Trade and Industrial Policy in Developing Countries

David Greenaway and Chris Milner

TRADE AND INDUSTRIAL POLICY IN DEVELOPING COUNTRIES

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TRADE AND INDUSTRIAL POLICY IN DEVELOPING COUNTRIES

A Manual of Policy Analysis

David Greenaway

and

Chris Milner



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To Susan and Ruth

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Preface

Trade policies and the formulation of trade strategy in developing countries has been a focus of attention for trade and development economists for several decades. The 1980s witnessed intensified interest in the relationship between trade policy and trade performance, and between trade performance and overall economic performance. There are a number of reasons for this. In academic and policy circles there has been a reevaluation of the relative merits of intervention-led and market-led development strategies. This has resulted from both a paradigm shift and the contrast between the experiences of some developing countries which adopted the most dirigiste and inward-oriented development strategies in the 1950s and 1960s and those of a number of NICs which apparently followed more outward-oriented policies. At the operational level there were no doubt some internal pressures on policy makers in developing countries as a result of dissatisfaction with what existing policies had delivered. But external influences have probably played a greater role. There has been a strong demonstration effect; the success of the export-oriented, newly industrialising countries, in particular of the Asian NICs, has received envious attention from politicians and the administrations in many less successful countries. There has also been a considerable amount of external pressure from multilateral agencies to undertake policy reform. The provision of significant amounts of financial resources, both short- and long-term, has become subject to policy conditions. In particular trade policy reform has invariably been a key component of the World Bank's structural adjustment programmes in developing countries.

Technical support in the form of funding for commissioned studies of current and possible future policies and their effects has frequently been a feature of structural adjustment lending (SAL). Indeed both of the present authors have been involved in the fieldwork for and production of reports on trade policy reform in countries involved with World Bank SAL negotiations – in Cote d'Ivoire, Madagascar, Tanzania, Burundi, Barbados and Trinidad for example. The governments of such countries seek independent advice on the costs and benefits of existing and other possible policies, and studies offer some opportunity for some 'technology transfer' about

the available tools for analysing trade and industrial policies. But one-off studies prepared during periods of negotiation with an external agency, such as the World Bank, are likely to be of restricted value in providing a permanent basis for the on-going evaluation of policy and the monitoring of the implementation and impact of reforms. Herein lies one of the primary aims of this book, namely to provide a manual that will be of value to policy makers and economists in developing countries when designing and monitoring trade and industrial policy reform. It seeks to explain how concepts and tools of analysis can be used to examine specific policy issues – for instance how the concept of effective protection might be used to comment on anti-export bias, or how computable general equilibrium models might be used to examine the impact of trade policy reform on the distribution of economic activity across sectors. It also aims to investigate the implementation of specific tools of analysis – to explain for example what information from official sources or surveys is required to measure the structure of incentives or protection, to identify the problems of measurement where data quality is likely to be constrained or to show how specific models can be tested for their sensitivity to particular assumptions or parameter values. By understanding the purpose and limitations of trade policy analysis, the aim is to provide the policy analyst with the tools for investigating the effects of both partial or piecemeal reform and general or wholesale reform. The latter issue of the optimal timing and sequencing of large-scale trade and related-policy reform is clearly complex, and something that will be a central focus of policy debate in developing countries for many years to come.

Of course these issues are of considerable interest to any 'student' of trade and development, as well as to policy makers in developing countries. The last decade has seen substantial growth in our knowledge of the nature and effects of trade policies in developing countries – the SAL programmes and the World Bank have been prime movers in raising the quality of applied trade and trade policy analysis in developing countries. Much of this work, however, is either difficult to access or is available only from diverse sources. It is hoped therefore that this book will also provide a useful source of summary information on this recent empirical work.

As explained above, a considerable amount of the background research for this book was conducted 'at the coal face', undertaking trade policy studies in a number of developing countries in Africa, the Indian Ocean and the Caribbean. Operational experience gained while acting as economic advisers to Maxwell Stamp plc (London), the World Bank, UNIDO and UNCTAD provided an excellent opportunity to gain experience in applying the principles of trade policy analysis. We are grateful for this experience. In addition both authors have, jointly and independently, worked on a number of analytical problems in the field of trade policy and development. As well as the analytical work and operational experience, the preparation of this book was enriched by a

period at the World Bank headquarters in Washington. That stay was financed by the Wincott Foundation and Maxwell Stamp plc. We are very grateful to both for making the visit possible.

The World Bank has been the leading force in the move to reduce trade policy distortions in developing countries. It has considerable operational experience and knowledge of local conditions in each of its country departments, and has attracted very able economists, including major trade economists from the academic community, to structure and develop its own research programmes. Our study visit to the World Bank during Easter 1988 provided us therefore with an invaluable opportunity to access its documentary resources, to gather case study material and to have discussions with World Bank officials who specialise in trade, and country specialists. In particular, we would like to thank the Research Administrative Department and the Economic Development Institute for the accommodation and facilities they provided; special thanks for their support and friendly interest in our work goes to Dennis de Tray and Richard Snape.

Finally our thanks also go to some other individuals. The typescript was expertly prepared by Su Spencer at Loughborough and Sue Berry and Sharon Tippier at Nottingham. Stephen Rutt at Macmillan displayed considerable support and patience during the project's long gestation. Finally, we would like to thank both of our families for their support and for the admirable way in which they coped while we were away gaining experience 'at the coal face' – not that fieldwork in some interesting 'southern' location is necessarily arduous!

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CHAPTER 1

Introduction and Overview

1.1 Background and aims

In general developing countries are small open economies. In the absence of intervention the traded goods sector invariably accounts for a large share of total output or final expenditure. The exact composition of output would in turn be determined by factor endowments, technology and tastes and preferences. Economic theory tells us that the allocation of resources across sectors, and the efficiency with which resources are utilised in a given sector, can be influenced by intervention. Governments have at their disposal a range of instruments which can be, and in general are, used in an endeavour to direct resource utilisation in a particular way. These instruments are collectively referred to as trade policy, or more generally trade and industrial policy. The former applies to border measures, the latter non-border measures, although drawing the line between the two is becoming increasingly difficult.

The instruments of trade policy have been extensively deployed in many developing countries. This is partly because of a genuine belief held by many that industrialisation can be effectively promoted through a policy of import substitution, partly because trade policy instruments have substituted for other forms of intervention (for example tariffs for fiscal purposes), and partly because GATT provisions have condoned intervention on a scale which would not have been possible in industrialised countries (particularly through Article XVIII).

Much has been written on trade policy and economic development on, *inter alia*, the relative efficiency of alternative instruments of intervention, the role of import substitution and export promotion, the links between trade strategy and economic performance and so on. In the process the trade policies and trade strategies of many developing countries have come in for close scrutiny, and an impressive literature is now available to the serious student of trade policy and economic development. There are

however two potential entry barriers: first the scale of that literature is now quite intimidating; second the menu of techniques available to the applied economists is such that the necessary background to penetrate a particular study may sometimes be lacking.

This book is designed to lower these entry barriers. We sub-title it 'A Manual of Policy Appraisal' to signal that it is techniques oriented. Anyone interested in, or working on, applied trade policy should be able to familiarise him or herself with the full range of tools available to the analyst. It is not a 'cookbook', however. As well as introducing the techniques we aim to demonstrate how they have been used in the context of policy appraisal and, where appropriate, survey the relevant literature. Thus it is not a book about the theory of trade policy and economic development. Both of these feature, but the core is directed at the way in which we evaluate the impact of trade policy.

1.2 Outline of the manual

We have organised the material in five parts. Part I sets the context. In Chapter 2 we review the instruments of trade (and industrial) policy to highlight the range of fiscal and quantitative instruments which are available to policy makers, and to remind ourselves of the principles which economists use when assessing the relative efficiency of different instruments of intervention. Chapter 3 broadens the focus somewhat. It looks at trade strategy and economic development. We show how structuralist ideas were important to making the case for import substituting industrialisation in the 1950s and 1960s, with its emphasis on infant industry protection, direct controls and planning. In the later 1970s and 1980s 'getting prices right' emerged as a major theme and was associated with widespread trade liberalisation.

Part II concentrates on partial equilibrium techniques for policy appraisal. Chapter 4 is concerned with the measurement of nominal protection – nominal tariffs and the tariff equivalents of quantitative restrictions in particular. Measures of both are widely used by analysts. The theory of effective protection pointed up sharply the deficiencies associated with relying solely on measures of nominal protection. Chapter 5 systematically develops the effective protection measure, paying particular attention to practical difficulties in computation. In turn, a limitation of effective protection is that it only takes account of the impact of distortions in tradables. In contrast the domestic resource cost (DRC) ratio also takes account of non-border distortions, and this is dealt with in Chapter 6. Here again we develop the measure from its theoretical foundations, but focus particularly on practical aspects of its usage. In all the chapters in Part II we motivate the discussion of measures and measurement problems with frequent reference to empirical evidence – both cross-section and case study.

