaluation and design, it is important to understand the forces which underlie the behaviour of real exchange rates in LDCs. Yet it is quite recently that there have been attempts to explore the subject systematically (Kirkpatrick and Diakosavvas, 1989, review this literature). Here, it will suffice to give an overview of some of the determinants of the RER and of the likely direction of their influences.

The real exchange rate is an endogenous variable which responds to both exogenous and policy-induced shocks. The effects of these shocks may be traced through the nominal exchange rate, the price of tradables, the price of non-tradables or some combination of these components. However, it is important to distinguish between those factors which will influence the RER primarily in the short run and those which will affect the equilibrium real exchange rate, sustainable in the long run. The difference between the actual short run RER and its long run equilibrium level measures the degree of real exchange rate overvaluation or undervaluation.

Edwards (1988b) develops a (small country) model which establishes that nominal and real factors play a role in setting the RER in the short run but that only real factors - the so-called 'fundamentals' - influence the long run equilibrium rate. The fundamentals will include the external terms of trade, import tariffs, the level and composition of government consumption, capital inflows, technological change, the rate of investment (investment to GDP ratio) etc.[17]. An equilibrium real appreciation will be induced by a) higher import tariffs, b) an increase in government consumption of non-tradables, or c) an increase in capital inflows. The impact of a change in the terms of trade would depend on the elasticity of demand for importables.

Nominal disturbances influence the short run real exchange rate and hence the extent of overvaluation. Specifically, expansive, non-sustainable macroeconomic policies, such as the excess supply of domestic credit, would be associated with a real exchange rate overvaluation, a deficit on current account, and a loss of international reserves. On the other hand, a nominal devaluation would be expected to have a positive effect on the RER on impact, inducing a short run depreciation.

The dynamic macro-economic model which is developed encompasses three goods - exportables, importables and non-tradables. To capture the fact that in most LDCs there is a parallel market for financial transactions, a dual exchange rate is posited: a fixed nominal exchange rate for commercial transactions and a freely floating nominal rate for financial transactions. It suggests that real exchange rate movements are in response to both real and nominal disturbances; this is reflected in the empirical model which Edwards applies using pooled data on a group of 12 developing countries.

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[17] Valdes (1986) presents a synthesis of a number of unpublished studies of the relationship between the RER and its determinants in 5 Latin American countries. The determinants considered were (i) import restrictions, (ii) terms of trade, (iii) government expenditure, and (iv) capital inflows.

The dynamics of RER behaviour are captured in a partial adjustment equation:

$$\Delta \log e_t = \theta[\log e_t^* - \log e_{t-1}] - \lambda[Z_t - Z_t^*] + \phi[\log E_t - \log t-1] - \psi[PMPR_t - PMPR_{t-1}] \quad (3.4)$$

where e = actual real exchange rate (the relative price of tradables to non-tradables),

E = nominal exchange rate

e^* = equilibrium real exchange rate

Z = index of macroeconomic policies

Z^* = sustainable level of macroeconomic policies

PMPR = spread in the parallel market for foreign exchange

All parameters are expected to be positive.

The first term on the right hand side of this equation captures the self-adjustment process towards the equilibrium RER (the smaller the value of θ the slower the speed of adjustment). The second term in parentheses indicates that if macroeconomic policies are 'inconsistent', the RER will be overvalued. The impact of changes in the nominal exchange rate is measured by the third term (a nominal devaluation has an immediate positive effect on RER). Finally, the theoretical model predicts that an increase in the parallel market spread will be associated with a real exchange rate appreciation.

The equilibrium RER (e^*) is a function of the 'fundamentals': (i) the external terms of trade, (TOT), (ii) the level and composition of government consumption, viz. the ratio of government consumption on non-tradables to GDP, (NGCGDP), (iii) import tariffs, (TARIFFS), an (iv) capital flows, (KAPFLO). Edwards adds to this list some real determinants not explicitly included in his model: a measure of technological progress (TECHPRO) and "other fundamentals" such as investment to GDP ratio (OTHER). A double-log function is chosen to depict the relationship between the equilibrium RER and these six explanatory variables.[18]

The expression of the equilibrium RER is substituted into (3.4). However, the equation is still not specified entirely in observable variables; an expression for "inconsistent macroeconomic policies", the component $[Z_t - Z^*_t]$ must be found. Edwards suggests the excess supply of domestic credit (EXCRE) i.e. the rate of growth of domestic credit less the lagged rate of growth of real GDP. (He also experimented with alternative measures).

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[18] As reliable data were only available for the terms of trade (TOT) and capital flows (KAPFLO), proxies were included for the other fundamentals: the rate of growth of real GDP for technological progress, the ratio of tariff revenues to imports for tariffs and the ratio of government consumption to GDP for government consumption on non-tradables.

The empirical results provide broad support for the model. Interestingly, the adjustment coefficient (θ) was quite small in all regressions. This suggests that in the absence of other interventions, actual real exchange rates approach their long run equilibrium levels very slowly. The results also confirm that inconsistent macro policies will result in real exchange rate overvaluations and that nominal devaluations can be a powerful device to re-establish real exchange rate equilibrium. However, for the nominal devaluation to have a lasting effect, the sources of the original disequilibrium must be eliminated.

Edwards' analysis does not go beyond the estimation of the RER equation. A useful extension would then be to link the RER, and specifically disequilibrium in the RER, to agricultural sector performance. In other words, equation (3.4) would form part of a larger structural model of the sector. This point is taken up again in Chapter V, section 5.4.2.

3.4 Interactions with Domestic Distortions

The task now is to examine the various instruments of trade policy when they are employed in the context of domestic distortions.

A distortion occurs when there is a divergence between marginal private and social costs or between marginal private and social benefit. These divergences can arise in two ways: through market failure or through deliberate government intervention.

Market Failure. Here the distortion is generated by particular characteristics of market structure. These would include in domestic product markets, production externalities (where private costs of production diverge from social costs, e.g. pollution and deforestation), monopoly (where price exceeds marginal costs and output is less than the social optimum output, e.g. some marketing boards), and monopsony (where price paid is less than marginal revenue product, e.g. some export marketing boards). In factor markets, there may be monopoly suppliers of labour or monopsonistic purchasers of labour. Other reasons for market failure are listed in Table 3.1.

Table 3.1 : Reasons for Market Failure

(i) Monopoly or oligopolistic markets

(ii) Externalities

(iii) Increasing returns to scale

(iv) Some markets, e.g. insurance and futures markets, cannot be perfect or may not exist

(v) Slow or imprecise market adjustment, because information may move slowly or marketing institutions may be inflexible

(vi) Slow adjustment by individuals or firms

(vii) Poor information about products, prices, production possibilities etc.

(viii) Individuals may not be optimisers, either explicitly or implicitly

(ix) Government taxation is unavoidable and does not take a form which allows efficiency.

Source: Adapted from Stern (1989).

Policy-Induced Distortions These are the direct result of government intervention such as the imposition of taxes and subsidies. Indeed Corden (1974) reserved the term "distortion" for a divergence of private and social costs caused by government policy; market failure would produce a divergence but it was not in Corden's view a distortion. He also introduced the term "by-product distortion" for the spillover effect resulting from a government policy designed to correct a divergence of some kind.

In passing, it may be noted that although much of the debate on the appropriate role of government has centred on the issue of market failure, increasing attention has been given to the problems of "government failure". These are not simply a matter of the degree of competence in designing and administering detailed economic plans but also arise from the incentives which governments create for individuals both inside and outside the government. These would include bureaucratic obstacles to private initiative, the creation of resource-using, rent-seeking activities through lobbying and corruption, the circumvention of government controls through black markets, the creation of groups with a vested interest in planning etc.[19] In determining the right balance between markets and governments, the costs of market failure must be set against the costs of government failure.

Optimal Intervention

Assuming that intervention is found to be desirable, the issue then becomes: which of the many alternative policy instruments should be chosen and, of particular relevance in the present context, in what circumstances would it be appropriate to select trade policies (tariffs, export subsidies etc.)?

Corden (1974) has suggested a hierarchy of policies, based on the number of by-product distortions generated by each instrument. Efficient intervention in dealing with a distortion requires the application of the instrument which minimises the number of by-product distortions.

Where there is a single distortion the optimal course of action is its removal. The next best alternative would be to adopt some domestic tax or subsidy as a countervailing measure. Indeed a number of authors have shown that a trade policy instrument will almost always be second- or third-best; domestic policy instruments, if available to the policy-maker will be superior.

To take an example which is in keeping with the Harris-Todaro model of rural-urban migration: urban labour markets may be distorted by the imposition of minimum real wage. Optimal policy in this case would remove the relevant piece of wage legislation. Second-best policy would be a subsidy on urban labour employment, while the third-best policy would be a subsidy on the production of urban goods.[20] Only when these policy options would be infeasible would trade policy generate a welfare improvement.

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[19] Stern (1989, Table 4) lists ll such problems of state intervention.

[20] Harris and Todaro(1970) suggested an urban wage subsidy together with a restriction on migration to urban areas.

3.5 Trade Taxes and Their Consequences

The superiority of the subsidy over trade intervention will depend on whether the subsidy can be financed and how that finance may be raised. The principal choices would be ranked as follows (Greenaway(1989):

1. non-distortionary lump sum taxes
2. income or expenditure taxes
3. trade taxes.

Lump sum taxes are the first-best choice but because they are regressive in nature, they may not be desirable. On the other hand income and expenditure taxes, the second-best choice, tend to distort labour supply or savings decisions and in any case may not be a viable option in those LDCs where a large proportion of the population and of economic activity would escape the tax net. Trade taxes, although third-best, may then offer the most administratively convenient means of raising revenue. Certainly this is the route which many LDCs have taken. Greenaway (1984) suggested that the proportion of government revenue from trade taxes in selected LDCs has been very high. Notably, 40-55 per cent of government revenue in Ghana, Sierra Leone, Ecuador, Chad, Zaire and Swaziland came from this source over the period 1972-1977.

Given the dependence of several LDCs on import and export taxes, it is worth exploring some of the implications of these taxes on domestic producers and consumers. As Gemmell (1989a) points out, these implications will depend on, *inter alia*:

1. whether domestic production competes with imports
2. whether there is a domestic market for exports
3. the country's share of world imports and exports, and its ability to influence world prices
4. the impact on net foreign exchange earnings and hence the exchange rate.

In the case in which the country must take world prices of its exports and imports as given (i.e. the "small country" case), the introduction of trade taxes would have the following consequences:

(i) the domestic price of imports will increase by the full amount of an import tax; the tax burden will fall on domestic consumers

(ii) the price received by exporters will fall by the full amount of an export tax; the tax burden will fall on domestic producers

(iii) import taxes encourage domestic, import-competing industries; export taxes encourage domestic consumption. [note: as domestic consumption and production would no longer be at levels consistent with their true opportunity costs (given by world prices), the taxes are "distorting"]

(iv)the elasticities of domestic demand and supply will determine whether foreign exchange earnings will increase or decrease

(v) the country's net welfare loss from the imposition of the tax will be less the less elastic the demand for imports or the supply of exports.

Where the country is "large" enough to influence the world price of the commodity in question, the main conclusion is that some of the tax burden may transferred to foreigners. Precisely how much will depend on the elasticities of foreign demand and supply.

Further consequences would ensue if trade taxes also induce changes in the exchange rate. As noted above, general import taxes which reduce imports would prompt an appreciation of the exchange rate or at least create pressure in that direction. This in turn reduces the exporters' price in domestic currency and encourages a shift from exports to domestic markets. To the extent that the import tax would directly increase the cost of imported inputs, exporters would be squeezed further. In this way part of the burden of the import taxes falls on the exporter. As Gemmell puts it, "import taxes do not protect domestic industry at the expense of foreign industry but protect import-competing industry at the expense of exporters" (1989, p.292). General export taxes which affect exchange rates would have the opposite effect. The resulting depreciation benefits exporters but at the expense of domestic import-using industry.

IV AGRICULTURAL TRADE STRATEGIES

Policy-making in the sphere of agricultural trade can be viewed as the outcome of a sequential process of reconciliation of conflict between divergent interests, with decisions often taken in a piecemeal fashion in response to shifting circumstances. Nevertheless, for analytical purposes, it is useful to identify the overall orientation of trade policy. The World Bank (1987) World Development Report summarises a conventional approach:

> "..trade strategies can be broadly divided into two groups, outward oriented and inward oriented. An outward oriented strategy is one in which trade and industrial policies do not discriminate between production for the domestic market and exports, nor between purchases of domestic goods and foreign goods. Because it does not discourage international trade, this nondiscriminatory strategy is often (somewhat inaptly) referred to as an export promotion strategy. By contrast, an inward oriented strategy is one in which trade and industrial incentives are biased in favor of production for the domestic over the export market. This approach is well known as the import substitution strategy." World Bank (1987,p.78).

In this chapter, this broad categorisation of trade strategies is examined with reference to the agricultural sector (section 4.1). There then follows an overview of some current concerns regarding an outward orientation for agriculture, namely the renewed pessimism about the prospects for agricultural exports, the scope for diversification, and the issue of import liberalisation. The chapter concludes with some generalisations about "appropriate" trade stances for the major LDC regions.

4.1 Import Substitution and Export Promotion

Under the policy of **import substitution** (IS), a country imposes high tariffs and non-tariff barriers to imports and behind this shelter, it expands domestic production to replace imports. Ideally, this protection would be a temporary, if costly, device to assist in developing an "infant economy", by inducing diversification and a process of search and learning (Helleiner, 1990).

Typically the country begins by increasing the production of nondurable consumer goods. The next, more difficult step is to turn to final processing of assembly commodities, requiring a shift in the composition of imports from final goods to intermediate inputs and capital goods. The protective structure is then escalated by the degree of processing, with final goods being highly protected but with capital goods and some intermediate inputs attracting little or no duty.

In the 1950s and early 1960s IS was the dominant trade strategy, at first mainly in the larger LDCs in Latin America (e.g. Argentina, Brazil, Mexico) and in Asia (e.g. India, Pakistan, the Philippines) but later adopted by countries in Africa (e.g. Ghana, Kenya and Nigeria) and by smaller economies in Latin America and S.E. Asia. Although tariffs, quotas and administrative controls were widely used to restrict imports, the emphasis on each instrument varied from country to country. For example, some (e.g. India, Mexico) relied mainly on import licensing, others (e.g. Argentina) preferred tariffs. During this phase of rigorous IS activity, there was also extensive government intervention in other spheres of economic activity (e.g. investment licensing, public sector investment, differential taxes between sectors).

Under a policy of **export promotion** (EP), the country, taking a more outward-looking attitude, changes the system of incentives in favour of exports. This may entail fiscal incentives to raise exporter's revenues (e.g. export subsidies) or to reduce their costs (e.g. lowering the duty on imported inputs). The strategy holds out the promise of scale economies, especially for small countries, and, it is argued, for productivity gains from exposure or access to international tastes, technology and competition.

From the mid 1960s, a number of LDCs became disenchanted with the IS strategy and began to adopt more outward-looking EP policies. Hong Kong, S. Korea, Singapore and Taiwan were the forerunners, later to be joined by some of the larger semi-industrialised LDCs (e.g. Brazil).

As Helleiner (1990) stresses, the record of trade strategy has been richer and more complex than the dichotomy of outward- and inward-orientation would suggest. Although EP and IS have been treated as alternative trade strategies, they are not mutually exclusive and in practice most LDCs have employed elements of both, through time changing the emphasis given to each. All countries, especially those with IS policies, have measures to encourage exports. In some cases (e.g. when firms are required to export part of their output in return for privileges in the home market) these measures are to offset partially the incentives to import substitution (Krueger, 1986). Moreover, if a country does adopt a more export-oriented attitude, this may not entail dismantling protective structures in the domestic market but rather the country may add selectively to the incentive package for exports or at least reduce the disincentives. The EP approach may be more a matter of reducing the bias against exports rather than creating a bias in favour of exports. This point is illustrated in Table 4.1. Even within the same sector (beef and dairy), there were periods when export incentives and import restrictions were both in force in Brazil.