Part III switches the focus to general equilibrium approaches. The technique addressed in Chapter 7 is incidence analysis. Recent research suggests that this is a useful methodology for gaining insights into the way in which intervention in one sector impacts upon others. The theory is outlined, and recent empirical evidence is reviewed. Another technique of fairly recent origin is computable general equilibrium (CGE) modelling. Modern computer hardware and software has facilitated the translation of Walrasian ideas into an empirical setting. The technique is not without its critics, but nevertheless has become widely used. Because of its importance, and its proliferation, we devote two chapters to it (Chapters 8 and 9). In the first we outline the principles upon which CGE models are constructed; in the second we look at their implementation.

Trade policy intervention may be motivated by a desire to promote exports rather than protect imports. Some analysts believe it is possible to identify activities of potential comparative advantage, and a number of measures of revealed comparative advantage are used. This is the subject of Part IV. Again there are two chapters devoted to measurement issues and empirical applications.

One of the reasons why so much attention has been paid to trade policy, and trade policy reform, in developing countries is because it has figured so prominently in the conditional lending programmes of the major multilateral lending agencies, especially the World Bank. For this reason we devote Part V to structural adjustment lending and policy appraisal. Chapter 13 is concerned with the motivation behind SALs and their implementation. It pays particular attention to the role of policy appraisal in the whole process. Chapter 14 then looks at issues of timing, sequencing and adjustment, again with a view to assessing how our techniques of policy appraisal can be used to gain insight into these issues.

The book is intended for advanced undergraduate and postgraduate students of international trade, as well as 'practitioners', that is those involved in policy appraisal. As such it can be used as a work of reference as well as an advanced text. Many of the chapters and parts are designed to stand alone, although throughout we have tried to emphasise the interconnections between techniques, and between theory and practise. We hope that both students and analysts find it useful.

PART I

TRADE AND DEVELOPMENT

CHAPTER 2

Instruments of Trade and Industrial Policy

2.1 Introduction

Like Chapter 3, this is a scene setting chapter. In Chapter 3 we provide an overview of the links between trade policy and economic development, paying particular attention to the influences that have shaped particular strategies. In this chapter we review in a functional manner the economic effects of a range of instruments of trade and industrial policy. It should be emphasised at the outset that the aim is not to provide a 'ready reckoner' of analyses of different instruments. In the context of the present volume that would be both over-ambitious and in fact unnecessary. There are many texts devoted entirely to the microeconomics of commercial policy. As we emphasised in the introduction, this is a book devoted to applied aspects of commercial policy analysis and a basic familiarity with the microeconomics of alternative forms of intervention will therefore be assumed. Our intention in this chapter is simply to offer a brief refresher on the material by way of background.

Commercial policy can be directed at protecting firms in import substitute activities or in export oriented activities. As we shall see later, governments often believe, quite erroneously, that they can pursue both simultaneously. The distinction between the two is a useful one analytically and forms the framework for organising the material which follows. Section 2.2 examines the economic effects of a range of instruments of import substitution, whilst Section 2.3 does the same for instruments of export promotion. Section 2.4 discusses how instruments are often bundled together into policy packages in support of chosen strategies. In this section we will emphasise the key feature of protection as a relative concept. Finally Section 2.5 closes the chapter with some concluding comments.

2.2 Economic effects of instruments of import substitution

Table 2.1 provides a list of instruments of import substitution currently in use, to a greater or lesser degree, in many developing countries. The list is fairly exhaustive. It divides interventions into tariff and non-tariff barriers. The former probably remain the most pervasive form of import protection, although non-tariff barriers of various forms are common, especially in countries following inward oriented policies.

Tariff measures

PREVALENCE

Import tariffs are simply indirect taxes which apply, on a discriminatory basis, to imports. They may be ad valorem or specific. The former have the

Table 2.1 Instruments of import protection

Barriers	*Instruments*
Tariff	Ad valorem import tariff
	Specific import tariff
	Seasonal tariff
	Tariff quota
Non-tariff	Special levies
	Variable levies
	Border tax adjustments
	Anti-dumping duties
	Countervailing duties
	Prohibitions
	Global quotas
	Bilateral quotas
	Seasonal quotas
	Non-automatic licensing
	Import authorisations
	Voluntary export restraints
	Import surveillance
	Advance payment requirements
	Regulations on terms of payments
	Minimum pricing
	Price surveillance
	Sole importing agency
	Special entry procedures
	Additional customs formalities
	Customs valuation procedures
	Standards and regulations
	Local content requirements

Source: Based on Laird and Yeats (1990) Appendix 4.

advantage of being index linked, whilst the latter have the desirable feature of reducing opportunities for underinvoicing and other illegal practices designed to minimise tax liability. Sometimes particular tariffs can be used as quasi non-tariff barriers, for example when they apply on a seasonal basis or when they are linked into a quota.

Table 2.2 gives an indication of the prevalence of tariffs in developing countries. For purposes of comparison some information is also included on developed countries. Several points are notable. First the range of tariffs is relatively wide: in Singapore average nominal tariffs were only 1.3 per cent whilst in Bangladesh they are 68.8 per cent. Second the unweighted average for the developed countries in the table is 6.3 per cent whilst that for developing countries is 28.2 per cent. Admittedly these are non-random samples. Nevertheless the point holds. Nominal tariffs are in general higher in developing countries than in developed countries. Tariff rates in the former group have declined dramatically over the post-war period as a consequence of seven rounds of GATT multilateral trade negotiations. These have not impacted on developing countries, which have not been obliged to reciprocate tariff cuts. Moreover the GATT Charter waives the reciprocity obligation under Article 18 and Part IV permits developing countries greater freedom in the use of tariffs than applies to developed countries. The other point about Table 2.2 that should be noted is that these data apply to *nominal* tariffs. As we shall see in Chapter 5, in general average *effective* tariffs tend to be higher. In Chapter 4 we shall explore further issues in the measurement of nominal protection. Enough has been said thus far to make the central point that tariff protection is pervasive in developing countries.

ARGUMENTS FOR TARIFFS

As we explained in the introduction, this is a book devoted to techniques of policy appraisal. As such it is not our intention to probe deeply into normative issues. Moreover these are issues which have been investigated exhaustively elsewhere (for example Corden 1974). Nevertheless for purposes of reference it is important to review briefly the principal arguments advanced for import tariffs, or protection in general.

In a classic article Johnson (1965) distinguished between *economic*, *non-economic* and *non-arguments* for protection. The last of these can be dispensed with fairly easily. It applies to cases where an obviously fallacious case is put forward. The so-called 'cheap labour argument' is a good case in point. Here protection is sometimes requested on the grounds that overseas producers benefit from cheap labour and that confers an unfair advantage. As anyone familiar with the Heckscher–Ohlin model is aware, cheapness is relative and is driven by relative factor endowments.

Non-economic arguments revolve around socio-political objectives. For

Table 2.2 Trade weighted average MFN and applied tariffs in selected developed and developing countries

Country/ Country Group[1]	Trade Weighted Tariff Average					
	Developing Country trade weights:		Developed Country trade weights:		World trade weights:	
	MFN	Applied	MFN	Applied	MFN	Applied
Developed Countries:						
Australia	8.3	4.8	14.0	9.4	12.4	8.2
Austria	5.5	5.6	10.5	1.5	9.9	2.0
Canada	6.1	4.6	6.6	4.5	6.5	4.5
European Community[2]	3.2	2.1	4.8	2.8	4.2	2.5
Finland	6.7	4.6	4.7	0.7	4.8	1.0
Japan	3.0	2.4	4.2	4.0	3.5	3.0
New Zealand	5.2	3.3	16.0	13.0	13.6	10.9
Norway	3.2	2.8	4.9	0.8	4.8	1.0
Sweden	3.1	2.5	3.6	0.7	3.5	0.8
Switzerland	2.7	2.5	3.0	0.9	3.0	1.0
United States	4.9	4.5	3.4	3.4	3.9	3.8
Developing Countries:						
Algeria (1982)	11.0	–	11.9	11.9	11.7	–
Bangladesh (1983)	69.3	–	68.3	68.3	68.8	–
CARICOM (1979)	7.7	–	18.7	18.7	17.0	–
CEUCA (1977)	12.5	–	18.3	18.3	17.2	–
Egypt (1981)	35.5	–	22.8	22.8	24.2	–
India (1984)	26.9	–	60.2	60.2	44.8	–
Indonesia (1980)	20.2	–	24.7	24.7	23.0	–
Cote d'Ivoire (1980)	37.3	–	33.6	33.6	34.9	–
Kenya (1982)	37.5	–	31.8	31.8	34.0	–
Korea, Rep. of	6.9	–	16.2	16.2	13.0	–
Malaysia (1981)	6.6	–	14.3	14.3	11.6	–
Mexico (1984)	19.3	–	20.2	20.2	20.0	–
Morocco (1982)	33.2	–	36.7	36.7	35.7	–
Nigeria (1982)	29.3	–	22.1	22.1	23.1	–
Pakistan (1982)	30.3	–	54.7	54.7	43.4	–
Philippines (1985)	17.5	–	21.5	21.5	19.9	–
Saudi Arabia (1980)	5.5	–	11.9	11.9	10.9	–
Singapore (1983)	0.4	–	2.1	2.1	1.3	–
Sri Lanka (1983)	19.7	–	23.8	23.8	21.8	–
Tanzania, United Rep. (1981)	12.5	–	15.9	15.9	15.1	–
Thailand (1981)	6.1	–	20.5	20.5	14.5	–
Tunisia	14.5	–	18.9	18.9	18.5	–
Yugoslavia (1980)	4.5	–	12.1	12.1	10.0	–

Source: Laird and Yeats (1990).