As a guide when examining trade structures, it may be useful to construct an index of trade regime bias. Krueger (1986) suggests the following measure:[21]

$$B=\frac{\sum_i w_i(P_{mi}/Q_{mi})}{\sum_j w_j(P_{xj}/Q_{xj})}$$

where B is the measure of bias, P denotes the domestic price, Q is the world price, i is an index of import-competing commodities, j is an index of exportable commodities, and w denotes the share of i and j in total value added. The index measures the extent to which domestic prices of importables and exportables diverge from international prices. If B is unity, the incentive structure is neutral. If it is less than unity, an export-oriented regime is indicated; if B is greater than unity, then incentives are biased towards import-substitution.

[21] There may be conceptual and measurement difficulties in applying this indicator. See Milner (1988).

Table 4.1 : Government Policies Towards the Beef and Dairy Sectors, Brazil 1947/79

BEEF	FLUID MILK	DAIRY PRODUCT
EXCHANGE RATE POLICY - fixed (1947/53); multiple rates (1953/60); unstable system (1961/64); crawling-peg system (1965 onwards) TRADE POLICY - Import Quantitative Control (1947/53); 1961/64; 1974/79), Tariff-1957 (ad-valorem system); 1966 (tariff reform) Export Quantitative Control (1947/53); Export Incentives (1964 onwards)		
Export Quotas - 1954,59/60,63/65,67,71, 73/74 Export Taxes - 65/67,73 Export Incentives - 1968 Onwards Imports at preferential rates - 58,70,74 onwards		Import under special conditions (dried milk) - PL480 (60/72), Tax exemption (73) Import Quotas (dried milk for reconstitution) - 1974/79

Source: Da Silva and Young (1985).

Table 4.2 presents some evidence of trade bias using the index defined above. There are strong biases towards import substitution, even after some liberalisation, in 4 of the 5 countries in this sample. Only South Korea shows evidence of an export-oriented regime but even here the bias is not strong. It would seem that the set of countries are pursuing mixed IS and EP strategies.

4.1.1 Experience of IS

By the early 1970s a consensus was emerging that the IS strategy had been a failure. Little et al. (1970) mounted one of the first, and certainly one of the most influential attacks on the strategy and a voluminous literature on the subject has followed. Among the economic effects of the strategy which are stressed are:

a) high levels of protection induced currency overvaluation and so discouraged exports. Protection was also achieved at high domestic resource cost;

b) there was a clear bias against the agricultural sector;

c) income was redistributed toward industrial sector profits, thus aggravating income inequalities;

d) excessive capital intensity and protection permitted under-utilization of capacity and limited expansion of employment in the manufacturing sector;

e) the ability to move into export markets, when domestic market limits were reached, was impaired by inefficiencies induced by reduced foreign competition, inappropriate technology and bureaucratic procedures;

f) dependence on imports was not removed because import-substitution of consumer goods was often achieved at the expense of increased imports of machinery and equipment.

Much of this would be widely accepted as a description of what had occurred under IS. Where critics differ is in the interpretation of these events. The structuralist-radical school would be cautious in assigning a causal link between the policies of protection and economic performance. Rather they would emphasise the need to make significant changes in economic structures (through, for example, land reform, income redistribution, increased centralised planning, public ownership) in order to improve the effectiveness of policy interventions. A planned strategy of industrial development, with IS complemented by policies of agricultural development and by the exploration of export opportunities, could avoid many of the pitfalls which had been encountered. For the neoclassicists, the failure of IS can be directly attributable to the policy packages which had been implemented. It is argued that policymakers typically know little about scale economies, or prospects for learning and productivity growth in particular industries. An appropriate policy response would be to relax trade restrictions and to give greater attention to 'correct' market signals, or at least to provide uniform incentives for all sectors.

Table 4.2 : Trade Regime Bias in Selected Countries

	At the start of the transition to export orientation[a]	After the transition[b] to greater export orientation[c]
Brazil	2.89	1.34
Chile	2.83	1.79
Philippines	1.67	1.16
South Korea	0.97	0.92
Turkey	3.05	1.80

a The years for which these estimates apply are as follows: Brazil (1957), Chile (1956), Philippines (1960-2), South Korea (1961), Turkey (1958-9).

b The transitional period, according to Krueger, is characterised by exchange rate 'correction' and the removal of detailed regulations.

c These are estimates for 1966 (Brazil and South Korea), 1967 (Chile) and 1972 (Philippines and Turkey).

Source: Krueger (1978), Table 6.2.

4.1.2 **Experience of EP**

The export performance of the "newly industrialising countries" (NICs), as the group of export-oriented countries came to be called, has been most impressive. Their manufactured exports increased annually by 20-40 per cent between 1965 and 1978, while annual GDP growth rates were at 8-11 per cent. The orthodox explanation for their success is that appropriate policies (reducing import protection, providing export incentives etc.) had been adopted. However, as always historical experience is open to alternative interpretations.

It has been argued that the neoclassical account of the EP experience is incomplete in two respects. Firstly, as external market conditions were exceptionally favourable during the period of rapid NIC growth, the NIC model is not capable of wide replication. The challenge here is based on the unprecedented growth in world trade, the minimal levels of protectionism in DC markets, and the ease of access to international finance during the 1960s and early 1970s. A related argument, taken up below, is that a fallacy of composition limits the prospects for export growth of other LDCs. Secondly, the NICs' success was not simply a matter of 'getting the prices right' but was due in large part to government intervention. In several cases this took the form of state planning and regulation. For example, in S. Korea and Taiwan a strategy of selective import substitution (using import controls) and export promotion (using export incentive controls) was undertaken. There was also government regulation of markets, notably the labour market, to ensure 'competitive' price levels.

If the success of the outward-looking NICs is due not to a regime of *laissez faire* but rather is due to active export promotion, is selective state intervention in appropriate strategy for other LDCs? A general policy prescription of this sort has its dangers. As with the IS strategy, promotion of some activities will yield more than others in terms of positive externalities, learning and income distribution effects. However, detailed and accurate information either of the choice set in specific countries or of the development attributes of particular enterprises is often absent. Moreover, given the complexities of economic structures, a necessary condition for success is the existence of capable, strong government and an efficient administrative system[22]. As Milner (1988) notes, governments which were unable to select the right 'infant industries' to produce import substitutes, are unlikely to do better at picking export 'winners'.

With regard to the adoption of an outward orientation or export promotion strategy for agriculture, a number of additional concerns have recently been voiced. These are the subject of the next section.

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[22] Having surveyed 42 developing countries, Reynolds (1983, p.976) concludes "my hypothesis is the single most important explanatory variable [in economic development] is political organisation and the administrative competence of government".

4.2 Some Current Concerns

4.2.1 Export Pessimism

The promotion of export crops may raise revenue for a developing country but as Fishlow (1985) has argued, the strategy is implicitly based upon a *ceteris paribus* presumption that only the country in question will execute it. The same strategy pursued by the major producing countries taken together may rebound to their disadvantage. This 'fallacy of composition' arises because, it is argued, world demand can absorb the extra output only if there is a more than proportionate fall in price[23]. The strategy is particularly perilous when investments involve heavy fixed costs and long gestation periods, thus locking the country into an inflexible, and unprofitable production pattern. The issue is a topical one, since more or less the same package of policy reforms, designed in part to improve farmers' incentives, is being advocated, as a condition for structural adjustment lending to many LDCs.

The Fallacy of Composition

The extent to which the world market price for a particular product will fall as a result of export growth in a group of countries will depend on (Koester et al., 1989):

(i) changes in world demand in the course of economic growth

(ii) the price elasticity of world demand

(iii) the share of the group of countries in world export markets

(iv) the reaction of supply of competing countries to changes in world market prices.

Taking each of these in turn:

(i) **Growth in World Demand.** As per caput incomes rise in the course of economic growth, the demand for export crops will be expected to increase. However, the extent of the demand pull is governed by the income elasticity of export demand and, as some empirical evidence reviewed in the next chapter suggests, the demand for many traditional exports (e.g. coffee, cocoa, tea) is income inelastic. Thus the scope for expansion in these markets is not promising, although the prospects for non-traditional exports (e.g. horticultural products) may be much better.

Population growth may also provide a stimulus to world demand, although its impact is less easy to assess *a priori*. Changes in population are likely to affect the level of per caput incomes, income distribution and even tastes (as the age and sex distribution, as well as location, of the population is likely to alter). Population growth *per se* does not increase market demand.

A significant constraint to the growth in demand for LDCs' exports is protectionism in developed countries' markets. Undoubtedly trade liberalization would boost export demand but the extent of exporters' gains will vary considerably by type of product. For these products which compete with DCs' suppliers, the

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[23] A number of authors have made this point. See for example, Lipton (1987).

potential gains from low-cost exports of the LDCs displacing high-cost production in the importing countries may be quite substantial. But for commodities which are mainly produced in LDCs and do not compete directly in DCs' markets, the gains are limited by the extent of any stimulus to consumption and of any increase in market price. Specifically, the gains for exporters of traditional agricultural products in raw form are likely to be modest. Valdes and Zietz (1980) estimated that in 1975-77 an across-the-board 50 per cent reduction in protection in 17 developed countries would have increased exports earnings by only 3.1 per cent for green coffee, 5.0 per cent for tea and 2.1 per cent for cocoa beans.

A common feature of protectionism in developed countries is tariff escalation on many primary commodities, hampering the development of export-oriented agro-industry in the LDCs. As Table 4.3 illustrates for the E.C., raw and semi-processed agricultural products are subject to much lower duties than the processed commodity. Whether trade liberalisation offers significant gains in export earnings will depend in part on the value added in processing. For example, the value added in processing tropical beverages is relatively small and so the potential gains from domestic processing are lessened.

(ii) **The Price Elasticity** Two propositions (details of which are given in Chapter V) are often advanced by "elasticity optimists":

a) as import demand depends on the reaction of internal supply and demand to relative changes in world prices, the price elasticity of a country's import demand can be large even for a product which is relatively inelastic in the domestic market (particularly so the more closed the economy). Hence world demand for exports may be much more price elastic than studies of demand in domestic markets would suggest.

b) Even if the global price elasticity of demand is relatively low, the price elasticity of demand for a single country's exports can be large, if it has a small share of the export market and/or other suppliers are relatively responsive to changes in world market prices.

With respect to the first of these propositions, the 'elasticity pessimist' would counter that empirical analyses of international markets suggest that the world demand for many primary commodities is price inelastic. This certainly seems to be the case for food products in the aggregate and for individual, traditional agricultural exports. On the other hand, the price elasticity for non-traditional exports (e.g fruit and vegetables) may be quite high.

The second proposition cannot be used to refute the 'fallacy of composition' argument, since the latter concerns several of the major producing nations pursuing the same strategy of export expansion and therefore confronting the global price elasticity of demand. It would however lend support to the 'beggar thy neighbour' approach, discussed below.

Table 4.3: Tariff Rates on Selected Commodities in the European Community

Coffee		
	Green Roasted	5.0
	Coffee Extracts	18.0
Cocoa		
	Cocoa Beans	3.0
	Powder and Butter	12.2
	Chocolate	27.0
Cotton		
	Raw Cotton	0.0
	Cotton Yarn	6.0
	Cotton Fabrics	10.0
	Cotton Outlining	13.7
Rubber		
	Natural Rubber	0.0
	Rubber Products	5.3
Leather		
	Hides and Skins	0.0
	Leather	3.9
	Leather Goods	11.7
Tobacco		
	Unmanufactured	0.0
	Manufactured	54.5

Source: Adapted from Koester et al. (1989), which in turn is based on World Bank (1983) Accelerated Development in Sub-Saharan Africa. An Agenda for Action.

(iii) Market Share Whether or not export expansion by a group of LDCs will significantly affect the world market price will depend on the market share of that group of countries. One way of assessing this is to examine export markets in particular regions. For example, Koester et al. (1989) compute the market shares and export values of the most important exports of sub-Saharan African countries. These are reproduced in Table 4.4. Large market shares coincide with high export values for cocoa and coffee, and so a concerted export drive in these products would be expected to reduce markedly their world market prices and export revenues. [Indeed, using a simple comparative static model, Koester et al. calculate that a 5% policy-induced shift in the supply curves of cocoa and coffee would reduce their international prices by 5.6% and 2.5% respectively in the short run.] On the other hand, there are some products (palm kernels, sisal, groundnut oil) whose export values and share of the region's total export revenue are small, although the region has a significant share of their export market. For these commodities, the resultant fall in world market prices would create fewer adjustment problems.

iv) Competitors' Reaction World market prices will decline less if the export supply of competitors is price elastic. This would be the case if competitors' exports were more diversified, allowing a smooth reallocation of resources away from those products experiencing declining world market prices. Returning to Table 4.4, it is clear that, with the exception of coffee, the export products which are important to African countries, are much less significant in Asia and Latin America. The export pattern in these regions is much less concentrated and so, it could be argued, they are more likely to shift into alternative exportables if confronted with declining world prices as a result of export growth from sub-Saharan Africa. In this way the African countries could regain some of their market share lost over the previous two decades. However, an alternative, short term strategy for competitors would be 'dumping' in order to maintain their hold in the world market.

The foregoing suggests that, whereas the export pessimists' case can be overstated, the prospects for the traditional exports of tropical products are bleak, given low income and price elasticities of demand, limited scope for market expansion and the large share of the market which LDCs command.

The problem is aggravated for those countries whose exports are highly concentrated on these demand-constrained commodities. (For example, Côte d'Ivoire earns about 75 per cent of its total agricultural exports revenue from cocoa and coffee; Ghana's exports of cocoa beans accounts for virtually the whole of its agricultural exports). What strategy are these countries to pursue? The World Bank appears to favour a 'beggar thy neighbour' approach. Berg (1986) expresses it as follows: "First of all, not all countries will follow counsel to expand primary exports. So those that do will capture the markets of those that do not, regardless of their respective comparative advantages. Given this reality, those who stand on the sidelines and urge African States to shun the export sector are in fact handing over market shares to Brazil or Malaysia or Indonesia". The World Bank Report ((1986), p.73) is equally sanguine: "attempts

Table 4.4 : Sub-Saharan Africa's Share of World Exports for Major Agricultural Commodities (1985)

	Export Value million US $)	SSA Share in World Exports (percent)	Commodity Shares in Agricultural Exports		
			SSA (percent)	Asia (percent)	Latin America (percent)
Cocoa Beans	1880.4	61.2	20.1	0.9	2.6
Palm Kernels	11.9	52.9	.1	0.0	0.1
Sisal	29.8	43.4	.3	0.0	0.1
Coffee	2538.5	22.3	27.3	3.8	22.4
Groundnut Oil	58.4	20.9	.6	0.2	0.4
Tea	362.5	15.3	3.9	5.3	0.3
Cotton	568.9	9.4	6.1	4.0	1.9
Tobacco	370.3	9.2	4.0	2.4	2.7
Groundnuts	32.7	6.7	.4	0.6	0.3

Source: Koester et al. (1988), based on FAO, Trade Yearbook 1986, Vol.40.

to restrict production have back-fired because foreign consumers have found alternative supplies or substitutes [while] market shares were absorbed by [countries] with more favourable attitudes towards producers". Lipton (1987, p.207), however, refutes this view that "there is no alternative", suggesting instead that it argues for better commodity agreements or for more diversification - but not "...for Bank pressure on each producing country to raise farmers' prices even for demand inelastic export crops...". Although some would balk at the prospect of yet more attempts to negotiate better commodity agreements, few would dispute that diversification would be a sensible approach for those highly concentrated export sectors of many LDCs. The difficulty of course is finding alternative enterprises for which the countries have a comparative advantage. (Diversification is considered in more detail in the next section.)

Finally, it may be noted that falling commodity prices may be offset by raising productivity and reducing costs of production[24]. Hence, whether or not it is advisable to expand production of a specific commodity, will depend in part on the domestic costs which will be incurred in generating the additional exports. There will undoubtedly be some cases in which additional exportable surplus will only be forthcoming by expanding into less suitable land, thus increasing unit costs of production. On the other hand, some LDCs have lost market share because of policy interventions such as export taxes, rather than increasing resource costs.

4.2.2 **Diversification**

With the collapse of some commodity markets (e.g. rice) and the poor prospects for demand growth in others (e.g. cocoa), increasing interest has been shown in crop diversification, as a means of allowing agriculture to remain as a major engine of growth. A number of countries have recorded early success. For example, in Latin America, Brazil (soybeans since early 1970s), Chile (fresh fruits), Mexico (tomatoes, melons), and Guatemala (snow peas, broccoli, parsley)[25].

Diversification is a long term process,[26] driven by the changes in market demand which occur in the course of economic growth. As per caput incomes grow, agriculture undergoes a structural transformation, guided by differential income elasticities, in which resources are shifted from the production of staple food products to higher value livestock products, fruit and vegetables and processed foodstuffs. The process can of course be tempered, if it runs counter to other policy objectives such as income distribution, food security and short run price stability.

It may also be desirable to encourage diversification in the short run. Short run price fluctuations, if in the absence of price stabilisation programmes are allowed to pass on to the producer, create the need

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[24] The danger, of course, is that many of the benefits of higher productivity would be reflected in yet lower prices, thus raising the question whether productivity-enhancing investments offer an adequate rate of return.

[25] For a detailed analysis of non-traditional export crops in Guatemala, see von Braun et al. (1989).

[26] Timmer (1987) outlined the main conceptual and policy issues surrounding diversification. Much of this section draws upon that paper.

for rapid adjustments. When producers are not insulated from the vagaries of the world market, diversification can cushion the adjustment costs of resource reallocation; a more diversified, and flexible, agricultural sector will incur smaller costs of adjustment.[27] Diversification thus offers a means of transferring some of the burden of price instability to farmers and away from the government's budget.

Since diversification offers these potential benefits, the question arises: which "new" commodities are to be produced? Labys and Lord (1990) suggest that the problem can be seen as equivalent to portfolio selection, in which both returns and variations in returns are taken into account. The potential to reduce earnings uncertainty through diversification is higher for those products whose covariance signs are small or negative. To expand exports of a product whose price is closely related to other commodity exports will not lowered risk, though expected yield may be improved. In order for diversification to produce a lower level of uncertainty from price fluctuations, price movements among the goods exported should be negatively correlated. Nevertheless, choice of non-traditional export goods may be constrained in a number of ways.

At the farm level, the potential for diversification is determined by the extent of technical rigidity in the production system, expected commodity prices, as well as attitudes and perceptions of the riskiness of alternative products. Apart from any agronomic constraints, flexibility in the choice of output-mix may be hampered by past, commodity-specific investments (e.g. irrigation systems for rice production) or by the technical and managerial expertise required in the new enterprises. Although the production of feed grains might readily replace the production of grains for direct consumption, a shift to livestock production, with its greater demands on managerial ability, would be more problematic. Moreover, in "new" world markets tastes, quality standards, and marketing requirements may be quite different from domestic market. In the absence of adequate information on new market opportunities, farmers are likely to view the production of non-traditional crops as more risky.

Another constraint to diversification may be what Timmer terms "international spillover". This refers to commercial and political repercussions when diversification programmes begin to impinge on established markets of trading partners or third countries. For example, the EC negotiated a "voluntary restraint" on the export of cassava when Thailand's diversification into that crop threatened the EC's price support regime for feed grains. The American Soybean Association has also conducted a campaign emphasising the health risks of palm oil, an important export of Malaysia and coastal Africa. Timmer suggests that, if spillover effects are to be avoided in tightly interconnected commodity markets, "diversification might have to be restricted to domestic non-tradables, such as fresh fruit and vegetables with very short shelf-life and few international market opportunities". If this is so, the potential for diversification to make a significant contribution to current adjustment problems must be negligible.

What would be the appropriate areas of policy intervention to stimulate diversification? This will be considered in the final section of this chapter. What may be noted here is that government intervention is more likely to run into difficulties where diversification programmes are targeted on specific products.

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[27] There may, however, be economic losses from diversification. In particular, specialization allows the producer to take advantage of economies of size or scale.

Government planners are not usually well placed to predict future market trends accurately. In similar vein, it is doubtful whether a significant amount of resources should be allocated to protecting farmers while they learn to compete in non-traditional product markets. The extension of the "infant industry argument" to diversification must confront the same obstacle: in general governments have a poor record of picking winners.

4.2.3 IMPORT LIBERALISATION

A more outward orientation in international trade can be accomplished by removing existing trade barriers, together with appropriate adjustments to the exchange rate, and increasingly, adjustment programmes contain some element of import liberalisation. The appropriate timing of trade reforms has, however, been the subject of some debate. Import liberalisation typically begins with the replacement of quantitative controls on imports by tariffs, a reform which allows greater transparency of intervention, removes quasi-rents and raises government revenue. Thereafter, reduction in the level and dispersion of tariffs is urged. The process may be slow, because of influential vested interests, the loss of fiscal revenue when import tariffs are removed, and the fear of inflationary pressures, if the reforms are accompanied by devaluation.

The timing and extent of these reforms is then quite controversial. Although gradual liberalization via pre-announced policy changes is favoured by some, there have been too few examples of this course of action for any firm conclusions of its efficiency to be drawn (Papageorgiou et al., 1986, quoted in Helleiner, 1990). Others prefer a more compressed liberalisation programme.

Many have argued that successful reform will depend critically on stable macroeconomic conditions and even favourable weather. But the link between import liberalisation and export expansion is open to question. For example, the lessons from experience in East Asia drawn by Sachs (1987),(quoted in Helleiner, 1990), include i) there is likely to be a long interval between stabilisation and export expansion or liberalisation, ii) there is also likely to be a long lag between successful exporting and import liberalisation and the latter is not an essential or typical part of successful EP efforts, and iii) the public sector is likely to play an important role in successful exporting.

The appropriate timing of trade liberalisation within the overall reform programme has also been the subject of some debate. The consensus which seems to be emerging (Helleiner,1990) on the "proper" sequence of policy reforms is as follows:

i) fiscal discipline,
ii) "freeing" the labour market,
iii) "liberalising" goods markets, including external trade,
iv) "liberalising domestic financial markets, and
v) "liberalising" the external capital account[28].

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[28] See Choksi and Papageorgiou (1986).

4.3 "APPROPRIATE" POLICY INTERVENTIONS

In judging what might be deemed appropriate policy intervention with a view to influencing agricultural trade performance, an assessment may be made on the basis of: a) the guidance given by economic theory, and b) the information required by policymakers in order to implement the strategy effectively.

In a world of perfect competition in perfect markets, prices reflect the scarcity value of all goods and services and indicate the appropriate direction for resource allocation. As each industry will earn a "normal" return in the long run, there is no incentive for a government to favour one industrial structure over another (Grossman, 1986). In this idealised world, unfettered free trade is the appropriate trade strategy.

Where there is market failure or where an undesirable income distribution results, governments may choose to intervene, but trade policy is not a "first best" policy choice and invites retaliation from trading partners.

Recent theoretical treatment of international trade where there is imperfect or oligopolistic competition, suggests that, in certain circumstances, an ideally designed, targeted policy (e.g. an export subsidy to a particular domestic industry) would improve aggregate economic welfare of the country, raising domestic profits at the expense of foreign competitors'. As some sectors or industries have a greater potential for increasing national benefit than others, the government would no longer be indifferent to industrial structure. Hence, a role for strategic trade policy is introduced.

However, it must be stressed that the guidance which the new theories of international trade give to policy design is by no means clear-cut. As Grossman (1986) argues, the results which emerge from these models have not proven robust to variations in assumptions.

In addition, since the choice of the right sectors involves complex analysis, there is the question of whether the information needed by policymakers is readily available and of sufficient quality. "In short, the theory is replete with ambiguous policy conclusions that can only be resolved on the basis of very detailed data and a relatively complete understanding of how a particular industry competition is played out and about how the industry in question interrelates with other sectors of the economy" (Grossman 1986, p.66).

This conclusion does not imply as bleak a future for the policymaker, as might at first appear. There are a number of policy interventions which will still be required. These will be aimed at creating a fertile environment for entrepreneurship and innovation, and at offsetting evident market failings, rather than directed towards the selection of activities for favoured treatment.

A list of uncontroversial policy measures would include:

(i) investment in rural infrastructure (transportation, communications, irrigation).

(ii) investment in agricultural research (particularly in multi-product farming systems, suited to the small scale farmer, and adaptable to changing market conditions). This is particularly important in the field of biotechnology which may bring about important shifts in comparative advantage; the LDCs cannot afford to allow all the R&D here to be done by others.

(iii) provision of extension services and market information on traditional and non-traditional products.

(iv) improvements in institutional arrangements (credit, contract farming, insurance etc.).

(v) implementation of grading and quality standards.

These are areas in which governments can make a positive contribution by laying the foundation for a more flexible agricultural sector.

Beyond this, how might the appropriate stance towards agricultural trade be characterised? A definitive answer cannot be given here; detailed country case studies would be necessary to give an accurate account. A country's trade policy must be viewed within the context of an overall development strategy, its constraints on resource use, the capacity of its administration, and its access to detailed and accurate information on available options. Nevertheless, at the risk of over-simplification, some generalisations are offered.

Although **import substitution** programmes have been widely discredited, their objectives (self-sufficiency, to put it simply) seem more respectable in the agricultural sector than in manufacturing (Helleiner, 1990, Rao and Caballero, 1990). In part this may be due to a recognition of the widening gap between f.o.b. export and c.i.f. import prices in this sector, as the role of transportation costs increases. More fundamentally, it reflects the view that food security is a legitimate concern of policymakers and, moreover, that food security may be equated to self-sufficiency.

Lipton (1987), for example, expresses the worry that resources switched into export crops are thereby denied to locally-consumed food crops. His argument is that once resources are used in growing tree-crops, and in creating gluts in export crops, they are unavailable for food crop production. But, he adds, this does not mean that resources best suited for export crops should not be used to grow them.

The costs and benefits of an outward-looking "cash crop" strategy as opposed to an inward-looking strategy, initially aimed towards food self-sufficiency, are reviewed in more detail in Maxwell and Fernando (1989)[29]. On food security, the view that cash cropping necessarily competes with food production and worsens food security is seen as naive and wrong. Cash cropping can be associated with increases in the production and availability of food at the national level. However, this outcome is by no means inevitable and at the national level, there no strong evidence that foreign exchange earned from cash crops is actually used to buy food.

The argument that increased food production will improve food security has perhaps most credibility in **sub-Saharan Africa**. As many African economies appear to have been unable to reduce their dependence on a traditional, single largest primary export, their exposure to the volatility of international markets is exceptionally marked. Furthermore, the prospects for some traditional exports (coffee and cocoa, in particular) are poor, at least in the short term. In the absence of greater diversification in the sector, risk-

[29] Matthews (1989) also reviews the arguments for and against self-sufficiency.

averse governments must give a high priority to domestic food production[30].

Elsewhere, in those countries with a more flexible agricultural sector, a more **outward orientation** would seem appropriate. Certainly, this is the strategy adopted currently in many countries in **Latin America** and **SE Asia**. Within the broad strategy, some policy choices, which are not however mutually exclusive, may be noted:

a) developing new markets for traditional exports. Protectionism in developed countries' markets has been a significant obstacle to market expansion and the Uruguay Round, despite its early promise, now seems unlikely to provide much relief. However, developing markets in other areas, namely Eastern Europe, and intra-regional trade, discussed briefly below, should be explored further.

b) diversifying exports from traditional to "new" primary products. A significant feature of the successful primary exporting countries tends to be their diversification within the primary export sectors (Lewis, 1989). For example, the Malaysian government, recognising that domestic production costs of rice far exceed the world market price, has reduced its target of self-sufficiency in rice to 65 per cent and is encouraging diversification, particularly into tropical fruits. Several Latin American countries have also been developing new export lines, such as shrimps and horticultural products[31].

c) diversifying exports out of unprocessed commodities and into manufacturing and services, including tourism and processing of products previously exported as "primaries". In this area, countries which already have some established manufacturing base have considerably more manoeuvre than those whose output remains strongly based on agriculture and mining.

Because of difficulties in estimating comparative advantage (Chapter V), and because of problems with respect to earnings instability for individual crops, diversification is certainly an important objective.

Thus far in this account the emphasis has been on exports, which can be most important as a means of importing technical knowledge in a directly effective way and of providing the potential for scale economies. However, it should be stressed that an outward orientation is not simply export promotion; it also encompasses substitution of imports by efficient domestic products.

The essential feature of an outward orientation is the adoption of a neutral, uniform incentive scheme. In most cases this will be the best that can be done. More active government intervention, beyond dismantling discriminatory programmes and laying the broad foundation for a flexible, efficient sector, would require detailed analysis of the dynamic, long term costs and benefits of different crops and of the covariance of their returns. Both comparative advantage and potential linkages to the rest of the economy should be taken into account. This information is rarely available. Without it, there is the danger that the

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[30] Koester et al.(1988) argue that competitors' comparative advantage has moved somewhat away from the products of interest to sub-Saharan countries. Hence, they may have the potential to increase their market share of their traditional export markets by lowering their costs of production.

[31] Of course, entry into new markets whether for traditional or "new" primary exports may not be easy. Tastes, quality standards and marketing requirements may be quite different from present markets.

promotion of crops whose investment needs, in terms of specialised capital, downstream processing and marketing, may lock the country into a rigid production pattern over the long term.

Direction of trade: There should be scope too for LDCs to expand intra-regional ("South-South") trade in agricultural commodities. This may be viewed as a way of achieving "regional" self-sufficiency (Rao and Caballero, 1990).

To date, economic integration or preferential trade agreements among LDCs have not fulfilled their early promise. Even those trade blocs which are considered relatively successful, e.g. ASEAN, still account for only a small proportion of trade in agricultural products in the region. Nevertheless, sound economic, and non-economic, arguments can be found for continuing to try to develop this form of cooperation.

Certainly, there has been revived interest in regional trade agreements in Latin America. Brazil, Argentina, Paraquay and Uruguay hope to set up a common market by the end of 1994; Mexico and the Central American republics by 1996; Chile, Colombia, Venezuela and Mexico will soon negotiate their free trade agreements[32]. Although more than 85 per cent of the continent's trade is still with countries outside the region[33], there are opportunities for substitution of extra-regional imports by efficient regional production (in agriculture, there is scope for trade in wheat, animal products, animal feeds and edible oils). But the boost to Latin American economic integration rather than mere liberalisation has come in part from the threat of trading blocs in Europe, North America and Asia. If the rest of the world's trading blocs turn into fortresses, liberalisation, they fear, will not help their economies.

The instability in many of Latin America's economies, their widely different economic and social conditions, and the inadequacy of the supporting international infrastructure make a common market along European lines seem far-fetched. But some core treaty across the continent, followed by a series of over-lapping bilateral trade agreements seems within reach.

Finally, it may be noted that there are a number of very small economies with highly specialised resources and, typically, little of an industrial base. These are in the most unenviable position; they are "condemned" to a very specialised pattern of production and exports. For these countries many of the strictures against reliance on trade apply and an outward orientation may seem inappropriate. On the other hand, any alternative strategy and, in particular, reliance on the domestic market, may, in most cases, entail even lower national income.

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[32] See Financial Times, 5 April, 1991, p.31.

[33] More specifically, only 6 per cent of Brazil's trade is with the 3 Southern Zone countries with whom it is negotiating a free trade agreement.

V EMPIRICAL ANALYSIS OF AGRICULTURAL TRADE

In the choice and design of agricultural trade strategies there is a primary need for quantitative information on the country's comparative advantage and disadvantage in the production of individual agricultural commodities, and on the determinants of trade flows and market shares. Empirical investigation of international trade flows has also an important bearing on the debate on international trade policy, such as the current GATT Round, and on a number of macro and sectoral policy issues, including the impact of structural adjustment, and of expenditure-switching and expenditure-reduction policies in particular.

Instead of offering a summary of a vast body of literature, the purpose of this chapter is to indicate the principal methodological approaches which may shed light on the topics touched upon in Chapter IV and to suggest some methodological issues which arise in empirical analysis in this area. Much of the chapter concerns the modelling of income and price effects on agricultural commodity trade but instability and long run trends in agricultural prices, and the measurement of comparative advantage are also considered. A number of studies are chosen to exemplify the methodologies and are described in some detail. They are selected not because they are pioneering efforts but because they are recent and fairly typical of the approach being discussed. As most applied work in these areas uses econometric estimation of time series data, either directly or indirectly, we begin by noting some problems which arise in econometric modelling.