Notes:
1. The dates shown in parentheses show the year for which the tariff data were drawn. Since the UNCTAD data base did not contain information on developing country preferential arrangements applied tariff averages could not be computed.
2. The trade weighted rates are based on the external trade of the EEC.

example a government may wish to exclude imports on health or safety grounds, or may wish to support a particular sector to preserve a particular 'way of life'. These are not arguments which the economist is well equipped to handle, involving as they do judgements about the desirability of given non-economic objectives. The economist may nonetheless have a role to play in commenting upon the instruments used to realise chosen objectives. Invariably there will be more than one instrument available. In principle the choice of instrument should rest upon efficiency considerations.

Economic arguments are of greatest interest to the economic analyst. These rest upon the notion that distortions are present in a particular market and intervention can successfully correct the distortion(s) in question. Table 2.3 illustrates the point. Distortions can exist in product or factor markets. When present they prevent the market from gravitating automatically to an optimum. Thus market power results in price exceeding marginal cost, negative externalities result in social costs exceeding private costs and so on. Resource misallocation is the inevitable outcome. In general there will be some instrument of intervention which can correct the distortion in question. It can be argued that certain distortions should be dealt with by instruments of trade policy. For example it is often argued that infant industries need to be protected from foreign competition whilst they mature. Another frequently cited argument for tariffs is that they provide central government with much-needed revenue, revenue which, due to administrative constraints and high collection costs, could not otherwise be collected through income-based or commodity-based taxes. Later in this chapter, when we have reviewed non-tariff measures, we will comment further on arguments for protection. For now let us review the simple welfare analytics of tariff imposition.

ECONOMIC EFFECTS OF TARIFFS

As with arguments for tariffs, there is no need to spend a great deal of time on the effects of nominal tariffs. This topic is covered exhaustively in most undergraduate texts on international economics (see for instance Williamson and Milner 1991). A review of some basics as a reference point is, however, in order.

For purposes of analysis we invoke the simple $2 \times 2 \times 2$ Heckscher–Ohlin–Samuelson model, with all its attendant assumptions (perfectly competitive and efficient markets, incomplete specialisation in accordance with relative factor endowments, international immobility of factors and an inability of the home country to influence the international terms of trade). Figure 2.1 describes the case of a small open economy in a partial equilibrium framework. D^H, S^H and S^F denote domestic demand, domestic supply and foreign supply, respectively, of the import substitute. At the world

Table 2.3 Forms of distortions which result in market failure

Distortion	*Effects*
Domestic product market:	
1. Consumption externality	Private consumption levels which exceed or fall short of socially optimal levels
2. Monopoly sellers	Price in excess of marginal cost leading to private production and consumption at levels which are socially sub-optimal
3. Production externality	Private production levels which exceed or fall short of socially optimal levels
Domestic factor markets:	
1. Monopoly suppliers of labour	Wages in excess of marginal revenue products leading to employment below the socially optimal level
2. Interest rates in excess of social discount rates	Investment levels below the socially optimal level
3. Surplus labour	Wages in some sectors above their social opportunity cost leading to underemployment in those sectors
International product markets:	
1. Market power	Unexploited gains from trade available to the large country

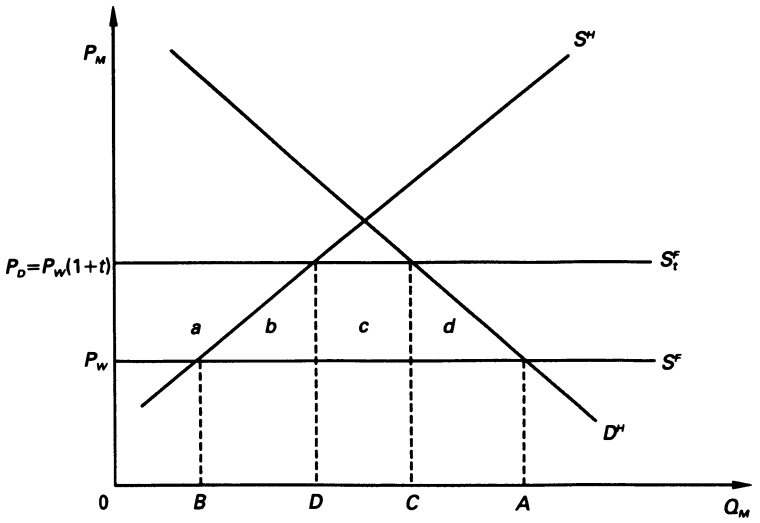


Figure 2.1 Economic effects of an import tariff: partial equilibrium, small open economy

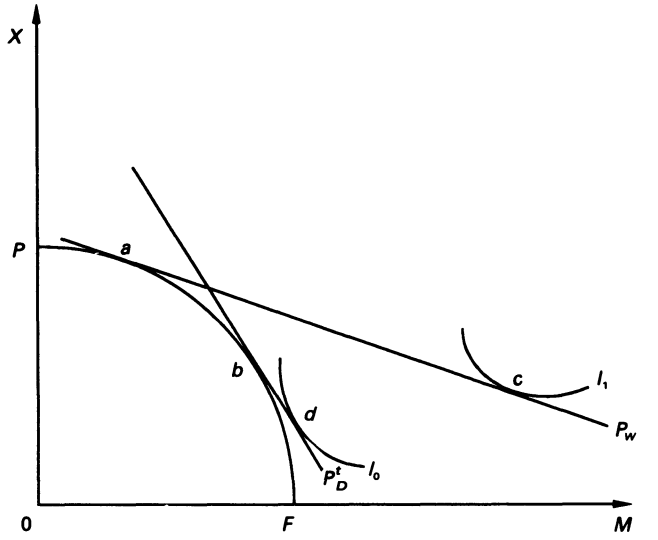


Figure 2.2 Economic effects of an import tariff: general equilibrium, small open economy

price of P_W, OA is consumed, of which OB is supplied domestically, the residual BA being imported. If an ad valorem tariff of t is levied the domestic price becomes:

$$P_D = P_W + P_W t$$

$$= P_W(1 + t) \tag{2.1}$$

At this price demand contracts to OC, domestic supply expands to OD and import penetration falls to DC/OC. The standard welfare effects follow. Consumer surplus declines by $a + b + c + d$. Part of this constitutes an internal redistribution. Producer surplus increases by a and government revenue increases by c. The residuals, b and d, are the well-known 'dead-weight losses' of tariff protection. d is incurred because at the margin some consumers are squeezed out, hence the term 'consumption loss'; b represents the excess cost of producing something domestically which could otherwise be imported, hence the term production, or efficiency, loss. *In the absence of distortions* these will be net losses to the domestic economy. As we shall see later, the gains to society from eliminating distortions could offset, in whole or in part, these losses.

Figure 2.2 presents the same analysis in a general equilibrium setting, with x as the exportable and m as the importable. Free trade production is located at a on the production frontier, consumption at c on indifference curve I_1. The tariff distorts the domestic relative price ratio from P_W to P_D^t, where:

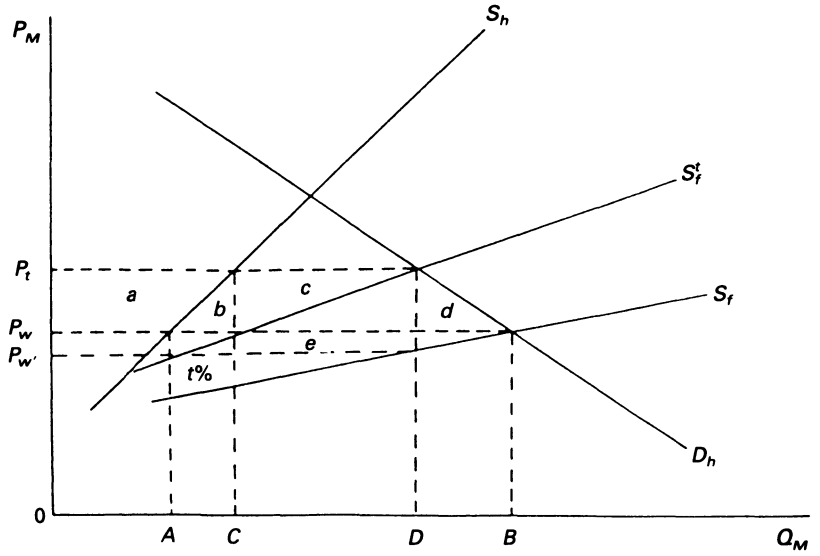


Figure 2.3 Economic effects of an import tariff: partial equilibrium, large open economy

$$P_D^t = \frac{P_m(1 + t)}{P_x} \tag{2.2}$$

At this price ratio production shifts from *a* to *b* as the export sector contracts to facilitate expansion of the import substitute sector. Consumption shifts from *c* to *d*, with the restriction of consumption possibilities taking the economy from I_1 to I_0. This is the analogue of the deadweight losses identified in Figure 2.1. Analytically, the key point which Figure 2.2 brings out is the fact that protection is a *relative* concept. In protecting one sector protection is removed from another. This is a feature of import protection that is often forgotten and to which we return in Chapter 7.