5.1 Some Methodological Issues

Most empirical analyses of agricultural trade have made use of econometric estimation of time series data, either directly in the case of estimation of behavioral equations or indirectly, as with some CGE models, where parameters may be borrowed from other econometric studies. It would then seem appropriate to highlight some methodological issues which this type of work must confront. As a practical matter, it is well recognised that data limitations plague empirical research in LDCs and some of the topics considered here may lie beyond the scope of many studies. Nevertheless, when interpreting empirical results, it is as well to bear in mind the rules of proper econometric procedure.

Data Inadequacies

Rigorous econometric modelling in the field of agricultural trade is hampered by inadequate sample sizes and by data series containing gaps or inconsistencies. This severely limits our capacity to analyze current trade flows or predict future trends. For example, it is difficult to assess the profitability of diversification, say, into tropical fruits, if there is little coverage of this specific product group in trade and consumption statistics[34].

Even if relevant data series are available, an additional problem is confronted: measurement errors abound in international trade data. Nor is it easy to ascertain the extent and nature of data inaccuracies, since in general no means of cross-checking exists. Leamer (1984, p.128) suggests that "God (and very few

[34] Hallam (1990) discusses these and other data problems in more detail.

others) knows how ... countries collect information on GNP, savings flows, labor force and so on." Where there are "errors in variables", the reliability of the estimates of parameters will be adversely affected. While errors in the dependent variable are absorbed in the disturbance term, errors in explanatory variables result in biased and inconsistent parameter estimates when ordinary least squares is applied. Other estimation techniques may be adopted but the commonest response is to ignore the problem.

Measurement problems of import and export prices are of particular concern but surprisingly they have received relatively little attention in applied trade literature. Two aspects are highlighted here. Firstly, where domestic and world prices enter the import or export functions (discussed in section 5.4 below), these should be defined for the same quality of product, at the same location and at the same point in the marketing chain. Published price series rarely meet these requirements of consistency.

Secondly, where data are to be grouped, the appropriate means of aggregation must be considered. In this regard, Aw and Roberts (1988) suggest the application of recent advances in the theory of index numbers to the measurement of import or export prices. Specifically, a Tornqvist or translog quantity index would be defined as follows:

$$\ln F_{ij} = \frac{1}{2}\sum_k (S_k^i + S_k^j)(\ln x_k^i - \ln x_k^j) \qquad (5.1)$$

where x_k^i is the quantity of imports of commodity k for observation i, and S_k^i denotes the share of total expenditure for observation i devoted to commodity k.

A Tornqvist price index can be constructed in similar fashion:

$$\ln P_{ij} = \frac{1}{2}\sum_k (S_k^i + S_k^j)(\ln p_k^i - \ln p_k^j) \qquad (5.2)$$

where p_k^i denotes the fixed price for import quantity x_k^i.

These indices permit the bilateral comparison between two observations i and j. This is, however, limiting where the analysis requires the comparison across supplying countries as well as over time, as would be the case when assessing changes in comparative advantage among countries or when exploring the impact of country-specific trade policies on import prices. As an alternative, Aw and Roberts propose the use of a multilateral translog quantity index:

$$\ln F_{ij}^* = \frac{1}{2}\sum_k (S_k^i + \bar{S}_k)(\ln x_k^i - \ln \bar{x}_k) - \frac{1}{2}\sum_k (S_k^j + \bar{S}_k)(\ln x_k^j - \ln \bar{x}_k) \qquad (5.3)$$

where

$$\bar{S}_k = \frac{1}{N}\left(\sum_{i=1}^{N} S_k^i\right) \qquad \text{and} \qquad \ln \bar{x}_k = \frac{1}{N}\left(\sum_{i=1}^{N} \ln x_k^i\right) \tag{5.4}$$

and N is the total number of observations in the sample. The comparison between i and j is thus made as the difference between two bilateral comparisons, where each of the latter is between one of the observations of interest and the mean of all observations. A translog multilateral price index is defined conformably (with p_k^i and p_k^j replacing x_k^i and x_k^j in the formula). This index is particularly useful in constructing industry-level import prices that differ by country of origin.

Even if this approach to aggregation is followed, the question remains as to the appropriate composition of commodity groups. Historically, commodities have been grouped to construct appropriate price indices for domestic demand analysis. However, in analyzing international trade issues, there is a need for "price indices for traded and non-traded goods with weightings pertaining to internal decisions in the importing countries" (Chambers and Just, 1979,p.256).

Dynamics: Lags in Adjustment

Most of the empirical analyses reviewed in this chapter have assumed implicitly that the adjustment of exports or imports to market stimuli is instantaneous. Yet the presence of adjustment costs, production and delivery lags and incomplete information in international markets suggest that importers and exporters will not always be operating at their desired or long run levels. Time lags are likely to be important, particularly for perennial crops, and should be incorporated into the empirical model if precise forecasts of external trade levels are to be obtained and the effects of changes in tariffs, exchange rates etc. are to be gauged accurately.

A simple approach, commonly adopted, is to use a distributed lag specification. For example, import demand might be modelled as:

$$M_t = \alpha + \sum_{j=0}^{n_p} \beta_j P_{t-j} + \sum_{j=0}^{n_y} \gamma_j Y_{t-j} + \sum_{j=0}^{n_z} \delta_j Z_j + e_t \tag{5.5}$$

where M_t denotes the quantity of imports, P_{t-j} is the price of imports in period t-j, Y_{t-j} represents domestic economic activity in period t-j, and Z_j is the current or past value of another exogenous variable, such as a policy intervention or the level of foreign reserves, which might also influence import demand. By including lagged values of the dependent variable, as in Houthakker and Magee (1969), a more general specification can be derived. Nested within the general model are the partial stock adjustment model, the autoregressive

model and the static model[35].

Regrettably, the theory gives no guidance as to the appropriate dynamic form. Rather, *ad hoc* lag structures (typically geometric or polynomial (Almon) lag structures) are imposed[36] on essentially static theory. The final choice of specification then rests on empirical criteria. For example, Thursby and Thursby (1984) estimate 324 equations for aggregate import demand in 5 countries in order to determine an appropriate specification. Judging appropriateness in terms of unbiased (or at least consistent) and efficient estimates of elasticities, they concluded that the static form and Almon models performed poorly. However, in the absence of theoretical foundation, interpretation of the results from "data mining" of this kind is difficult (Husted and Kollintzas, 1984).

Simultaneity

Price elasticities computed from single equation trade models can be seriously biased where there is simultaneity between prices and quantities. Indeed for simultaneity bias to be absent, some rather restrictive conditions have to be in place. For example, an export demand function may be estimated in isolation and without bias, if demand is stable over time, while export supply fluctuates. When such conditions do not pertain, the correct procedure would be to formulate a complete model, with demand and supply components, estimated as a simultaneous system. An alternative would be to solve the model and estimate the reduced-form equations, by single equation methods. If the model is "just identified" (not necessarily a common occurrence), the elasticities from the underlying demand and supply equations can be retrieved.

Although there are some examples of explicit export functions incorporated in export demand models,[37] simultaneous models of import relationships are quite rare.

Stationarity

For a long run equilibrium relationship to exist between two variables, they should exhibit the same intertemporal characteristics. Analyses which seek to establish stable relationships between time series variables (e.g. a link between export demand (X) and the real exchange rate (RER)), should confront the issue of whether these series are "stationary". Broadly speaking, a time series is said to be stationary if there is no systematic change in mean (no trend), if there is no systematic change in variance, and if strictly periodic variations have been removed.

The dynamics of a time series can be described by the number of times it must be differenced to obtain a time-invariant, stationary process. A series which needs to be differenced n times is said to be integrated of order n. The order of integration is inferred by testing for unit roots, one of the most widely

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[35] For a more detailed, technical discussion of the use of dynamic forms in allocation models, see Bewley (1986).

[36] Appropriate ways of estimating distributed lag models are detailed in Judge et al. (1980). Goldstein and Khan (1985) suggest there is also great scope for the use of time series methods to trade relationships.

[37] See Goldstein and Khan (1985).

used tests being the augmented Dickey-Fuller test[38]. If it turns out that two variables are integrated to different degrees, a long run relationship cannot be established between them: standard regressions would be meaningless.

Having established that X and RER are integrated, the next step would be to determine whether they are co-integrated. Co-integration implies that there exists a constant k such that

$$Z_t = X_t - k.RER_t \qquad (5.6)$$

is integrated of order zero. That is to say, the unexplained error, Z_t, is stationary with invariant mean and variance; the series X_t and RER_t have important long run components which cancel out in forming Z_t.

To test whether the series are co-integrated, a two-stage procedure is adopted. Firstly, the coefficient k is estimated by OLS and, in the second stage, the series Z_t, constructed as in 5.6 above, is tested as integrated of order zero.

Ardeni (1989) emphasises the importance of the co-integration approach in empirical work on the "Law of One Price". He argues that the assumption that commodity prices are perfectly arbitraged, at least in the long run, (a common assumption in international trade modelling) is counterfactual and that much of the empirical evidence provided to support it is flawed. One shortcoming of these studies is a failure to consider the time series properties of the price variables (non-stationarity). His results (for wheat, beef, sugar, tea, wool, tin, and zinc in Australia, Canada, U.K. and U.S.A.) show that exchange rates and commodity prices are not co-integrated, thus showing a lack of empirical support for the "Law of One Price" as a long run relationship.

The issue of stationarity of exchange rates is also analyzed by Edwards (1988b). In his study of the real exchange rate of 12 developing countries, he concludes that the first differences of log RER (i.e. the dependent variable in his model as given in equation 3.4 in Chapter III) are stationary.

Causality

The use of causality tests in time series analysis has proved to be quite controversial, with many objecting to the term "causality" when the tests focus solely on predictability. Specifically, the tests can be used to determine whether a series (say, export demand, X) can be generated separately from other variables (e.g. the real exchange rate, RER), i.e. RER contains no information for characterising export demand, and *vice versa*. A series is generated separately if it can be forecast from its own past values and other series contain no information concerning its forecast values.

Following Geweke et al. (1983), the following equation would be estimated:

[38] See Granger and Newbold (1989).

$$X_t = \sum_{j=-\infty}^{\infty} \beta_j X_{t-j} + \sum_{j=-\infty}^{\infty} d_j RER_{t-j} + e_t \qquad (5.7)$$

where e_t is a (white noise) residual. The test of the null hypothesis that RER does not 'cause' X corresponds to the usual F test on $d_j = 0$.

Although the tests offer a convenient means of exploring predictability, there seems to have been no systematic investigation of causality in agricultural trade models.

5.2 Instability and Trends in Agricultural Product Prices

Controversies on agriculture-based development strategies, and reliance on agricultural trade in particular, have often turned on the question of long term trends and instability of agricutural price series relative to the prices of manufactured goods. Price instability is a concern in so far as it reduces investment incentives and creates vulnerability to foreign exchange equilibria. Scandizzo and Diakosavvas (1987) review the main conceptual and empirical problems encountered in analyses of the extent of instability in agricultural markets. They suggest that a reasonable definition of instability was proposed by Coppock (1977) viz.: 'Instability should not be understood to mean any deviation from a fixed level. It means excessive departure from some normal level'. Since for many economic variables there is a time trend, trend values of the variable could be taken as the 'normal' level, and deviations from the trend as a measure of instability. This is essentially the approach in World Bank (1986), whose results, reproduced in Table 5.1, offer some indication of the extent of recent price instability in world commodity markets. The indices measure the squared percentage deviations from the price trend, averaged over the data period. For example, in the 1974-84 period, the price of sugar in a given year would 'typically' be 51.5 per cent above or below the trend value for that year. Price variability in these agricultural markets is of a much higher order than would be found in the markets for manufactured goods.

Proponents of import substitution as a means of industrialisation and growth have been strongly influenced by the argument, due to Singer and Prebisch[39], that the terms of trade of LDCs (i.e. world prices of their primary product exports relative to those of their imports of manufactures) deteriorate progressively. Since the 1950s there have been a number of attempts to settle the debate on this thesis by recourse to empirical evidence, but the results have often been inconclusive or unconvincing. There have been two recent, detailed studies addressing the question of whether there is a long-term trend in the terms

[39] Their thesis rests on the relative size of income elasticities of demand for imports, the differential rates of technical progress and the structure of product and factor markets in the LDCs and DCs. For further discussion, see, for example, Scandizzo and Diakosavvas (1987).

of trade against the LDCs. Both suggest that the answer largely depends on the data period under review. While stressing the conceptual and methodological limitations of this type of analysis, Scandizzo and Diakosavvas (1987, p.160) conclude that "a 'selective' deterioration has affected some (primary) commodities, and some LDCs for specific sub-periods. Support for this hypothesis is provided by the fact that terms of trade of primary commodities tend to deteriorate slightly over the longer period considered, and considerably more in some of the sub-periods". Grilli and Yang (1988), taking a slightly longer data period 1900-86, examine the course of the relative price of food and the relative price of non-food agricultural products. Again much depends on the choice of period in both cases. However, a long run downward trend appears to be stronger for the non-food agricultural commodities, particularly since the 1950s. Moreover, a major decline in food prices occurred over the last 15 years of the sample.

5.3 The Analysis of Comparative Advantage

Comparative advantage arises from two sources: factor endowment, a country characteristic, and factor intensity, which is a characteristic of the technology associated with a product or group of products. For example, with respect to the latter, factor requirements of agricultural products differ by their degree of processing. Unprocessed agricultural raw materials would be intensive in the natural resource, whereas processed agricultural products would be capital intensive. Factor endowment on the other hand will be given by the country's initial stock of natural resources and by past economic, political and social processes[40].

Although comparative advantage is a central concept in international trade theory, its use in empirical work is quite problematic[41]. Firstly, in measuring comparative advantage, it is not sufficient to investigate a country's characteristics; specific product characteristics must also be taken into account. Comparative advantage may be high when a large (small) factor endowment is combined with high (low) factor intensity. On the other hand, a low comparative advantage is implied when a large (small) endowment is associated with a low (high) factor intensity.

A more serious difficulty arises because the concept is defined in terms of relative prices in the absence of trade. But autarkic prices are unobservable when the data are post-trade observations. In order to proceed with empirical analysis, the *ex ante* concept of comparative advantage is replaced by "revealed comparative advantage"; indices constructed from trade, production and consumption data may "reveal" the underlying pattern of comparative advantage.

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[40] This characterisation of comparative advantage follows Lange (1989).

[41] For examples of tests of the empirical validity of a central result of trade theory, the Heckscher-Ohlin theorem, see Leamer (1984) and Feenstra (ed.) (1988).

Table 5.1: Price Instability Indices, 1964-84

Commodity	International Price 1964-84	1978-84
Sugar	90.8	51.5
Cocoa	37.3	34.1
Rice	33.0	21.9
Coffee	32.0	37.7
Palm Kernels	27.5	32.5
Wheat	24.3	16.9
Tea	21.7	23.6
Jute	21.2	26.8
Soybeans	20.8	9.9
Beef	16.7	11.3
Corn	16.6	15.6
Rubber	16.1	14.0
Sorghum	15.6	13.6
Cotton	14.3	10.7

Note: Index $= \frac{1}{N}\sum\left[\frac{P_i-\bar{P}_i}{\bar{P}_i}\right]^2$

where P_i is the actual price in any year and $\bar{P}_i$ is the exponential trend price; N is the number of years of observations on prices. Prices are mainly from the London and New York markets, and they are deflated by the manufacturing unit value index (1984=100).
Source: World Bank (1986)

5.3.1 Revealed Comparative Advantage (RCA)

In the revealed comparative advantage approach *ex post* patterns of trade across countries and commodities are examined in order to identify those goods which a country can produce with relative efficiency. A number of RCA indices have been suggested.[42] These include:

(i) X/Q , where X denotes exports, and Q is domestic production

(ii) NT/Q , where NT denotes net trade (exports (X) minus imports (M)).

(iii) M/C , the ratio of imports to domestic consumption (C)

(iv) Q/C , the self-sufficiency ratio.

The degree of comparative advantage is positively related to the ratios in (i), (ii) and (iv), but inversely related to (iii). The indices are interrelated by the trade identity (ignoring stocks)

$NT = X-M = Q-C$

However, it is sometimes more convenient to base the measure of comparative advantage on external trade data only.[43] Two indices which have this property are:

(v) $NT/(X+M)$. This measure, suggested in UNIDO (1982), would be positively related to the degree of comparative advantage.

(vi) $(X/X_w)/(T/T_w)$, where w denotes the summation over all countries and T is total merchandise exports. This index, also positively related to comparative advantage, was put forward by Balassa (1965). It is sometimes computed in the form:

$RCA = \log((X/X_w)/(T/T_w) + 1)$

This index may be more robust than (v) because it does not use import data, which are usually more directly affected in the short run by trade policies.

Ballance et al. (1987) examined the extent to which these, and other, measures are consistent.[44] When the various indices were used to quantify the commodity specific degree of comparative advantage of each country, quite a high degree of inconsistency emerged. The two trade-only indices ((v) and (vi) above) were positively correlated but with a correlation coefficient of only .5 to .6 (depending on the level of commodity aggregation). Rather more worrisome was the finding that the sign of the correlation between measures (i) and (iii) was positive, and thus inconsistent with the *a priori* hypothesis of their relationship.

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[42] See Ballance et al. (1987).

[43] It may be difficult to concord data where different product classifications are used in trade data and production data. (Ballance et al., 1987).

[44] The sample for the exercise comparing indices (i) to (iv) was from 25 commodities in 3 industrial sectors covering 812 country-commodity observations in 1980. For the trade only indices, the data are 2-year averages (1979-80) covering 21 3-digit, 122 4-digit and 176 5-digit SITC categories in 4 industrial sectors.

When the indices are used to provide a commodity-specific ranking of countries by degree of comparative advantage, a high degree of consistency between the two trade only indices was found (a rank correlation of about .8); the indices (i) and (iii) were again inconsistent.

These results suggest that empirical analyses of comparative advantage may be highly sensitive to the particular index selected. Moreover, one should be wary of indices based on only one side of the market, i.e. demand indices such as M/C or supply indices such as X/Q.

A more general criticism of these measures is that at best they offer a useful tool for positivistic research on changing trends in trade competitiveness; because of the pervasive influence of government intervention in agricultural production and trade, together with the volatility of exchange rates, little can be concluded as to what countries ought to be trading[45].

Lange (1989) provides a recent, detailed example of the use of Balassa's index, the most widely used of the RCA measures defined above. It is worth re-iterating that this index is not a 'true' measure of comparative advantage but merely reveals a country's relative export performance reflected in international trade data. The index is computed for 91 countries and for exports of 3 agricultural products: a) agricultural raw materials, b) processed agricultural products (e.g. butter, flour, refined sugars), and c) products of second-stage processing (e.g. prepared meat, cereal preparations, chocolate). Based on 3-year averaged data for 1980-82, the following 'revealed' pattern of comparative advantage emerges:

In terms of **agricultural raw materials**, a high degree of comparative advantage is recorded for countries which are relatively well-endowed with agricultural resources e.g. the United States, the USSR, India, East Africa, Oceania and most of the Central and South American countries. For **processed agricultural products**, the largest indices are found in Argentina, Brazil, Paraguay and Uruguay, in Senegal, Sudan and Tanzania, and in India, the Far East and Australia. For the **highly processed agricultural products**, which are more capital intensive, it is mainly the developed countries which record high comparative advantage. Most LDCs in Africa and Asia reveal low international competitiveness in this category, although some Latin American countries (Argentina, Brazil) and a few African countries (Kenya, Tanzania) score relatively highly.

Lange then undertakes a simple econometric analysis, in which measures of the stage of economic development, the potential of agricultural resources, and the availability of minerals and fossil fuels are regressed on the revealed comparative advantage indices. The principal conclusion is that comparative advantage of unprocessed agricultural products decreases significantly with economic development, but increases for processed agricultural products.

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[45] See Matthews (1989) for a fuller account.

5.3.2 Domestic Resource Cost (DRC)

According to Chenery (1965) a country has a comparative advantage in producing and exporting a commodity if the social opportunity cost of producing a unit of it (the value of all inputs in their best alternative employment) is less than the commodity's export price:

$$e.F + D < e.P^w$$

where F is the cost of direct and indirect foreign inputs per unit of output (in foreign currency); e is the exchange rate; D is the opportunity cost of direct and indirect domestic inputs per unit of output (in local currency); and P^w is the international price of the product (in foreign currency). A simple reformulation of this relationship yields the basis of the domestic resource cost (DRC) method of measuring comparative advantage:

$$\frac{D}{(P^w - F)} < e$$

Namely, a country has a comparative advantage in a certain line of production if the social opportunity cost of earning a unit of foreign exchange is less than the exchange rate.

The DRC methodology has been used quite widely to give some indication of the economic profitability of agricultural activities. For example, Appleyard (1987), an FAO study, reviewed the efficiency of increasing production of 5 major crops in Pakistan, and Morris (1989) calculated DRC ratios for 6 irrigated crops in Zimbabwe to explore the rationale for expanding wheat production and displacing wheat exports.

Matthews (1989) noted a number of limitations of the DRC method. It requires accurate measures of the opportunity cost of factors employed, as well as of the degree of price distortion for outputs and material inputs. The valuation of land poses a particular difficulty, but the appropriate choice of shadow prices for labour and capital, and for the exchange rate is also problematic. Market values do not always provide good approximations to shadow prices. Whenever they are used, they will be influenced by trade flows, and so cannot directly identify the 'true' pattern of comparative advantage. Moreover, the DRC ratios are defined for marginal changes. As their magnitude and rank order will alter (but in an unpredictable way) as output levels change, not much can be inferred about equilibrium output levels.

To summarise, the RCA and the DRC measures are of very little use in identifying the true pattern of comparative advantage. Indeed, despite a substantial amount of quantitative analysis in this area, we simply do not know the relative social cost of producing even the major agricultural products in various parts of the world.

5.4 Modelling Agricultural Trade Flows

The subject of most empirical studies of agricultural trade has been the estimation of 'trade equations'. These have used a partial equilibrium, often quite *ad hoc*, specification for a single agricultural commodity or commodity group. The principal explanatory variables have been prices and income, although recently some researchers have incorporated the real exchange rate in the analysis. The agricultural trade sector has also been an important component of computable general equilibrium models. These models have been used frequently in the analysis of medium and long term policy issues in LDCs. Foreign trade policy has been the focus of many of these applications but even when this is not the case, the assumptions about the structure of the trade sector will be decisive to the outcomes of policy simulations. In this section, both modelling approaches are considered. We begin, however, by considering models designed to explain changes in market shares over time.

5.4.1 Market Share Models

As noted in Chapters I and IV, LDCs' share of total world trade in agricultural products has been falling during the last decade, with the relatively poor performance of sub-Saharan Africa being a particular cause of concern. Very few empirical studies have focused on market shares *per se*, but a number of analytical techniques could be utilised in work in this area.

Markov analysis has been frequently employed in agricultural economics research and although the methodology has been little used in the field of international trade, it would seem an obvious choice where attention focuses on market shares.

Defining the share of the jth exporter of a product at time t as m_{jt}, and the total number of exporters as n, then:

$$\sum_{j=1}^{n} m_{jt} = 1 \qquad (5.8)$$

Market shares are then assumed to evolve in the following manner:

$$m_{jt} = \sum_{i=1}^{n} m_{it-1} p_{ij} + v_{jt} \qquad (5.9)$$

where

$$\sum_{j} p_{ij} = 1 \quad \text{for all } i$$
$$p_{ij} \geq 0 \quad \text{for all } i,j$$

Here p_{ij} denotes the "transition" probability that an importer will switch in period t from exporter i to exporter j and is assumed to be time-invariant. A random error term, v_{jt}, is appended. The only requirements are observations on shares (exporters' market proportions) over time. The transition probability matrix can be generated by a maximum likelihood estimator, which ensures efficient estimates in the permissible range.

For example, Durham and Lee (1987) used Markov analysis in their study of poultry imports in Kuwait. They attempted to explain the country's import share behaviour over time by estimating the probabilities of repeating or switching product suppliers.

An obvious drawback when applying the standard Markov specification to world commodity markets is the assumption of constant probabilities, and hence a stable trade regime. With a lengthy time horizon this may be considered too unrealistic and so an attempt might be made to introduce some variation in the transition probabilities by expressing them as functions of a set of exogenous explanatory variables (say, supply in the exporting country) - but at the cost of imposing further restrictions on the estimation procedure. Modifying the model in this way should enhance its predictive power and at the same time introduce some "policy" content, which Markov analysis in its standard form lacks.

Alternatively, in **the market share equation approach,** market shares are directly estimated as a function of key explanatory variables. For example, Capel and Rigaux (1974) expressed (Canadian wheat) market share as a function of relative prices:

$$m_{it} = f(UVR_{it}) \qquad (5.10)$$

where UVR_{it} denotes the "unit value ratio", i.e. the ratio of exporter i's export price to all other exporters' prices. The analysis can then be extended by treating this expression as one depicting long run equilibrium

and imposing a Nerlovian partial adjustment process. Additional explanatory variables could of course be included in the function.

The most serious deficiency of this approach is that there is no guarantee that the predicted shares will lie between 0 and 1, or sum to unity, as required by definition. In fact, relatively few functional forms ensure that the dependent variables will be non-negative and sum to unity, both in estimation and prediction. As Durham and Lee note, Theil's **multinomial logit model** is one which meets the two criteria[46] and they apply it in their analysis of the Kuwaiti poultry trade.

5.4.2 Partial Equilibrium Models

When attention focuses on export and import trade flows, most researchers have adopted a partial equilibrium approach. Two versions may be distinguished:

a) the "perfect substitutes", dealing with goods which are close, if not perfect, substitutes, and

b) the "imperfect substitutes" model, dealing with differentiated products.

A. The Perfect Substitutes Model

When dealing with homogeneous products, as many primary commodities are often claimed to be, the perfect substitutes model in which there is no differential between domestic and foreign good prices, is appropriate.

For country i, the model would be specified as follows (Goldstein and Kahn, 1985):

$$D_i = d((-)P_i, (+)Y_i) \tag{5.11}$$

$$S_i = s((+)P_i, (-)F) \tag{5.12}$$

$$M_i = D_i - S_i \tag{5.13}$$

$$X_i = S_i - D_i \tag{5.14}$$

$$PM_i = P_i = PX_i = eP_w \tag{5.15}$$

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[46] For details of the multinomial logit model, see, for example, Bewley (1986).

$$D_w = \sum_{i=1}^{m} D_i \tag{5.16}$$

$$S^w = \sum_{i=1}^{m} S_i \tag{5.17}$$

$$D_w = S_w \tag{5.18}$$

Where D_i and D_w are the quantity of the traded good demanded in country i and world demand for the good respectively; S_i and S_w are country i's supply of the traded good and world supply respectively; M_i and X_i are the quantities of imports and exports of country i; PM_i, PX_i, P_i and P_w are the import, export, domestic and world prices of the traded good; Y_i denotes increase in country i and F_i measures factor costs.

As equations 5.13 and 5.14 indicate, import demand and the supply of exports are now determined as excess demand and excess supply, respectively, for the domestic good; they are the residuals in a standard model of commodity demand and supply.

A more general specification would include the prices of other traded goods and of non-traded goods in the demand and the supply equations. Each traded good commands a single price, ignoring transport costs and trade barriers, i.e. $PM_i = PX_i = P_w = P_i$. This price is determined by the interaction of world supply and demand for the product. To influence the world price, the country must be able to alter either world supply or demand and this in turn will depend on its share of world imports and exports, as well as on its own price elasticities of demand and supply for the good.

The following expressions for trade elasticities can be derived:

$$\epsilon_M^d = \frac{D_i}{M_i}.\epsilon - \frac{S_i}{M_i}.\eta \tag{5.19}$$

$$\epsilon_X^s = \frac{S_i}{X_i}.\eta - \frac{D_i}{X_i}.\epsilon \tag{5.20}$$

The price elasticity of demand for imports (ϵ_M^d) will be positively related to the (absolute) values of the

price elasticities of domestic demand (e) and supply (η), and negatively related to the shares of imports in domestic demand and in domestic production. One implication is that import price elasticities can be high, even if domestic price elasticities are relatively low.

The price elasticity of export supply (e_X^s) will be positively related to the (absolute) values of the domestic demand price elasticity and of the supply price elasticity and negatively related to the shares of exports in domestic supply and domestic demand.

It is also illuminating to express a country's export price elasticity in terms of global elasticities:

$$(e_X^d)_i = \frac{X_w}{X_i}.(e_x^d)_w - \frac{X^*}{X_i}.(e_x^s)^* \qquad (5.21)$$

Where exports of the rest of the world are denoted by X^*, and the export price elasticity of supply in the rest of the world is given as $(e_X^s)^*$. The global export price elasticity of demand is denoted as $(e_X^d)_w$. This expression implies that a country's price elasticity of export demand can be high, even though the global elasticity is relatively low, if it accounts for a small proportion of world exports. This result is a source of some optimism for those who adopt an outward-looking attitude to trade.

B. The Imperfect Substitutes Model

In a number of empirical settings, it would be inappropriate to assume that domestic and foreign goods are perfect substitutes. For example, it may be the case that the country both exports and imports the "same" product. Alternatively, there may be significant price differences (net of transport costs and other trade impediments) for the same product across countries or within a country, so that the "law of one price" does not seem to hold.

Goldstein and Khan (1985) suggest that the essential features of the model, for 2 regions - country i and the rest of the world, can be captured in the following 8 equation system:

$$M_i^d = f((+)Y_i, (-)PM_i, (+)P_i) \qquad (5.22)$$

$$X_i^d = g((+)Y^*e, (-)PX_i, (+)P^*e) \qquad (5.23)$$

$$M_i^s = h((+)PM^*(1+s^*), (-)P^*) \quad (5.24)$$

$$X_i^s = j((+)PX_i(1+s_i), (-)P_i) \quad (5.25)$$

$$PM_i = PX^*(1+t_i)e \quad (5.26)$$

$$PM^* = PX_i(1+t^*)/e \quad (5.27)$$

$$M_i^d = M_i^s e \quad (5.28)$$

$$X_i^d = X_i^s \quad (5.29)$$

where M_i^d denotes the quantity of imports demanded by country i, X_i^d is the quantity of country i's exports demanded by the rest of the world. The quantity of imports supplied to country i (the rest of the world's exports to that country) is given by M_i^s , while the quantity of exports supplied from country i to the rest of the world is denoted by X_i^s. The remaining endogenous variables in the model are the domestic currency prices paid by importers in the two regions (PM_i and PM^*) and the domestic currency prices received by exporters in the two regions (PX_i and PX^*). The exogenous variables are the levels of income in the two regions (Yi,Y^*), the prices of domestically produced goods (P_i,P^*), proportional tariffs on imports (t_i,t^*), subsidy rates on exports (s_i,s^*) and the exchange rate (e) (units of country i's currency per unit of the rest of the world's currency).

In this form the model accords with orthodox demand theory of constrained utility maximisation. If the product in question is an intermediate good, then the demand for imports could be specified as an input demand function with the price of imports, the price of domestic input and the level of domestic gross output as the explanatory variables.

In a more general version, with more than 2 regions, country i's exports would compete not only with domestic producers in the recipient country but also other, "third country", exporters. This can be handled by including competitors' export prices, adjusted by the exchange rate, into the export demand equation.

Quantities and prices are determined simultaneously, through the interaction of both demand and supply. However, it is often assumed that price elasticities of supply for imports and exports (equations 5.24 and 5.25) are infinite, allowing import demand (5.22) and export demand (5.23) to be estimated as single equations.

It should be noted that the relevant import price in the input demand equation is the landed price in domestic currency and inclusive of all charges (tariffs, freight etc.). In the export supply function, the relevant price is that actually received by the exporter and so will include any subsidies (or penalties) for exporting. Hence although the small country cannot influence the prices of exports or imports in foreign currency, it can affect the volume of trade by altering the internal profitability of that trade.

The model treats the domestic price (P_i) as an exogenous variable, but as Goldstein and Khan note, this assumption may be questioned. Empirical evidence suggests that the domestic price, export prices in domestic currency (PX_i) and money wages are influenced by changes in the exchange rate and by changes in foreign export prices (PX^*), especially in small, very open economies. One implication of this is that the effectiveness of expenditure-switching policies such as devaluation will be reduced, as the relative price changes brought about will be small.