The large open economy case differs in one crucial respect. If a country is 'large' it can influence the prices at which it trades through changes in demand or supply. Thus when a tariff is levied it no longer leaves the post-tariff world price unchanged. Intuition suggests that the imposition of an import tariff by a large economy should drive down the world price, to the advantage, of course, of the importing country. The analytics are straightforward and are outlined in Figures 2.3 and 2.4. Figures 2.3 is the analogue of Figure 2.1. The key difference is the change in the world price from P_W to P'_W, which is driven by the tariff-induced restriction of demand. This actually has a beneficial impact on domestic welfare which is given by the area *e*. This area represents the tariff revenue which is in effect redistributed from foreign producers to the domestic government. If *e* exceeds *b* plus *d*, the country concerned is actually better off with the tariff.

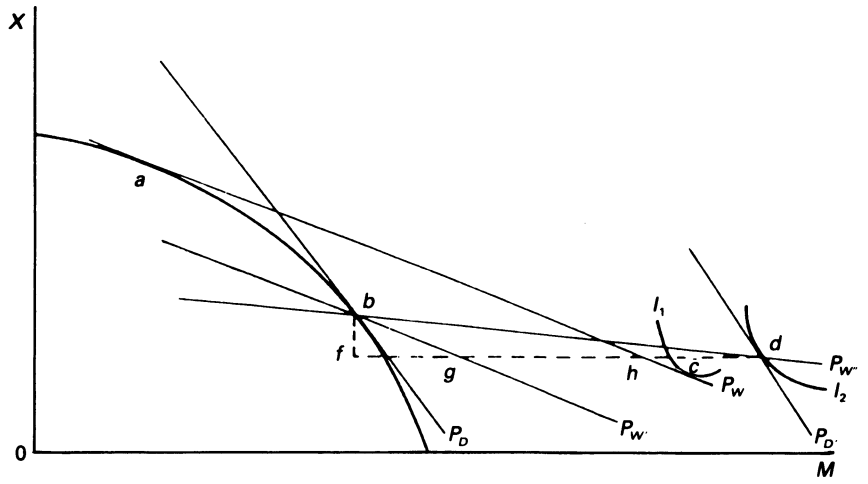


Figure 2.4 Economic effects of an import tariff: general equilibrium, large open economy

It could in fact levy an optimum tariff if the net gain is maximised. Figure 2.4 constructs the analysis in a general equilibrium setting. After the tariff has been imposed, the consumption point shifts to point *d* on indifference curve I_2, which lies above I_1. Note, of course, that the home country benefits by redistributing income from the rest of the world. Nonetheless the case is sometimes put forward as an argument for tariff protection.

In summary then, in the absence of distortions an import tariff results in net welfare losses in a small open economy. If however the country concerned is a large open economy, the tariff-imposing country can actually end up better off with the tariff.

Non-tariff measures

PREVALENCE

As can be seen from Table 2.1 above, the range of instruments that can be listed under the heading of non-tariff measures (NTMs) is large. It is also diverse, with some being fiscal, some quantitative, some involving monitoring and so on. Moreover, depending upon how one defines a NTM, the list could be longer still. Many measures are very carefully hidden.

From a documentary standpoint the diversity of NTMs is a major complication. One cannot easily 'add together' the restrictive impact of deliberately complicated customs valuations procedures with that of price surveillance, or an import quota. It is in part for this reason that summary statistics are hard to come by. However the situation is complicated further by the fact that many NTMs are quite deliberately opaque. From a political

economy standpoint, opacity is a desirable characteristic. It means that policy makers can redistribute income from one group to another at low political cost. From the perspective of the economic analyst, the opacity has nothing to recommend it, leaving us struggling to pin down the existence of many measures, let alone their economic effects.

For these reasons it is just not possible to provide a summary of NTMs like that for tariffs reported in Table 2.2. As far as developing countries are concerned this kind of summary just does not exist. More information is available for developed countries where some analysts have recorded the frequency of NTMs by industry, or the proportion of trade which is covered by NTMs (see for instance Nogues, Olechowski and Winters, 1987). It might be noted in passing that this work shows that reliance on NTMs in developed countries has increased quite significantly over the last decade or so.

For developing countries one is forced to rely upon case study material which is either qualitative or which estimates the price-raising effects of particular NTMs. This kind of information must be used with great caution. Carefully interpreted, however, it can offer some guidance as to the pervasiveness or otherwise of NTMs. Table 2.4 reports the results of one of the few attempts to summarise information. This is taken from Greenaway (1986). For a (non-random) sample of developing countries, country-specific analyses were reviewed and the prevalence of direct controls qualitatively assessed according to whether they were pervasive, moderate, non-existent and so on. We should emphasise again that the information must be interpreted very carefully indeed. What it does appear to suggest is that NTMs in the form of direct controls are quite extensively deployed in many developing countries and especially those which have followed inward-oriented trade policies. This is consistent with the findings of a number of multi-country studies like those of Balassa (1982) and Krueger et al. (1981), as well as a multitude of case studies, some of which we will report on later. The impression that comes through strongly is that NTMs are widely used in many developing countries and their use is more pervasive than in developed countries. Having said that, it should be noted that there has been dismantling of some of the overt QRs in a large number of LDCs in the 1980s. As we shall see later, this is partly driven by adjustment lending programmes (see Thomas *et al.*, 1991 and Papageorgiou, Michaely and Choksi, 1991). It should also be noted, however, that in the process of trade reform some LDCs are utilising some of the features of the new protectionism, such as anti-dumping legislation.

ARGUMENTS FOR NTMs

Fundamentally the framework for putting forward arguments for NTMs is the same as that for tariffs. We can again distinguish between economic,

Table 2.4a Characteristics of trade and exchange rate regimes, 1965–73

Country	*Average EPR*[1]	*Range of EPRs*	*Use of direct controls*	*Export incentives*	*Bias in trade orientation*[2]	*Exchange rate alignment*	*Group*[3]
Korea, Rep. of	10 (1968)	−67→164 (1968)	Extensive until mid-1960s, limited thereafter	Extensive positive incentives	0.78 (1963) 0.91 (1966)	Realistic–low, undervalued	A1
Singapore	6 (1967)	−1→86 (1967)	Some instituted in 1963, removed in 1965	Extensive positive incentives	1.09 (1967)	Realistic	A1
Yugoslavia	28 (1970)	−3→66 (1970)	Moderate use of import controls	Extensive positive incentives	–	–	A2
Thailand	16 (1969) 27 (1973)	−38→68 (1969) −43→236 (1973)	Limited use of price controls and import controls	Moderate positive incentives	–	Realistic	A2
Colombia	−2 (1969)	−51→215 (1969)	Moderate use, increased reliance over period	Extensive positive incentives	1.23 (1969)	Low, overvalued	A2

continued on p. 18

Table 2.4a continued

Country	*Average EPR*	*Range of EPRs*	*Use of direct controls*	*Export incentives*	*Bias in trade Orientation*	*Exchange rate alignment*	*Group*
Malaysia	–8 (1963) 38 (1970) 39 (1973)	–42→212 (1963) 5→248 (1970) 0→307 (1973)	Limited use of import controls	Limited positive incentives and EPZ arrangements	–	Realistic	A2
Indonesia	33 (1971)	–19→5400 (1971)	Moderate use of import controls and industrial licensing	Limited positive incentives	–	–	A2
Ivory Coast	41 (1971)	–25→278 (1971)	Minimal use of direct controls pre-1974	Minimal positive incentives	–	Realistic	A2
Brazil	66 (1967)	25→362 (1967)	Extensive use of import controls until 1967	–	1.34 (1966)	Realistic to low overvalued	B1
Philippines	63 (1965)	–461→260 (1965)	Moderate use of direct controls and industrial licensing	–	1.36 (1962–4) 1.16 (1970)	Realistic	B1
Argentina	47 (1969)	–18→207 (1969)	–	–	1.94 (1969)	Significantly overvalued	B1