Armington-type Models

When the analysis focuses on imports or exports disaggregated by commodity and by country of origin or destination, the number of potential competitors increases markedly and some formal scheme for deriving own- and cross-price elasticities is required. The Armington methodology (Armington, 1969) has become the most popular solution (Grennes et al., 1978, were the first to use it for agricultural trade). It offers a convenient and consistent way of estimating all bilateral and multilateral direct and cross-price effects, and it is a flexible approach which can be adapted to the analysis of export supply functions or to use in CGE models (as indicated below).

In the Armington approach[47] consumers distinguish the commodity by country of origin (i.e. imperfect substitutes are assumed). It can be shown that, under certain separability assumptions[48], the demand in the importing country for commodity i, originating in country j (j = 1,..,m) can be expressed as:

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[47] This outline is based on Sarris (1981).

[48] Specifically, it is assumed the consumer's utility function is weakly separable and that the groups' quantity indices are linearly homogeneous functions of the individual products.

$$x_{ij} = b_{ij}^{\sigma_i} x_i \left[\frac{p_{ij}}{p_i}\right]^{-\sigma_i} \tag{5.30}$$

where, in turn, x_i is defined as a CES function:

$$x_i = \left[\sum_{j=1}^{m} b_{ij}\, x_{ij}^{-\rho_i}\right]^{-\frac{1}{\rho_i}} \tag{5.31}$$

Similarly, a CES price index, p_i, is defined for the prices p_{ij} associated with each quantity x_{ij}:

$$p_i = \left[\sum_{j=1}^{m} b_{ij}^{\sigma_i}\, p_{ij}^{1-\sigma_i}\right]^{\frac{1}{1-\sigma_i}} \tag{5.32}$$

The elasticity of substitution (σ_i) is equal to $1/(1+\rho_i)$.

With some manipulation, an expression depicting percentage changes of the flow variables, x_{ij}, can be derived. In terms of the log change of the jth exporting country in some market for commodity i, this becomes:

$$\frac{dx_{ij}}{x_{ij}} - \frac{dx_i}{x_i} = -\sigma_i (1 - S_{ij})\frac{dp_{ij}}{p_{ij}} - \sigma_i \sum_{k \neq j} S_{ik} \frac{dp_{ik}}{p_{ik}} \tag{5.33}$$

where S_{ij} are the shares of the consumption value of the ith commodity from the jth country of origin in the value of total consumption of the ith good.

This may also be expressed in terms of value shares:

$$\frac{dS_{ij}}{S_{ij}} = -(\sigma_i - 1)(1 - S_{ij}) \frac{dp_{ij}}{p_{ij}} - (\sigma_i - 1) \sum_{k \neq j} S_{ik} \frac{dp_{ik}}{p_{ik}} \tag{5.34}$$

Thus changes in market shares from some initial value depend only on changes in (c.i.f.) prices of the commodity from different origins, the initial market share and the elasticity of substitution, σ_i. Clearly this is most convenient in terms of computation. But two points may be noted. First, the predictive ability of the model will only be as good as the estimates for σ_i. Second, some attention must be given to the "right"

level of aggregation for the classes of commodities. The separability assumptions may be violated if the commodity groups are too narrowly defined. This said, the methodology provides an extremely economical approach to empirical agricultural trade analysis.

Partial Equilibrium Estimates of Price and Income Elasticities of Export Demand

The imperfect substitutes model of Goldstein and Khan has been adapted and estimated in two recent studies of primary commodity exports. These are briefly reviewed here.

Islam and Subramanian (1989) suggest that the demand of LDCs' exports will depend on incomes in the importing countries (taken to be the developed countries) and on the relative prices of LDCs' exports in the markets of importing countries:

$$X^d = a_0 + a_1 Y^* + a_2(P_x - P^*) \qquad (5.35)$$

where X^d denotes the demand for LDCs' exports; Y^* is the real GNP of developed market economies; P_x is the dollar unit values of LDCs' exports; and P^* is the GNP deflator (a measure of the price level) of developed countries. All variables are expressed in logarithms.

The authors discuss briefly, though do not apply, two alternative versions: a) where there are more than 2 regions, an additional price variable could be included, namely $(P^c - P^*)$ where P^c denotes the price of competitors' exports.

b) where the DCs also produce the commodity in question, the domestic price of the product in the recipient country should also be included.

The supply of exports from LDCs is specified as a function of export price, measures of supply shocks and demand pressure, and a time trend:

$$X^s = b_0 + b_1(P_x - P) + b_2 t + b_3(S - S^t) + b_4(D - D^t) \qquad (5.36)$$

where P denotes the GNP deflator in LDCs; $(S-S^t)$ is the deviation of actual production from trend; $(D-D^t)$ is the deviation of GNP from trend and t is a time trend.

Random variations in production, mainly due to agro-climatic reasons, are assumed to drive export supply (b_3 is expected to be positive). On the other hand, when domestic demand rises above its trend level, resources tend to be diverted from export production and there may be long delays in deliveries for export (b_4 is expected to be negative). The time trend is included to capture secular shifts in the supply curve which may be due to changes in factor productivity, infrastructure etc.

Using annual data over the period 1962 to 1983, this two equation model is estimated for total agricultural exports of developing countries (excluding fishery and forestry products), although ideally it

would be the quantity of exports from developing countries to developed countries which should be explained. Various experiments with dynamic specifications are undertaken. The overall results are, however, mixed.

In the export demand equations, the income elasticity is well determined and robust to changes in specification. It turns out to be quite low (.6)[49]. The price elasticity, however, in some cases is of the wrong sign and is statistically insignificant in the versions of the model which are reported.

In the export supply equations, again the price response is found to be insignificant, as is the effect of "demand pressure". Much of the variation in export supply is in fact explained by the time trend, the supply shock term and a dummy variable for the oil shocks of 1974, 1975, 1979 and 1980.

Their analysis concludes with a study of export demand for 6 individual commodities - coffee, cocoa, tea, bananas and plantains (as traditional tropical exports) and pineapples and tomatoes (as non-traditional exports) (Table 5.2). Again income elasticities are well determined. For the four traditional exports, they are less than unity (the lowest being for cocoa (.18)); for the non-traditional exports, the income elasticity is about 1.6. With the exceptions of tea and tomatoes exports, the price elasticities have the correct sign, and are statistically significant. Only for pineapple exports is demand price elastic, however.

The authors conclude that their results support the contention that collective action to promote agricultural exports results in "damaging repercussions for export revenues". Their limited evidence also suggests that LDCs need "to rely progressively less on traditional exports and increasingly to diversify towards non-traditional agricultural exports".

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[49] Interestingly, Lewis' (1980) less elaborate analysis of the relationship between world trade in primary products and DCs' industrial production also produced an inelastic coefficient, viz. the rate of growth in world primary product trade was .87 times the rate of growth of industrial production.

Table 5.2 : Demand Elasticities for Selected Commodities

Commodity		Elasticity
Coffee	Income	.47
	Price	-.27
Cocoa	Income	.18
	Price	-.19
Banana & Plantain	Income	.58
	Price	-.40
Tea	Income	.52
	Price	.06
Pineapple	Income	1.59
	Price	-2.67
Tomatoes	Income	1.63
	Price	.17

Source: Islam and Subramanian (1989).

Bond (1987) undertook an empirical study of the flow of primary commodity exports from non-oil exporting LDCs grouped by geographical region, viz. Africa, Asia, Europe, the Middle East and the Western Hemisphere. Again commodity exports of different regions are treated as imperfect substitutes. The commodity groups are food, beverages and tobacco, agricultural raw materials, and minerals.

For each commodity group and region, export demand and export supply equations are specified, broadly following the Goldstein and Khan model. The quantity of exports demanded from a given region is assumed to be a (double-log) function of the export price of the region's commodity relative to the average prices of the good in world markets, and of the real income in importing countries. The export supply equations for each region is specified as a (double-log) function of current and lagged ratios of the export price of the commodity to domestic price levels in producing countries in the region, an index of productive capacity and two dummy variables to account for the effects of the two oil crises during the estimating period (1963-82).

Table 5.3 presents some selected results. In the export demand equations, the expected negative, and statistically significant, price elasticity is found for most of the commodity groups. In all but one case, the estimated price elasticity is also less than unity: the weighted averages across regions are --.22 (food), -.33 (beverages and tobacco), -.62 (agricultural raw materials, and -.5l (minerals). For food, the income elasticities have the expected positive sign and are statistically significant. The export demand for food products is also found to be quite income elastic (l.2 on average). The income elasticities for the other product groups are more variable across regions in terms of sign and size.

The export supply equations are rather unsatisfactory. Only in Asia are the supply elasticities with respect to price consistently positive across the commodity groups. The estimates for food, beverages and minerals in Africa are strikingly perverse. The estimated responses to the lagged price variable are little better; only 6 of the 23 equations record the expected positive, and statistically significant, coefficient. Given the generally unsatisfactory nature of these results, it is rather surprising to read in the concluding section of Bond's paper that "the results presented in this paper also provide further evidence of, and support for, the usefulness of pricing policy. Export supply in developing countries does indeed respond to improved price incentives". (Bond, 1987, p.223).

Table 5.3 Export Demand and Supply Elasticities*

	Price Elasticities of Demand			Income Elasticities of Demand		
	Food	Beverages & Tobacco	Agric. Raw Materials	Food	Beverages & Tobacco	Agric. Raw Materials
Africa	-.32	-.31	-3.28	1.01	1.34	.54[NS]
Asia	-.33	.08	- .34	1.14	-.14[NS]	.46
Europe	-.14	-.26	- .21	1.12	-.38	1.15
Middle East	-.46	-	- .09	1.54	-	-.41
W. Hemisphere	-.11	-.33	- .14	1.32	.51	.04[NS]

(Short Run) Export Price Elasticities of Supply

	Food	Beverages & Tobacco	Agric. Raw Materials
Africa	-1.28	-5.0[NS]	.70
Asia	1.21	.23	.17
Europe	.19	1.23	-.39
Middle East	-2.70	-.27	.27
W. Hemisphere	-.40	.54	-.30

* Adapted from Bond (1987)

NS indicates that the coefficient is not statistically significant from zero

Modelling with an Exogenous Exchange Rate

The agricultural trade models considered so far have either excluded exchange rates or simply used them to adjust the prices which were included in the specification. However, as Chambers and Just (1979) argue, more generality is attained by including a separate exchange rate variable in the regression equation. Its omission may lead to biased estimates of price elasticities.

For example, Chambers and Just (1981) present a dynamic econometric model of U.S. wheat, corn and soybean markets designed to investigate the effects of exchange rate fluctuations on the domestic and foreign sectors of these commodity markets. These effects turn out to be significant in terms of the volume of exports and the allocation between exports and domestic use of these commodities. Working at a much more aggregated level, Bahmani-Oskooee (1986) tries to separate the effects of changes in relative prices and in the effective exchange rate on both aggregate imports and aggregate exports for 7 LDCs.

Following the recent interest in the real exchange rate and its influence on agricultural performance, a number of researchers have sought to quantify the relationship between real exchange rate and external trade in agricultural products. As a measure of the degree of competitiveness of domestically produced goods relative to goods produced in the rest of the world, it is expected to influence external trade through its effect on the incentives to produce exportable and import-competing goods.

The most common approach is to specify a simple, *ad hoc* equation expressing the external trade variable, usually exports, as a function of the real exchange rate, among other variables. The real exchange rate is assumed to be exogenous or pre-determined. For example, Valdes et al.(1990) adopt this approach in their analysis of a number of agricultural export crops in Chile. To illustrate, exports of apples (expressed as a ratio to area planted) are regressed on the lagged dependent variable, the domestic price of apples, the price of fertiliser, the real exchange rate, and the ratio of the official exchange rate and the black market exchange rate. All explanatory variables in this case are exogenous.

Kirkpatrick and Diakosavvas(1989)[50] produce empirical evidence on the impact of the real exchange rate on aggregate agricultural exports using time series data for 28 countries in sub-Saharan Africa in the period 1974-87.

[50] A condensed version of their analysis is to be found in Diakosavvas and Kirkpatrick (1989).

The real exchange rate (RER) is defined as the nominal exchange rate (local currency per US$) multiplied by the ratio of US wholesale price index to the domestic consumer price index. The ratio of agricultural exports (X) to agricultural production (Q) for country i is then expressed as a function of RER, lagged one year, and of changes in foreign income (FY):

$$\log(\frac{X}{Q}) = a + b \log(RER)_{-1} + c \log(FY) \qquad (5.37)$$

This may be viewed as a reduced form equation from a simple model of export demand and supply. The foreign income variable (GDP of industrial countries at 1980 prices) is included to capture foreign demand for the country's agricultural exports.

In only 12 of the total sample of 28 countries is there evidence of a positive and statistically significant relationship between the real exchange rate and export performance. For two countries (Lesotho and Mauritania) the response to changes in RER is negative, and significant. There is also little evidence of significant demand-pull from changes in incomes in developed countries. The coefficient on the variable FY is negative as often as it is positive, and only statistically significant (and positive) in one case (Rwanda).

The authors conclude that "these results are interpreted as evidence that "getting the price right" may be a necessary condition for sustained export growth in [sub-Saharan Africa], but it is almost certainly not a sufficient condition". (Diakosavvas and Kirkpatrick, 1989, p.ll).

Digression: The Real Exchange Rate in Sub-Saharan Africa

Here the real exchange rate (RER) is defined, for 13 sub-Saharan countries over the period 1975-1987, as the nominal rate (US$/local currency) deflated by the ratio of U.S. consumer price index to the national consumer price index. Thus, an increase in the index reflects a real appreciation while a decrease indicates a real depreciation. In each country there has been substantial variability in the RER over the 12 year period but certain trends may be discerned. In the 1980s there has been a fairly steady real depreciation in Botswana, Kenya, Malawi, Zambia and Zimbabwe. In Cameroon, Côte d'Ivoire, Gambia and Senegal, the initial downward trend has been reversed. Finally, Ghana, Nigeria and Tanzania began the decade with appreciating currencies but in each country there has been a dramatic switch to depreciation (in 1983, 1984 and 1985 respectively). These changes might be generated by a structural change in one of the RER "fundamentals" (in accordance with Edwards, 1988, noted in chapter III); one should not infer misalignment without modelling the path of the equilibrium RER.

Table 5.4 presents simple correlation coefficients between the RER and agricultural imports and exports. In about half of the cases, the sign of the coefficient does not accord with *a priori* reasoning. Although this type of empirical investigation is rather naive, it does suggest that the results of simple regression analysis (as say, in the Kirkpatrick and Diakosavvas paper) are unlikely to be conclusive.

Returning to the Kirkpatrick and Diakosavvas study, their relatively inconclusive results may be due to the fact that their model suffers from a number of misspecifications. Firstly, as they recognise, several potentially relevant explanatory variables are omitted. In particular, there are no explicit price variables in the model and the influence on non-price factors on export performance is ignored. As Cleaver (1985, p.28) argues:

'The magnitude of the impact [of price and exchange rate reforms] may be exaggerated. Other factors such as inefficient Government involvement in farm input supply and marketing, population growth, the effort made by Government in operating and maintaining agricultural investments, resource endowment, the efficiency of agricultural research, extension, and credit services, politics, and other as yet unidentified factors are of much greater importance in determining agricultural growth..... It follows that it may be deceptive to predict large structural changes to occur from reform of price and exchange rate policy, especially in the short run.'

Table 5.4 : Estimated Correlations of Variables for Selected Countries (1975-1987)

COUNTRY	AG.IMPORT VS R.E.R.	AG.EXPORT VS R.E.R.
BOTSWANA	-0.4392	0.0083
CAMEROON	-0.3211	0.4435
COTE D'IVOIRE	0.2140	0.0777
GAMBIA	-0.6062	0.5220
GHANA	0.1309	-0.4881
KENYA	-0.1360	-0.1192
MALAWI	0.5746	-0.4130
NIGER	-0.3578	-0.0118
NIGERIA	0.5737	0.1052
SENEGAL	-0.6562	0.3674
SIERRA LEONE	0.1184	-0.1017
TANZANIA	0.3338	-0.3576
ZAMBIA	0.4978	-0.7888
ZIMBABWE	-0.4799	-0.6105

Source: Author's computation, using data from FAO, SOFA data base.

Omitting a relevant variable will lead to biased estimates of the parameters of the included variables. The extent and direction of bias depend upon the relationships of the omitted variable to the dependent variable of the equation and to the explanatory variables which are present. The bias will be zero only if the omitted variable is uncorrelated with the included variables.

Another potential source of specification error is the assumption that the real exchange rate is an exogenous variable. It might have been better to construct a more complete structural model, in which the real exchange rate was explicitly determined. In fact there have been very few attempts to analyze empirically the determinants of real exchange rate behaviour in LDCs and to incorporate the (endogenous) real exchange rate when modelling agricultural sector performance. This neglect is all the more surprising, given the importance accorded to the real exchange rate in recent policy discussions.

Although the external trade variables are too aggregated to be of direct interest in the present context, Hojman (1989) provides an example of a simultaneous model in which exports, imports, capital movements, GDP and the fundamental equilibrium exchange rate (FEER) are jointly determined. The FEER is that level of the exchange rate which generates a trade surplus or deficit equal to the underlying

flow of capital.

The macro model is a very simple one:

$$X = x_0 + x_1 \, RER + x_2 \, GDP + x_3 \, X_{t-1} \tag{5.38}$$

$$M = m_0 + m_1 \, RER + m_2 \, GDP + m_3 \, (X+K) + m_4 \, T + m_5 \, M_{t-1} \tag{5.39}$$

$$K = k_0 + k_1 \, RER + k_2 \, GDP + k_3 \, T + k_4 \, K_{t-1} \tag{5.40}$$

$$GDP = g_0 + g_1 \, RER + g_2 \, GDP_{t-1} \tag{5.41}$$

where X = exports; M = imports; K = net capital movements; GDP = real output; RER = real exchange rate; T = time trend. Under fundamental equilibrium (RER = FEER), the trade deficit (surplus) is matched by a positive (negative) net capital flow:

$$M - X = K \tag{5.42}$$

By substituting equations 5.38 to 5.41 into 5.42, an expression for FEER (in terms of T, GDP_{t-1}, X_{t-1}, K_{t-1} and M_{t-1}) can be derived.

Using data for Peru in the period 1960-86, Hojman estimates each of the four stochastic equations (5.23 to 5.26) using OLS and a maximum likelihood (ML) technique to correct for serial correlation. Exports and imports are found to be highly responsive to movements in RER. Real devaluations have a contractionary effect on GDP in the short and long term. Hojman uses the empirical results to run a number of simulations both with exogenous exchange rates and with exchange rates endogenously determined at the fundamental equilibrium level. Although one might question the simplistic structure of the macroeconomic model and the choice of econometric methodology, the study does indicate a potentially fruitful direction for further research.

An alternative suggestion would be to define explicit price equations for each component of the real exchange rate and incorporate these, along with the trade equations, into a model of the macro economy. For example, for a small country relying to a significant degree on an agricultural export, three commodity groups may be distinguished: the agricultural export, X, other tradables, T, and non-tradables,

N. The real exchange rate (RER) would be defined by the following set of price equations[51]:

$$\hat{P} = (1 - \delta)\,\hat{P}_N + \delta\,\hat{P}_T \tag{5.43}$$

$$\hat{P}_T = \hat{E} + \hat{P}_T^* \tag{5.44}$$

$$\hat{P}^X = \hat{E} + \hat{P}^{X*} \tag{5.45}$$

$$\hat{P}_N = \hat{P}_T + \lambda(\hat{M} - \hat{M}^d) + \rho\hat{Y} \tag{5.46}$$

$$\hat{E} = \lambda_0\hat{P} - \lambda_1\hat{P}^{X*} - \lambda_2\hat{Y} - \lambda_3\hat{P}_T^* + \lambda_4 Z \tag{5.47}$$

$$RER = E.P_T^*/P \tag{5.48}$$

where P = the domestic price level, P_T = the domestic price of tradables, P^X = the domestic price of the agricultural export, P_N = the domestic price of non-tradables, E = the nominal exchange rate (units of domestic currency per unit of foreign currency, M = the nominal money supply, M^d = the demand for money, Y = real income, and Z = other (exogenous) variables, such as commercial policy, influencing the exchange rate. In addition, the conventions of denoting a percentage change by the "hat" operator and of denoting a world price by an asterisk are followed.

Here, it is assumed that the nominal exchange rate is adjusted in response to changes in indicator variables (a crawling peg system). The rate of devaluation will depend on the rates of domestic and foreign inflation, the rate of growth in real income, the world price of the agricultural export, and other explanatory variables, such as trade policies. Domestic inflation is a weighted average of the domestic price of tradables

[51] This approach mirrors Edwards (1986), who modelled the Columbian economy and coffee exports in this way.

and non-tradables; the agricultural export price is omitted. The rate of change of the non-tradables price is determined by the rate of change in the tradables price, changes in real income and the excess flow of nominal money.

This set of equations could then be combined with equations defining real income and the monetary side of the economy and would permit an analysis of the interaction among agricultural export prices, inflation, money creation, and the real exchange rate.

5.4.3 General Equilibrium Approaches

Where the commodity or group of commodities being examined has significant linkages with other sectors in the economy, the partial equilibrium approach will be inadequate and possibly misleading. Instead, computable general equilibrium (CGE) models can be used when questions of structure are at issue. Apart from their suitability for analyzing wide-ranging policy change, their increasing popularity in the analysis of LDCs is because, unlike the empirical methodologies reviewed thus far, they do not require long, consistent time series data.

A class of CGE models which have been widely used in analyzing policy issues (and particularly structural adjustment) in LDCs adopts an essentially neoclassical philosophy but with limited elasticities of substitution in some important relationships. Following Robinson (1986), Table 5.5 depicts this "neoclassical structuralist model" of an open economy.[52]

For simplicity, only one sector and two factors of production (labour and capital) are represented. Production can either be sold domestically or exported; the non-linear transformation function between exports and domestically allocated goods is given by equation (2). Domestic goods are assumed to be imperfect substitutes for imports. Consumers are interested in the composite product, an aggregation of the imported and domestic goods (equation (3)). Given these two equations and the usual assumptions on optimisation behaviour, the desired import and export ratios are functions of relative domestic and foreign prices (equations (4) and (5)).

The "small country" assumption is retained in that world prices of exports and imports are taken to exogenous. The exchange rate serves as the equilibrating variable to ensure equilibrium in the balance of trade (also exogenous). The equilibrating mechanism works through changes in the ratio of the price of the domestic non-tradeable (D) to the prices of tradables (E and M), i.e. the real exchange rate. If the price of domestic sales (P^d) were chosen as the numeraire, then the nominal exchange rate (r) would also correspond to the real exchange rate.

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[52] See also de Melo (1988).

Table 5.5: A CGE Model of an Open Economy

Real Flows

(1)	$X(L^D, \bar{K})$	product supply
(2)	$X(E, D^s)$	export transformation
(3)	$Q^D(M, D^D)$	import aggregation
(4)	$\frac{M}{D} = f_1(P^m, P^d)$	import demand
(5)	$\frac{E}{D} = f_2(P^e, P^d)$	export supply
(6)	$C^D(P^q, \tilde{C})$	consumption demand
(7)	$Z^D(P^q, \tilde{Z})$	investment demand
(8)	$Q^D = C^D + Z^D$	total demand
(9)	$L^s(W, P^q)$	labour supply
(10)	$L^D(W, P^x)$	labour demand

Nominal Flows

(13)	$\tilde{Y}^L = W.L^s$	labour income
(14)	$\tilde{Y}^K = P^x.X - W.L^D$	capital income
(15)	$\tilde{C}(\tilde{Y}^L, \tilde{Y}^K)$	consumption
(16)	$\tilde{S} = \tilde{Y}^L + \tilde{Y}^K - \tilde{C}$	domestic saving
(17)	$\tilde{M} = \bar{P}^{sm}.M$	dollar imports
(18)	$\tilde{E} = \bar{P}^{se}.E$	dollar exports

Price Equations

(19)	$P^m = r.\bar{P}^{sm}$	import price
(20)	$P^e = r.\bar{P}^{se}$	export price
(21)	$P^q(P^m, P^d)$	composite price
(22)	$P^x(P^e, P^d)$	output price

System Constraints

(11)	$D^D - D^s = 0$	product market
(12)	$L^D - L^s = 0$	labour market

System Constraints

(23)	$\tilde{S} + r.\bar{B} - \tilde{Z} = 0$	savings-investment
(24)	$\tilde{M} - \tilde{E} = \bar{B}$	balance of trade
(25)	$f_3(P^d, P^m, P^e, W) = \bar{P}$	numeraire

Accounting Identities

(26) $P^x.X = P^e.E + P^d D^s$ Value of output = value of sales

(27) $P^q.Q^D = P^m.M + P^d.D^D$ Value of composite goods = absorption

(28) $P^q.C^D = \tilde{C}$ Consumption demand = expenditure

(29) $P^q.Z^D = \tilde{Z}$ Investment demand = expenditure

Table 5.5 Continued

Variables

X	=	aggregate output	$\tilde{M}$	=	dollar value of imports
D	=	output for domestic market	$\tilde{E}$	=	dollar value of exports
E	=	exports	$\bar{B}$	=	balance of trade (in dollars)
M	=	imports	P^m	=	domestic price of imports
Q	=	composite good	P^e	=	domestic price of exports
L	=	labour input	$\bar{P}^{sm}$	=	world price of imports
$\bar{K}$	=	capital input (exogenous)	$\bar{P}^{se}$	=	world price of exports
C	=	real consumption	P^x	=	price of aggregate output
Z	=	real investment	P^d	=	price of domestic sales
$\tilde{Y}$	=	nominal income	P^q	=	price of composite good
$\tilde{S}$	=	nominal domestic savings	W	=	wage of labour
$\tilde{C}$	=	nominal consumption	r	=	exchange rate
$\tilde{Z}$	=	nominal investment			

Notes:

Variables with a tilde denote nominal magnitudes. Variables with a bar are exogenous. The superscripts d, m, e, x and q refer to the domestic good, imports, exports, output, and the composite good, respectively (D, M, E, X, and Q). The superscripts D and S refer to demand and supply. The superscripts L and K refer to labour and capital.

Source: Robinson (1986).

By way of illustration, two examples of CGE modelling which give prominence to the agricultural sector are considered here: the detailed country-specific models of Sarris (1987) and the archetypal models of de Janvry and Sadoulet (1988).

In Sarris (1987), many of the features of the CGE model in Table 5.5 are found. With respect to the external trade variables, competing imports are assumed to be differentiated from the domestic product but there is a fairly high degree of substitutability. The product consumed domestically is then a composite good comprising domestically produced and imported elements. Following the Armington approach (described in section 5.4.2 above), the allocation to these two components is determined as the solution of a cost minimisation routine.

Exported goods are also considered as differentiated products, with less than infinite elasticities of demand in the world market. The exports function is governed by a constant elasticity with respect to the ratio of the price received by the domestic producer to the competing world price:

$$\bar{E}_i = E_i\left[\frac{P_i(1-s_i)}{rP_i^*}\right]^{-\eta_i}$$

where P^*_i denotes the world price, s_i is the rate of export subsidy, and η_i is elasticity of export demand. The nominal foreign exchange rate (r) is held constant.

Equilibrium in the static model is brought about when the excess demand for each of the domestically produced good is zero. The solution procedure entails minimising the following function of excess demands with respect to prices:

$$W = \sum_{i=1}^{n} ED_i^2$$

where ED_i denotes the excess demand of good i. Note that Sarris holds the nominal wage rate and the foreign exchange rate constant in the short run, i.e. in the equilibrium system for a single period. This, together with his preference for investment functions which are closer to a Keynesian than neoclassical specification, would put his model in the "structuralist" school.

The medium run is viewed as a sequence of short runs. The dynamic processes which enter the model are confined to capital accumulation, labour migration and wage adjustment. These variables are fixed for any given period but are assumed to adjust endogenously from period to period. Other variables in the model that are predetermined in a given period are assumed either to grow at fixed rates (as in the

case of transfers, government non-competitive imports, government expenditure) or are specified exogenously in each period (as with foreign prices and random production and export demand shocks).

The model is applied to four countries (India, Sri Lanka, Peru, and Côte d'Ivoire) and is used to simulate the impact of a number of policy reforms. The results illustrate the power of the model for counterfactual analysis and indicate potential pitfalls when structural adjustment programmes are implemented. Table 5.6 presents some results of 5 policy scenarios for the exports of the major cash crop (EXP2) and for the balance of payments deficit (BOPD). For each country, the balance of payments improves in response to the abolition of consumer food subsidies, a permanent devaluation, or an increase in export demand. On the other hand, the deficit worsens with trade liberalisation or the abolition of agricultural indirect taxes. Cash crop exports increase in response to the removal of food subsidies (due to improved competitiveness resulting from a fall in the domestic price) or devaluation, but fall when there is increased export demand in all sectors.

The reliability of the quantitative results rests on the accuracy of the parameter estimates, and the appropriateness of the model's structure. The former are in the main "best guesses" but when the model is submitted to sensitivity analysis, the results are quite robust. As is often the case with large models, the simulation results are governed more by model structure than particular parameter values.

de Janvry and Sadoulet (1988) construct a 3-sector, open economy, general equilibrium model in which agricultural imports are treated as perfect substitutes to domestic output. Having specified structural characteristics and parameter values for three archetype economies, they subsequently use the model as a simulation device to explore under what conditions technological change in cereals production in LDCs can increase their demand for food and feed grains imports.

Three sectors are distinguished: tradable agriculture (which imports), tradable industry (which exports), and a labour-intensive non-tradable sector. The agriculture sector is depicted as follows. The aggregate agricultural production function is specified with two inputs, labour and land. Land is in fixed supply but land productivity grows through time at an exogenously determined rate. The land productivity equation is one of two dynamic components in the model, the other referring to imported capital accumulation. In the agricultural labour market there is surplus labour, employment being determined by equating marginal productivity to a fixed real agricultural wage rate. In the consumption module, a linear expenditure system is specified for 6 social classes and for two agricultural products - the direct demand for food (grains) and the derived demand for feed.

Agricultural external trade is derived as:

net agricultural imports = (total domestic demand for grains) - (domestic production).

Table 5.6 : Outcome of Policy Changes on Selected Economic Variables: Direction of Percent Deviation from Reference Run Values

Experiment		India	Sri Lanka	Peru	Ivory Coast
Removal of Food Subsidies	EXP2[a]	+	+	+	
	BOPD	-[b]	-	-	
Removal of Agricultural Indirect Taxes	EXP2	+	-	+	-
	BOPD	+	+	+	+
Trade Liberalization	EXP2	-	+		+
	BOPD	+	+		+
Devaluation	EXP2	+	+	+	+
	BOPD	-	-	-	-
Increased Export Demand	EXP2	-	-	-	-
	BOPD	-	-	-	-

[a] EXP2 : export of major cash crops
BOPD : balance of payments deficit

[b] A + sign indicates a worsening (increase) in the balance of payments deficit; a - sign denotes an improvement.

Source: Derived from Sarris (1987).

In order to generate the required foreign exchange for these imports, it is assumed that a proportion of industrial output is exported. After import demand needs have been met in each period, any foreign exchange saved is used to import capital goods that increase the stock of capital in the industrial sector. Thus, the growth effects of technological change in agriculture, the authors' primary interest, is traced through foreign exchange savings and imported capital accumulation, as well as through income effects and increased demand for the non-tradable sector.

Computable general equilibrium models have the advantages of a solid economic foundation based on optimising behaviour of households and producers, and of internal consistency, often based on Social Accounting Matrices (SAMs) which allow the full implications on the various actors in the economy to be traced through.

Nevertheless CGE modelling should not be accepted unequivocally. This view is shared by Bell and Srinivasan (1984) who state "given the strong and often untestable assumptions required to set up a CGE model empirically, the resulting policy simulations it yields must be used with great care". The approach may also be deficient because model dynamics are poorly specified (resulting in poor tracking over the short (l-2 years) term), technological change may be inadequately handled and rigorous validation may be lacking. Furthermore, the CGE model is not well suited to the analysis of data which are highly disaggregated. For example, the model of de Janvry and Sadoulet (1988) comprises three sectors (tradable agriculture, tradable industry and a non-tradables sector) with the consumption of agricultural products being allocated between 'food' and 'feed'. Although adequate for their analysis, this level of aggregation is far removed from the needs of some policy analyses[53].