Mexico	49 (1970)	2→371 (1970)	Extensive use of import controls	–	–	Realistic	B1
Bolivia	54 (1970)	–	–	–	–	Realistic	B1
Israel	55 (1965) 62 (1968)	4→137 (1965) 0→188 (1968)	–	Moderate export incentives	1.5 (1968)	–	B1
Senegal	70 (1971)	–	Moderate use of import controls and industrial licensing	–	–	Low, overvalued	B1
Kenya	92 (1967)	−9→539 (1967)	Moderate use of import controls	–	–	Low, overvalued	B1
Nigeria	99 (1968)	−27→1063 (1968)	Extensive use of import controls and industrial licensing	Negligible	–	Overvalued	B2
Dominican Rep.	124 (1971)	−48→874 (1967)	–	–	–	Realistic	B2
Ghana	143 (1968–70) 105 (1972)	−10→1633 (1968–70)	Extensive use of import controls and industrial licensing	Negligible	–	Significantly overvalued	B2

continued on p. 20

Table 2.4a continued

Country	*Average EPR*	*Range of EPRs*	*Use of direct controls*	*Export incentives*	*Bias in trade orientation*	*Exchange rate alignment*	*Group*
India	125 (1968–9)	−21→3354 (1968–9)	Extensive use of import controls and industrial licensing	Negligible	–	–	B2
Sri Lanka	118 (1970)	2→382 (1970)	Extensive use of import controls and industrial licensing	Negligible	–	Significantly overvalued	B2
Tanzania	116 (1966)	−1→538 (1966)	Extensive use of import controls and industrial licensing	–	–	–	B2
Pakistan	356 (1963–4) 200 (1970–1)	−6→595 (1963–4) 36→595 (1970–1)	Extensive use of import controls and industrial licensing	Negligible	–	–	B2
Sudan	179 (1971)	32→783 (1971)	Extensive use of import controls	–	–	Low, overvalued	B2
Uruguay	384 (1965)	17→1014 (1965)	–	–	–	Significantly overvalued	B2

Ethiopia	125 (1970)	–	Extensive use of import controls	–	–	Realistic	B2
Tunisia	250 (1972)	1→737 (1972)	Extensive use of import controls	–	–	Low, overvalued	B2
Chile	175 (1967)	−23→1140 (1967)	Extensive use of import controls	–	1.79 (1967)	Significantly overvalued	B2
Peru	90 (1971)	–	Extensive use of import controls and licensing	–	–	Significantly overvalued	B2

Source: Greenaway (1986) Table 6.

Notes:
1. Effective rate of protection (see Chapter 5).
2. See section 2.4 for a definition of the bias index.
3. A1 – strongly outward oriented trade strategy; A2 – moderately outward oriented; B1 – moderately inward oriented; B2 – strongly inward oriented. See Greenaway and Nam (1988) for an explanation of the categories.

Table 2.4b Characteristics of trade and exchange rate regimes, 1973–84

Country	*Average EPR*	*Range of EPRs*	*Use of direct controls*	*Export incentives*	*Bias in trade orientation*	*Exchange rate alignment*	*Group*
Yugoslavia	9 (1974)	–	Extensive use of direct controls	Extensive positive incentives	–	–	A2
Malaysia	25 (1980)	−173→1175 (1980)	Limited use of import controls	Extensive positive incentives through EPZ	–	Undervalued	A2
Mexico	11 (1979) 3–10 (1980)	−32→249 (1979) −33→211 (1980)	Liberalisation of direct controls in late 1970s	Range of positive incentives available including EPZ incentives	–	Realistic	A2
Cameroon	31 (1975–6)	–	Some use of import controls	–	–	–	A2
Brazil	44 (1980–1)	−16→97 (1980–1)	Liberalisation of direct controls in 1970s	–	–	Low overvaluation	A2
Sri Lanka	38 (1979)	0→307 (1979)	Liberalisation of direct controls in 1977	Extensive positive incentives through EPZ	–	–	A2

Philippines	54 (1974) 44 (1978)	−41→18758 (1974)	Limited use of direct controls	Moderate positive incentives through EPZ	–	Realistic	B1
Indonesia	30 (1975)	−35→4314 (1975)	Extensive use of direct controls and industrial licensing	Limited	–	–	B1
Ivory Coast	76 (1978)	−8→118 (1978)	Moderate use of import controls post-1974	Limited	1.59 (1978)	Overvalued	B1
Colombia	44 (1979)	27→127 (1979)	Extensive use of import controls	Limited	–	Low, overvalued	B1
Thailand	54 (1978)	4→495 (1978)	Moderate use of import controls and industrial licensing	Moderate positive incentives through EPZ	–	Realistic	B1
Argentina	38 (1977)	−35→426 (1977)	Some liberalisation of direct controls in late 1970s	–	–	Significantly overvalued	B1
Pakistan	60 (1980)	−799→1543 (1980)	Moderate use of import controls and licensing	Limited	–	–	B1

continued on p. 24

Table 2.4b continued

Country	*Average EPR*	*Range of EPRs*	*Use of direct controls*	*Export incentives*	*Bias in trade orientation*	*Exchange rate alignment*	*Group*
Turkey	75 (1979)	−108→273 (1979)	Moderate use of import controls	–	1.33 (1979)	Overvalued	B1
Nigeria	82 (1979–80)	−62→1119 (1979–80)	Extensive use of import controls and industrial licensing	Negligible	–	Significantly overvalued	B2
Ghana	131 (1982)	−83→21632 (1982)	Extensive use of import controls and industrial licensing	Negligible	–	Overvalued	B2
Madagascar	164 (1982)	−23→4330	Extensive use of import controls and industrial licensing	–	–	Overvalued	B2
Burundi	91 (1984)	−4→7896	Extensive use of import controls and industrial licensing	–	–	Overvalued	B2
Bangladesh	144 (1976–7)	–	Extensive use of import controls	–	–	–	B2

Zambia	161 (1975)	−22→1251	Extensive use of import controls and industrial licensing	–	–	Realistic	B2
Bolivia	101 (1975–6)	−12→551	Extensive use of import controls and industrial licensing	Limited	–	Overvalued	B2
Peru	198 (1975) 122 (1978) 74 (1981)	27→121 (1981)	Extensive use of import controls Some liberalisation in early 1980	–	1.53 (1975)	Overvalued Realistic	B2

Source: Greenaway (1986) Table 7.

non-economic and non-arguments and nothing need be added here. It may, of course, be that certain NTMs are seen as being more effective in hitting particular targets and some will be less effective (for example the revenue motive will not apply unless quotas are auctioned). That, however, is a different matter and is something to which we will return later in this section.

ECONOMIC EFFECTS OF NTMs

As with tariff barriers, it is not necessary to dwell at length on the welfare analytics of NTMs, for at least some measures these are well known (see for example Anderson, 1988). Besides which the range of NTMs is so wide that one could write an entire text on this subject alone. For purposes of comparison with the tariff we will confine ourselves to a single but widely used measure, namely the quantitative restraint (QR). Extensive use is made of QRs in developing countries. Moreover a number of observations can be made about other instruments once we have evaluated the QR.

Figure 2.5 outlines the partial equilibrium effects of a QR. The upper limit on imports is $AF = CD$. This is represented by the effective supply curve becoming $P_W GS^H_Q$. In other words, beyond OF marginal supplies must come from domestic producers. For expository convenience we have set the quota to give us equivalent price effects with the tariff in Figure 2.1. Thus $P_Q = P_W(1 + t)$. The artificial scarcity created by the quota drives the domestic price above the world price, domestic supply expands and demand contracts. Because we have identical demand and supply conditions and have set the initial quantity effects as identical, there would appear to be complete equivalence between the welfare effects of the tariff and QR. In the sense that we end up with net welfare losses to the economy of $b + d$ (which should be interpreted in exactly the same way as the tariff case), this is so. However, the distributional consequences are somewhat different. Area a remains a redistribution from domestic consumers to domestic producers. Area c however is no longer a transfer to the domestic revenue authorities. In order to operate a QR, licences have to be issued to authorised importers. If the licences are distributed by some kind of administrative mechanism, the holders of these licences acquire rents which amount to the difference between P_W and P_Q. This arises because the world price remains at P_W whilst the domestic price is inflated to P_Q. The unit rent is the difference between the two, total rents amount to area c. If we ignore interpersonal utility comparisons the welfare effects of the two instruments are identical, although on equity grounds (the government should have the revenue rather than importers) or administrative grounds (developing country governments rely heavily on trade taxes for government revenue) one could make a case in favour of tariffs rather than

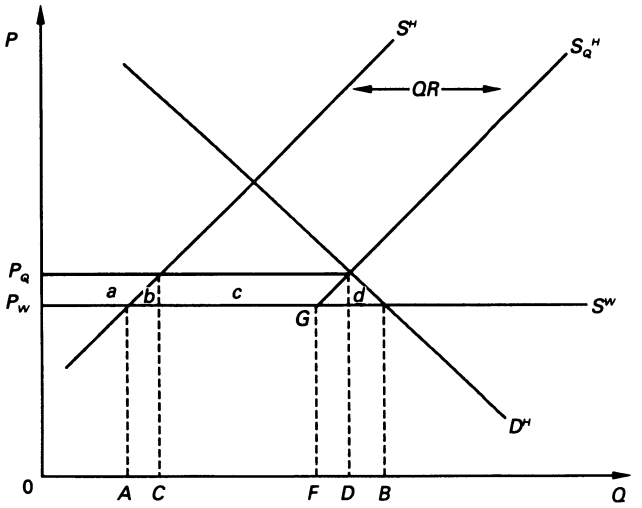


Figure 2.5 Economic effects of a QR: partial equilibrium, small open economy

quotas. However on efficiency grounds there would appear to be equivalence.

There are, however, important non-equivalences between tariffs and quotas which have been the subject of extensive analysis (Bhagwati, 1971; Anderson, 1988). Three in particular are worthy of mention. First, quotas can alter market structure and firm behaviour in a way that tariffs cannot. For instance, suppose the domestic market is dominated by a single firm or a cartel. If protection is provided via a tariff, this market power cannot be exploited. The market remains contestable at the margin. In contrast QRs eliminate competition at the margin and allow domestic firms to exploit their market power. As a consequence domestic price can rise beyond P_Q to the monopoly level. Second, if the market expands and D_H shifts out to the right, marginal supplies have to come from domestic producers rather than more efficient foreign producers. Thus, in an expanding market, the deadweight losses (b and d) grow. Third, the availability of rents results in rent-seeking behaviour. In other words agents compete by lobbying and other 'directly unproductive activities' (Bhagwati, 1971) to secure the rents. For these reasons, on efficiency grounds quotas are generally regarded as less efficient instruments of intervention than tariffs.

All of the above pertains to the small open economy, partial equilibrium case. We could replicate the analysis to large economy, general equilibrium cases. In fact there is no need to do so as equivalence holds for these cases also, subject to the points made above. The key result which comes out of this simple analysis is that the relative costs of securing a specific objective by alternative instruments might be quite different.

OPTIMAL INTERVENTION ANALYSIS AND NTMs

The last point of the previous section gives rise to the possibility that one can systematically compare instruments of intervention and rank them according to their relative costs or their by-product distortions (Corden, 1974). In fact this turns out to be a very powerful mechanism for policy analysis. The basic idea is very straightforward. First we identify a given argument for intervention, say to correct a particular distortion. Then we evaluate the impact of alternative means of correcting the distortion. The instrument which should be used is that which gets closest to the problem, that is that which minimises the by-product distortions of intervention. The ideas are traced out quite clearly in Meade (1955) and were subsequently formalised by Bhagwati (1958) and Johnson (1965a).

Table 2.5 illustrates the principle with a particular example. Here the distortion is taken to be a wage rate which exceeds the social opportunity cost of labour. This could be because of the influence of organised labour. The effect of the distortion is that employment is lower than it otherwise would be. The most efficient means of intervention would be to eliminate the distortion at source, that is break the power of organised labour. Of course this may be regarded as inadmissible because the presence of labour unions are regarded as important for socio-economic reasons. The next best instrument is a wage subsidy. This has a by-product distortion in that taxes have to be levied to finance the subsidy. It is however more efficient than a production subsidy which, by subsidising capital as well as labour, distorts the capital labour ratio in addition to introducing a distortion because the subsidy needs to be financed. A tariff is less efficient again because it also introduces a consumption distortion and so on as we go down the list.

From the standpoint of policy appraisal, the framework that optimal intervention analysis provides is potentially extremely useful to both policy maker and policy analyst. It provides a mechanism for encouraging investigation of alternative instruments for securing a given objective which emphasises efficiency criteria. This does not of course mean that the most efficient instrument of intervention will always be chosen. As we shall see later, greater reliance is often placed on relatively inefficient instruments. The reasons why this turns out to be the case are rather interesting and will be addressed later in this chapter.

2.3 Economic effects of instruments of export promotion

Table 2.6 gives details of the range of export incentives which have been used to some degree or other in some of the principal export-oriented developing countries. These are broken down according to whether they are input related, output related or externality related. The first two tend

Table 2.5 The hierarchy of policies

Instrument	*By-product distortions**
1. Remove distortions at source	None
2. Wage subsidy	Distortion from raising revenue (depending on tax used)
3. Production subsidy	(2) plus downward bias in labour intensity
4. Import tariff plus export subsidy	(3) minus distortion from raising revenue plus consumption distortion
5. Import tariff	(4) plus greater consumption distortion
6. Quantitative restriction	(5) plus potential loss of government revenue to license holders and greater administrative complexity and greater dynamic inefficiencies
7. Source specific quota/ voluntary export restraint	(6) plus export of rent to foreign licence-holders and trade diversion

* Distortion: private cost of labour exceeds the social opportunity cost.

to be firm or industry specific, the last tends to pertain to exports in general. The distinction between exports and imports relies upon an ability to trace the incentive specifically to a particular stage of the production process. As we can see, input-related incentives can be attached to intermediate or primary inputs, whilst output incentives can be direct (in the sense of being tied to volume of production) or indirect (in the form of systematic supports like infrastructure provision). Which instruments are used, and on what conditions, is fashioned by the arguments used to support intervention and the orientation of trade strategy (factors we will turn to later).

PREVALENCE

In Table 2.2 we were able to conveniently summarise the extent of tariff measures by reporting average tariffs for a range of developing countries. Unfortunately we are unable to do something similar for export incentives. This is the case for several reasons. Firstly, as we saw in Table 2.5, there is great diversity in the range of instruments used. As with NTMs and import substitution, there is no convenient way of 'adding' these up into a summary export incentive index. Second, and related to the above, many of the measures used are implicit. Governments have a strong incentive to provide support in this way on two counts: first, it ensures that the potential for demonstration effects on other sectors is minimised; second, it ensures that the scope for retaliatory action through GATT is minimised. Both are important, the latter especially so given the potential for use of

Table 2.6 Types of export incentives used in various LDCs[1]

A. 'Input-related' incentives[2]

1. *Intermediate input-related*:
   Tariff and tax exemptions/rebates on imported inputs for exporters and their domestic suppliers
   Import credits for exports
   Wastage allowance subsidies
   Reduced prices of public utility inputs
2. *Primary input-related*:
   Accelerated depreciation
   Reduced interest rates for exporters
   Investment loans (preferential access)

B. 'Output-related' incentives[2]

1. *Direct output-related*:
   Production loans for exporters (preferential access/interest rate subsidy)
   Domestic indirect and direct tax exemptions/rebates
   Import entitlement/licences linked to exports
   Export credits (preferential access/interest rate subsidy)
   Foreign exchange deposits held by central banks for use by individual exporters
   Foreign exchange loans (preferential access)
   Subsidised shipment insurance
   Direct export subsidies
2. *Indirect output-related*:
   Infrastructure provision
   Credits for, and government provision of, overseas marketing activities, R&D expenses, etc.

C. 'Externality-related' incentives

Export 'quality' inspection and incentives
Monopoly rights granted in new export markets

Source: Falvey and Gemmell (1990).

Notes:
1. These measures have operated at various dates in at least one of the following: Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand.
2. The 'output-related', 'input-related' division is based on whether the amount of 'subsidy' received is determined primarily by levels of output or input use.

countervailing duties by trading partners alleging serious injury from subsidised exports. For these reasons assessments of the use of export incentives has tended to be qualitative rather than quantitative.

Table 2.7 reports some documentation for export incentives in four Asian countries that have provided extensive support – Malaysia, Philip-

Table 2.7 Export incentives in Malaysia, the Philippines, Thailand and Korea

Type of incentive	*Malaysia*	*Philippines*	*Thailand*	*Korea*
A. Tax Incentives for Priority Industries*				
Priority industries	*'Pioneer'* (exports; also socially desired goods not already produced on commercial terms)	*'Preferred'* (demand exists, not supply); *'pioneer'* (demand and supply must both be generated)	*'Promoted'* (development-oriented industries based on decisions by the Board of Investment)	*'Key'* (government determined)
Tax holidays	5–10 years based on investment, location, and employment: *cit, dit, dt* (2–8 years); indefinite loss carryover	All taxes, except *cit* are exempt on a diminishing basis up to 1981; loss carry forward to a maximum of 10 years	3–8 years plus 50 per cent reduction for 5 more years; includes *bt, cit*	All taxes: *cit, it* on unincorporated units; *dit, pt*; *pat*–for 5 years plus 50 per cent reduction for 3 additional years
Deductions	Does not apply due to exemptions	Organisational and pre-operating costs from taxable income	25 per cent of installation costs from net profits	Does not apply due to exemptions
Tax credit:				
1. Equipment	Post-exemption period: 25–40 per cent of capital expenses incurred during exemption period	100 per cent on domestic and imported equipment; penalty of twice the credit for unauthorised resales.	100 per cent exemption of *bt* on equipment	100 per cent on domestic and imported equipment; no penalty law

continued on p. 32

Table 2.7 continued

Type of incentive	*Malaysia*	*Philippines*	*Thailand*	*Korea*
2. Interest payments	Information unavailable	Conditionally, on foreign loan interest	Information unavailable	Full exemption from tax on interest on foreign loans
Accelerated depreciation	Conditionally available	Allowed to a maximum of twice the usual rate of 20 per cent	Conditionally available	Domestic equipment may receive up to four times usual rate
Tariffs on machinery and raw materials	*cd* exemption on raw materials and machinery not available locally	*cd* exemption on machinery not available locally; not so for materials	*cd* exemption on raw materials and machinery not available locally	*cd* exemption on 'capital goods' interpreted to include raw materials
B. Tax Incentives Specific to Export Industries*				
Priority exports	All export industries are included in the 'pioneer' category; the following incentives are additional	Export Incentives Act does not specify whether the following incentives are additive	All export areas are not 'promoted'. Following incentives related to exports (promoted as well as traditional exports)	All foreign exchange earning industries are defined within 'key' sectors; the following are additional incentives
Tax holidays	4–7 years holiday for capital investments (instead of usual 2-5 years for pioneer industries)	*et* exemption if revenues exceed US$5 million within 5 years from the registration	Exemption from *bt* and *et* on exportation of manufactures	*bt* exemption