[53] c.f. the analysis on AT2000, reported in Alexandratos (l988), which tries to cover 2l agricultural products.

5.5 Concluding Remarks

Despite the attention given to empirical analysis of agricultural trade, there is little quantitative information which could confidently be used in the formulation of agricultural trade strategy. The results from most empirical work are not country-specific, exclude non-traditional commodities, and lack robustness.

The analysis of comparative advantage, in particular, is flawed, since the standard measures (revealed comparative advantage and domestic resource cost) are distorted by actual trade flows and do not identify the true social costs of resource use.

In assessing other empirical work, it should be borne in mind that proper econometric procedure is severely hampered when international trade data and data on LDCs are used. Data inadequacies have compelled the adoption of partial equilibrium, single equation trade models, containing few explanatory variables. Model misspecification, together with measurement errors, will result in unreliable and biased parameter estimates.

Even disregarding the econometric problems, the emphasis on simple partial equilibrium trade models is regrettable. The researcher is rarely content with the estimation and interpretation of price and income effects but rather wishes to draw broader policy conclusions regarding resource allocation and economic development. Strictly such inferences can only be valid when drawn from models of a more general equilibrium character.

As interest in agricultural trade issues continues to grow, we may look forward to the construction of trade models with better linkages to the rest of the agricultural sector and to the macro economy, and which are subsequently estimated with due regard to econometric rigour.

IV CONCLUDING OBSERVATIONS

The growing significance of trade for developing countries, the outward orientation of many structural adjustment policy reforms, the upsurge in protectionism and the recent multilateral negotiations on trade liberalization all have served to bring trade issues to the fore in the analysis of agricultural policy.

Much of the argument about the role of trade focuses on economic principles. The theory of comparative advantage, which dates back to the writings of Ricardo in the early nineteenth century, has, however, proved to be remarkably robust. It has great intuitive appeal, since it is a matter of elementary logic that exchange should take place where marginal valuations differ between residents of different countries. The growing interest in international trade theory has manifested itself in research in a number of new directions, with recent advances in the areas of imperfect competition, increasing returns and intra-industry trade. But even Krugman, one of the innovators in this field, admits that "new thinking about trade does not yet provide simple guidelines for policy" (Krugman, 1986, p.18). Thus far in the debate, the free traders emerge battered but unbowed. It is asserted that when both theoretical arguments and empirical evidence are considered, the case for trade intervention is weak, even where there are market imperfections.

Even when markets fail and there is a *prima facie* case for government intervention, there need not be recourse to the instruments of trade policy. There are sound reasons (Chapter III) that the causes of market failure should be tackled directly. This means that a production tax or subsidy should be implemented where there is a production distortion; a consumer tax or subsidy where there is a consumption distortion, etc. Domestic taxes and subsidies are superior to tariffs and quotas, since they minimise the side-effects of intervention. Two exceptions to this rule should however be noted. Firstly, an import tariff can be used to exploit international market power, although this must be considered a remote prospect for most LDCs and in any case may invite retaliation. Secondly, it should be recognised that tariffs are an important and enduring source of government revenue for many LDCs.

The specific disadvantages of trade policies include

(i) they are often administratively complex and so encourage evasion, corruption and fraud,

(ii) where they are selective, they offer only narrow incentives to the few (c.f. exchange rate policy),

(iii) even when they are introduced as temporary measures (e.g. to protect an infant industry or to cushion an exogenous shock), they become permanent.

In the long run the resource costs of trade intervention can be high, particularly when commercial policies are mismanaged. This is true for both tariffs and quotas, although some of the latter's costs are hidden.

Broad trade strategies, usually classified as inward-looking (or import substitution) and outward-looking (or, rather inaptly, export promotion), were considered in Chapter IV. Following Helleiner's advice, "one must resist succumbing to the oversimplifications and generalisations that have too frequently plagued the debates in the sphere of trade strategy" (Helleiner, 1990, p.880). Pragmatism and eclecticism will tend to rule over any doctrinaire approach. Policymakers will try to identify those elements of trade analysis will

seem to suit their needs and are within their capacity to implement effectively.

But to the extent that countries have pursued a consistent import-substitution (IS) approach, experience demonstrates the folly of excessive protection and of divorcing production decisions from market conditions. Nevertheless, it is tempting to argue, as several commentators do, that if some promising import-substituting enterprises appear, they should be encouraged with moderate, and temporary tariff protection. The counter argument is that governments do not have a good track record of picking IS 'winners' and in any case, as already noted a tariff is not a 'first-best' option; a production subsidy, for example, would be preferred. Where tariffs are entrenched as a principal source of government revenue, an appropriate response would be to institute a modest and uniform system of tariffs, covering all imports including capital goods.

What must be accepted is that there are large areas of our ignorance, not only of the determinants of policies actually followed, or more generally the political economy of policy change, but of basic information required for informed judgement. Most empirical studies of agricultural trade, severely hampered by data inadequacies, fail to provide the quantitative basis on which selective policy intervention can be undertaken.

The outward-looking, export promotion strategy also has its limitations when applied to the agricultural sector. The 'export-pessimism' expressed by some authors can be overstated but undoubtedly the prospects are poor for several traditional export products (e.g. coffee and cocoa) for which the price elasticity of demand is low and of which the LDCs are the main or sole suppliers. In such cases, successful export promotion must be associated with export diversification.

However, a major diversification programme may be infeasible in the short run for many countries in sub-Saharan Africa. Having failed to diversify their agricultural sectors in the past, they remain dependent on one or two primary commodities, and are thus especially vulnerable to the vagaries of the world market. For these countries, food security in the short term may be attained more readily by raising the degree of self-sufficiency in food production. This does not imply that export crops should be discouraged: resources best suited to export crop production should be allocated to that use. It does suggest that while alternatives to tree crops (e.g. fruits and vegetables) are being explored, the import-substituting role of domestic food production should be enhanced.

In contrast, many countries in S.E. Asia and Latin America are in a position to enjoy a more outward-orientation. In S.E. Asia adjustment in the agricultural sector has been assisted by rapid industrialisation and urbanisation in some countries (Japan, S. Korea, Taiwan) but in others (Indonesia, Malaysia, the Philippines, Thailand) agriculture must remain a major contributor to economic growth in the short run. But rice production can no longer be considered the mainstay of expansion of the sector; diversification of agricultural production is underway and again should be encouraged to continue. In Latin America, the potential for expansion of traditional exports is probably greater, although in practice protectionism in the developed countries' markets is a major handicap. Here also there are opportunities

for diversification (e.g. horticultural and fishery products, processed agricultural products). In addition, for both regions there is scope to develop new markets, through access to Eastern Europe and possibly China, and to expand intra-regional trade.

Although the importance of agricultural diversification for LDCs is clear, very little research on the subject has been undertaken. It raises a number of interesting questions. For example, what analytical tools can be used to identify fruitful forms of diversification? The standard indicators of revealed comparative advantage and domestic resource cost are of little use in this context. What is an appropriate role of government? A somewhat cursory response suggested here is that rather than trying to identify 'niche' products which might meet future consumer needs, the government should be laying the foundation for an agricultural sector which is flexible and responsive to changing market stimuli.

APPENDIX MODELS OF EXCHANGE RATE DETERMINATION

When considering a country's position in the world economy, attention focuses on the balance of payments and the market for foreign exchange. Here, to give some indication of theoretical aspects of the subject, sketches of three models of the open economy are presented. These are an extended version of the (Keynesian) Mundell-Fleming approach, termed the Dornbusch model; the monetarist model; and an extension of the latter, the portfolio balance model[54].

The Dornbusch Model

In the Dornbusch model[55], it is assumed that capital is perfectly mobile across countries, and asset markets adjust immediately to any change in demand or supply ("flex price"), with participants in these markets forming expectations rationally. Specifically, "news" (unanticipated events) will cause the exchange rate to adjust instantaneously to the level where expected capital gains or losses offset the nominal interest rate differential between the home country and the rest of the world. On the other hand, in goods markets there is a sluggish response to excess demand and supply ("fix price"). Given the different degrees of responsiveness in the two markets, purchasing power parity[56] (PPP) holds, at best, only in the long run.

The key elements of the model, taking output as given, are as follows:

$$m - p = hi \tag{A.1}$$

$$i = i^* + \dot{e} \tag{A.2}$$

$$\dot{p} = A[a(e - p) + g + b(i - \dot{p}) \tag{A.3}$$

where m, p, e denote the log of the nominal money supply, the log of the nominal price level, and the log of the nominal exchange rate respectively; i represents the nominal interest rate and g is a variable depicting fiscal policy. The overdot convention indicates a change in the log of the variable over time, while

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[54] This brief survey is based on Heffernan and Sinclair (1990), Frankel and Mussa (1985) and Levich (1985), which provide much more detailed accounts.

[55] See Dornbusch (1987).

[56] That is, when converted at current exchange rates, the price of a homogeneous good is equal across countries.

an asterisk indicates the "foreign" or "rest of world" equivalent of the variable.

Equation A.1 represents equilibrium in the money market (the LM schedule). Equation A.2 specifies that with an adjustment for anticipated depreciation, assets are perfect substitutes (there are no risk premia). Equation A.3 states that price adjustment is linked to excess demand in the goods market, which in turn depends on the real exchange rate (e - p), fiscal policy and the real interest rate.

The model has the "overshooting" property which featured in earlier work by Dornbusch. A one-time increase in the money supply will lead to an immediate depreciation of the exchange rate. The exchange rate overshoots its long run equilibrium level, which is proportional to the increase in money. Following this initial overshooting, the exchange rate appreciates, as prices rise, and this process continues until the initial real equilibrium is re-established.

Fiscal policy also appears an important determinant of the exchange rate. A fiscal expansion initially brings about a currency appreciation but also cumulative current account imbalances. Fiscal expansion creates an excess demand for goods, leading to higher prices, and hence, with a fixed nominal money stock, upward pressure on the domestic interest rate. As capital is attracted in, the country's external indebtedness is increased, with implications for the current account because of debt service charges. To restore current account balance, the currency will have to depreciate but by more than would be necessary to return to the equilibrium real exchange rate which existed prior to the fiscal expansion. Thus, whilst the initial impact is overvaluation, over the longer term the value of the currency must depreciate below its original equilibrium level.

The Monetarist Model

An essential feature of any monetary model is the assumption of money market equilibrium:

$$p = m - l \qquad \text{(A.4)}$$

$$p^* = m^* - l^* \qquad \text{(A.5)}$$

where m and p are defined as above; l denotes the log of the real money demand.

In addition, the purchasing power parity condition is assumed to hold:

$$p = e + p^* \quad \text{i.e.} \quad e = p - p^*$$

or

$$\dot{e} = \dot{p} - \dot{p}^*$$

Combining these equilibrium conditions yields an expression for the exchange rate in terms of supplies of domestic and foreign monies and demands to hold these monies:

$$e = (m - m^*) + (l^* - l) = p - p^* \qquad \text{(A.6)}$$

The exchange rate rises (i.e. the home currency depreciates) in response to a) increases in the supply of domestic relative to foreign money or b) increases of the demand for foreign relative to domestic money.

The assumption with regard to purchasing power parity can be relaxed somewhat by allowing the price level in each country to be a weighted average of the prices of tradeable and non-tradeable goods. Purchasing power parity can then be assumed to hold only for tradeables:

$$p_T = e + p_T^* \qquad \text{(A.7)}$$

where p_T denotes the log of the price of tradeables. Defining σ as the weight of the non-tradeable good in the price index,
and combining A.7 with A.1 and A.2:

$$e = (m - m^*) + (l^* - l) + [\sigma(p_T - p_N) - \sigma^*(p_T^* - p_N^*)] \qquad \text{(A.8)}$$

Thus the third important determinant of the exchange rate is the relative price structures in the domestic and foreign economies. Specifically, an increase in the domestic relative price of tradeable goods (i.e. a loss of competitiveness) raises the exchange rate (depreciates the domestic currency).

To add more substance, the determinants of the real money demand should be incorporated. The real money demand, in a simple version of the model, is determined as follows:

$$l = k + ny - ai \qquad \text{(A.9)}$$

$$l^* = k^* + ny^* - ai^* \qquad \text{(A.10)}$$

where y is the log of national income and the parameters n and a are (positive) elasticities with respect

to income and the interest rate respectively. For simplicity of exposition, these parameters are assumed to be the same at home and abroad. Incorporating these equations in A.6:

$$e = (m - m^*) + (k - k^*) + n(y^* - y) + a(i - i^*) \tag{A.11}$$

Alternatively, making use of A.8:

$$e = (k^* - k) + (m - m^*) + n(y^* - y) + a(i - i^*) + \sigma[(p_T - p_N) - (p_T^* - p_N^*)] \tag{A.12}$$

where again for convenience the parameter σ is taken to be the same in both the home and foreign countries.

Ceteris paribus, the home currency appreciates (e falls) if the domestic level of income rises relative to the foreign level of income, and it depreciates (e rises) if the domestic nominal interest rate increases relative to its foreign counterpart.

A further refinement is the inclusion of the interest parity condition,

$$i - i^* = d \tag{A.13}$$

where d denotes the forward premium on foreign exchange (i.e. the difference between the (log) forward and (log) spot exchange rates). Inserting this expression into A.11:

$$e = (m - m^*) + (k^* - k) + n(y^* - y) + ad \tag{A.14}$$

This yields the prediction that a rise in the forward premium (d) leads to a depreciation of the home currency (an increase in e). Thus, an expected future depreciation (as given by d) is immediately reflected in the current exchange rate.

In sum, the relevant factors in the determination of the exchange rate are

i) those under the control of the monetary authorities,

ii) those which affect the demands for domestic and foreign monies, and

iii) those which affect the relative price structures. A critical assumption is perfect price flexibility. It has also been assumed implicitly in this account that there are no barriers to trade. However, price differentials due to commercial policy can easily be incorporated. For example, where the home country has a tariff on imports, it may be posited, that:

$$p_T = t + e + p_T^* \tag{A.15}$$

where t denotes the log of one plus the proportionate tariff rate. It can then be shown that the imposition

of a tariff results in an appreciation of the currency[57].

The Portfolio Balance Model

The portfolio balance model extends the monetarist model by introducing foreign money and foreign bonds as substitutes for bonds and money of the home country, but they are not perfect substitutes in the short run. As a result, exchange rates are determined not only by the relative demand and supply of money but also by the relative demand and supply of other assets.

The main differences from the preceding model are a) the focus is on short run effects on exchange rates of changes in the supply of financial assets (whereas the monetarist model concentrates on long run steady state results), b) agents may hold international portfolios of assets denominated in different currencies, thus making the demand for money functions more complex and introducing another determinant of the exchange rate (the presence of imperfect substitution between assets), and c) there is a wealth effect, as changes in the exchange rate affect the wealth of holders of assets denominated in foreign currency.

In a simple version of the model, the asset market equilibrium conditions are given as follows:

$$M = m(i,i^*)W \tag{A.16}$$

$$B = b(i,i^*)W \tag{A.17}$$

$$EF = f(i,i^*)W \tag{A.18}$$

$$W = B + M + EF \tag{A.19}$$

where domestic wealth (W) may be held in a combination of three assets: domestic money (M), domestic bonds (B), which are not internationally traded, and foreign bonds (F), which earn a fixed interest rate i^*. The exchange rate is denoted by E. Foreign bonds cannot be traded for M or B; they can only be accumulated through a current account surplus.

The model provides a link between real factors which affect the current account, the current account itself (i.e. flow changes in F), and the exchange rate. The latter will also be affected by shifts in the distribution of financial wealth across currencies. Furthermore, with suitable modifications to the basic

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[57] If, however, tariffs result in distortions which lower real income, it is possible for a depreciation of the currency to occur. See Frankel and Mussa (1985), p720.

model, the impact of risk and individual portfolio behaviour on exchange rates can be analysed.

The portfolio balance model reduces to the monetary model in the long run if money is neutral and all non-money assets are perfect substitutes for each other.

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