Deductions	Expenses such as foreign advertising, export market research, transport costs deductible from tax base	*it* base reduced by a certain portion of export revenue, based also on domestic content	Not available	Not applicable due to total exemptions
Tax credit	Not available	Export producers: tax credit equivalent to the sales, compensating and specific taxes and raw material duties	7/8th of *cd* on raw materials	50 per cent for *it* and *cit*
Accelerated depreciation	Additional 40 per cent of the residual value of capital assets	Same as in priority industries	Same as in priority industries	Same as in priority industries

Source: Falvey and Gemmell (1990).

* Abbreviations used: *it* = income tax; *cit* = corporation income tax; *dit* = dividend income tax; *bt* = business tax; *dt* = development tax; *pt* = property tax; *pat* = property acquisition tax; *cd* = customs duty; and *et* = export tax.

pines, Thailand and Korea. The table is helpful in detailing the types of measures used, although it is not possible to provide summary measures, nor even to report the relative importance of each. Nevertheless it is useful in giving a flavour of the measures used, across industries and across countries.

There are a number of studies of trade policy which undertake this kind of exercise for different samples of countries (see for example Krueger *et al.*, 1981; Greenaway, 1986; Milner, 1990c). Summarising, the studies suggest the following. First, input measures tend to be more prevalent than output measures. This is partly to try to make them GATT-consistent, partly to tie them into protection of primary factors. Second, measures are much more widely applied to manufactures than primary products. Indeed the latter are very often explicitly taxed. Third, export incentives are more widely used by developing countries in Asia than in Latin America, the Middle East, or Sub-Saharan Africa. Fourth, to an increasing extent incentives operate through export processing zones (EPZs). These apply blanket incentives to any activity that produces exclusively for the export market. It is a phenomenon which has proliferated in recent years. Finally, typically the extent of export support provided falls short of that offered to import substitute activities.

ARGUMENTS FOR EXPORT INCENTIVES

In Section 2.2 we distinguished between economic, non-economic and non-arguments for intervention. The usefulness of this distinction is in forcing us to identify clearly circumstances where market failure of one form or another creates an a priori case for intervention. Later in that same section we saw that, having identified an a priori case, one could then use the optimal intervention framework to ensure that intervention was as efficient as possible, in the sense of minimising by-product distortions. The same approach can be applied to export incentives. One could for example make a case for supporting a particular export-oriented industry on infant industry grounds. Systematically working through the argument would help clarify whether the case was valid and, if so, determine the optimal intervention. The 'thought experiment' would be exactly analogous to the import protection case.

In addition to that class of argument there are two other lines of argument often used in connection with exportables, namely externalities which are peculiar to exports and compensatory export incentives. The first has been used to argue for export promotion in general. It stresses potential economy-wide benefits of exporting which derive from exposing indigenous producers to foreign competition. It is argued that this helps reduce X-inefficiency. In addition exposure to foreign competition facilitates technology transfer and accelerates technical process in the home economy. It

has been argued by some that these kinds of considerations have been important in promoting growth in the South East Asian NICs.

Compensatory export incentives have a different kind of justification. The argument depends here on the pre-existence of import protection and an adverse impact of that import protection on the export sector. Suppose that in a simple three-sector economy the importable sector benefits from protection of some form. Protection is relative – to be effective it must protect one activity relative to another. If production of importables is supported, the sectors which find themselves without protection are the non-tradeable and exportable sectors. In Chapter 7 we outline a model which shows exactly how import protection can be shifted to the export sector. In crude terms it occurs through competition for resources. The point is, for present purposes, that a case can be made for intervention in order to neutralise the effects of the import protection. In other words some form of export incentive is provided to offset the import tariff. This is of course a second-best argument. The same result could be achieved more efficiently by removing the import protection (assuming an absence of distortions). If however the import protection cannot be removed, perhaps on political-economy grounds, a compensatory export incentive may be seen as appropriate.

ECONOMIC EFFECTS OF EXPORT INCENTIVES

As with import protection, the basic welfare analytics of export incentives are well known and need not preoccupy us for too long. All that is required here are some background comments for reference. Having said that, we do face a difficulty of the sort we confronted in connection with NTMs, namely the range of export incentives upon which governments can call. To keep matters simple we will take as our reference point a straightforward export subsidy. This simplicity comes at a price in that we lose many of the subtleties associated with implicit measures, as well as ignoring the interactions with import measures. However we can evaluate implicit measures in a similar way if we are able to think of them in subsidy equivalent terms and we will be addressing interactions later in this chapter but more so in Chapter 7.

In Figure 2.6, D^H and S^H denote domestic demand and supply of the exportable, whilst P^W denotes the world price. At P^W, OB is produced, of which AB is exported. Suppose now an export subsidy of s is introduced. As this applies to only part of production it causes a movement along the existing supply curve, rather than a shift of the curve (as a production subsidy would). Exporting becomes more profitable at the margin and results in an expansion of total output from OB to OD. In addition, however, it also stimulates a reallocation of output. This follows because domestic consumers have to be willing to match the subsidy-inclusive price

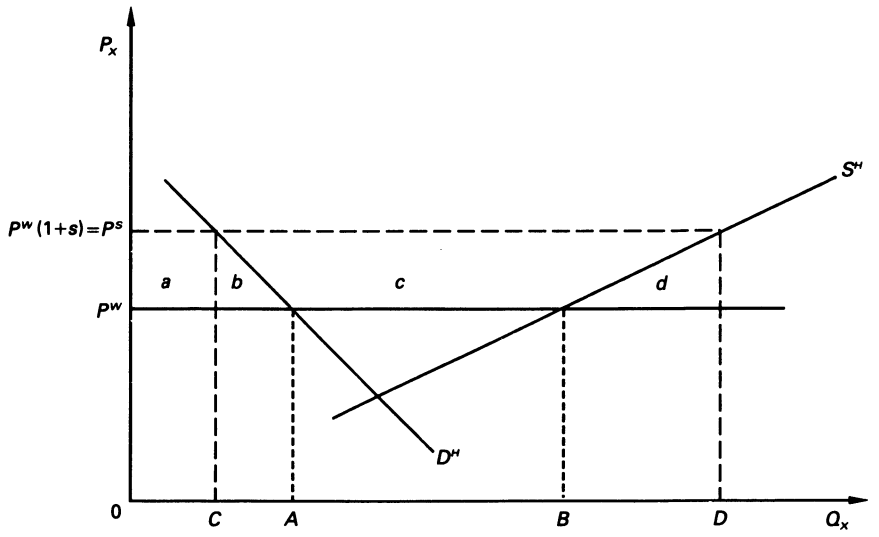


Figure 2.6 Economic effects of an export subsidy: partial equilibrium, small open economy

in order to prevent firms from exporting all of their output. Domestic price therefore increases from P^W to $P^S = P^W(1 + s)$, domestic demand contracts from OA to OC and the difference, CA, is exported. Total exports after the subsidy amount to CD.

The welfare effects are straightforward. Consumer surplus declines by $a + b$, and is a transfer to domestic producers. Government expenditure increases by $b + c + d$. Of this c is a transfer to domestic producers as producers' surplus increases by $a + b + c$. This leaves areas $b + d$, which is the net loss to the economy of the intervention. This is the waste of resources associated with reduced consumption and with producing BD relatively inefficiently, given a world price of P^W. In the absence of offsetting distortions, this is the net cost to the domestic economy of introducing the export subsidy. Clearly if some distortion were present the benefits of correcting it could outweigh areas $b + d$, making the policy justifiable on efficiency grounds.

This example could be easily extended into a general equilibrium setting by analogy with Figure 2.2. It is in fact a trivial extension and we leave it to the reader to carry it out. A more interesting extension is to the large economy, large producer case. In the case where we have a large producer facing competition from a number of small producers, and a perfectly elastic demand schedule, an export subsidy actually lowers the world price. The impact this has on area d depends on supply elasticities over the relevant range. One thing is clear however, the augmentation of total exports is less than in the small country. The large producer case has been

extensively investigated in recent years, following the pioneering work of Brander and Spencer (1984a, 1984b). What this shows is that under certain circumstances providing an export subsidy to a domestic monopolist, who competes on the world market as an international duopolist, can be welfare improving. The way the subsidy works is to cause a reallocation of profits, or rents, from the foreign to the domestic firm, which more than outweighs the cost of the subsidy. This particular possibility has given rise to an interesting debate. For present purposes what we should note is that the circumstances under which this rent snatching occurs are really rather special and unlikely to be of relevance to most, if not all, developing countries (see Greenaway, 1991).

2.4 Instrument packages and policy strategies

So far we have treated instruments of import protection and export promotion as if they were alternatives and mutually exclusive. In fact the real situation, especially in developing countries, is rather more complicated. Not only do we often observe a wide range of instruments of import protection and a wide range of instruments of export promotion in use separately, as we have already indicated, in addition we frequently observe a range of instruments from each set in use simultaneously. From the standpoint of policy appraisal this creates complications. In a situation where both may be used, how do we summarise their impact?

This question has exercised the minds of many analysts and it is really rather an important one. If one of our aims is to evaluate how trade policy affects growth, in order to investigate this we need to be able to distinguish between different strategies. In simple theoretical models the distinction between inward orientation and outward orientation is generally a straightforward one to make, turning on the impact of policy intervention on relative prices. In practice however it tends to be rather complicated, for several reasons.

First, many governments support both import substitution and export promotion and the instruments used cannot always be reduced to comparable measurement units. Actually coming up with a summary statistic of some form or other is then quite a challenge. Second, relative reliance on alternative instruments can alter through time, further complicating assessment. For example Krueger (1978) defined a five-way classification scheme for policy orientation and identified one case which went through all five stages over the period 1950–72.

One response to the problem has been to develop single indicators of trade orientation (see Greenaway and Reed, 1990). These attempt to summarise relative price effects in a single measure. Krueger (1978) for example proposes a measure of bias in the trade regime as follows:

$$B = \frac{\sum_{i=1}^{m} w_i \left(\frac{P_{mi}}{Q_{mi}}\right)}{\sum_{j=1}^{n} w_j \left(\frac{P_{xj}}{Q_{xj}}\right)} \tag{2.3}$$

where P and Q refer to domestic and international prices respectively, m and x refer to importables and exportables respectively, w refers to weights, i and j are product groups, and the weights are defined as the share of these product groups in total imports or exports. Thus B measures the distortion of domestic prices relative to world prices in importables compared to that in exportables. A computed value of one represents neutrality. An index in excess of unity indicates inward orientation; an index of less than unity indicates outward orientation.

Use of the effective exchange rate facing exportables is in the same spirit as the bias index. This approach has been advocated by a number of analysts, including Balassa (1982) and Bhagwati (1986). The basic idea is simple: one calculates the effective exchange rate facing producers in the import substitute sector and compares this with the effective exchange rate facing producers in the export sector. If the former exceeds the latter, the country is said to be following an *IS* strategy; if the effective exchange rates are the other way around, the country is said to be following an *EP* strategy.

Inevitably there are measurement problems, for instance with the aggregation of individual subgroups within the tradeable goods sectors. Aggregation difficulties arise not only through problems in assigning weights to individual groups but also as a result of the fact that imports and exports may be recorded simultaneously in a given industry. Nevertheless both of the single indicators discussed have been used. For illustrative purposes estimates of both the bias index and effective exchange rate ratios are reported in Table 2.8.

Single indicators of this sort have the great virtue of simplicity – a single measure can summarise a complicated regime. However there are problems in interpreting these ratios, not the least of which is that a value of unity can mean more than one thing. Thus although we can correctly interpret an index of one as denoting 'neutrality' in the sense that incentives to producers of importables are exactly matched by those available to producers of exportables, this could arise from a free trade set of prices or a highly distorted set of prices. Put another way, it could arise from complete laissez-faire or from dirigisme. From the standpoint of making inferences about intervention and economic performance, this is really rather important. If one failed to probe behind the index, one could reach quite erroneous conclusions regarding the efficacy of intervention or non-intervention.

One response to this problem has been to try to use multiple criteria as a

Table 2.8a Estimates of bias in five developing countries

Country	*Year*	*Bias Index*
Brazil	1957	2.45
	1961	1.79
	1964	1.41
Chile	1956	3.69
	1959	1.94
	1965	1.95
Philippines	1960–2	2.01
	1970	1.37
South Korea	1961	0.67
	1964	0.78
Turkey	1958–9	6.31
	1970	3.01

Table 2.8b Ratio of import to export effective exchange rates in nine developing countries

Country	*Year*	*EERM/EERX*
Brazil	1957	1.28
	1961	1.64
	1964	1.00
Chile	1956	1.21
	1959	1.18
	1965	1.18
Egypt	1962	0.98
Ghana	1967	1.83
India	1966	1.29
Israel	1952	0.95
	1962	0.97
Philippines	1960–2	1.64
	1970	1.37
South Korea	1961	0.68
	1964	0.78
Turkey	1958–9	1.87
	1970	1.63

Source: Extracted from Krueger (1978), Tables 6.3 and 6.2.

basis for classifying trade orientation. This line of analysis endeavours to categorise trade strategy by reference to a number of different criteria. Sometimes this approach focuses on policy inputs. Thus, for instance, Greenaway and Nam (1988) used information on effective rates of protection, reliance on direct controls, export incentives and exchange rate misalignment to classify 41 LDCs into four categories, namely strongly outward-oriented, moderately outward-oriented, moderately inward-oriented and strongly inward-oriented. Donges (1975) also relied upon a

number of quantitative and qualitative indicators in a similar type of cross-section study. Although Agarwala (1983) used a 'distortion index' in his analysis of growth patterns in LDCs, the index was constructed from information on a variety of qualitative and quantitative indicators. Thus, for instance, information on, *inter alia*, tariff levels, quantitative restrictions and exchange rate misalignment was used to distinguish between high, low and medium distortions in each. An overall inference on trade strategy could be made by reference to whether the overall degree of distortion was 'high', 'medium' or 'low'.

The advantage of this approach is that its information content is high. No one indicator is used. The principal disadvantage however is that an element of judgement is inevitably at work. This is not a problem if all the indicators point in the same direction (for example high import tariffs, pervasive direct controls, export taxes and an overvalued exchange rate). Where, however, they point in different directions (for example high import tariffs, no direct controls, no exchange rate misalignment and extensive export subsidies) it may be more problematic.

An alternative multiple indicator approach has been to use information on 'policy outputs' (that is relative prices, trade shares, and so on) to try to define a continuum of trade regimes from dirigisme on the import side, through laissez-faire, to dirigisme on the export side. This is the approach of Bradford and Branson and is summarised in Table 2.9. As can be seen, although this uses information such as estimates of relative effective exchange rates, it supplements this with other qualitative and quantitative information. The resulting spectrum is potentially rich and helpful. Again, however, it involves judgemental criteria, about trade ratios, critical degrees of discrimination and so on.

We have said enough to make the point that empirical identification of 'trade strategy' is far from easy in a world where intervention to protect both importables and exportables occurs. Our instinct as economists is to rely on relative prices. The problem with single indicators however is that their information content may be insufficiently high to convey an accurate picture of orientation. An appropriate response is to develop richer criteria and this is the direction research has recently taken. Further work in this direction will inevitably pay rich dividends.

2.5 Concluding comments

This has been intended as a 'scene setting' chapter. Before embarking on the main mission of this book we need to have some reference points. One such reference point is the range of policy instruments available to those charged with implementing commercial policy in developing countries. As we have seen, there is a great variety of potential instruments on both the import and export side. By way of background we reminded ourselves of

Table 2.9 Definition of trade regimes: the Bradford–Branson continuum

Trade regime	*Characteristics*
Autarky	No trade
	'Delinking'
	Self-reliance
Closed Economy	Exports and imports less than 5% as a share of GDP
Import Substitution	(a) Discriminates against all imports through controls: EERm > EERx
	(b) Selective discrimination
	(c) Mild and limited applications
Inward Orientation	Priority given to the domestic economy
Outward Orientation	Priority given to exports
Trade Economy	Exports 15% or more as a share of GDP
Open Economy	Internal liberalisation EERx = EERm
	(a) tradable goods
	(b) (a) + nontradable goods
	(c) (a) + (b) – macroeconomic variables
Export promotion	(a) Uniform subsidies for all exports: EERx > EERm
	(b) Selective subsidies:
	Industrial policy
	Import substitution

Note: EERx and EERm are the real effective exchange rates for exports and imports, respectively.

the economic effects of these instruments and alluded to their prevalence. Finally, we commented upon the difficulties of unambiguously identifying trade orientation in a situation where both the importable and exportable sectors benefit from protection.

Later in the volume we will look more carefully at economic effects. In the meantime the next stage in the analysis is to review thinking on trade policy and development to provide us with another reference point.

CHAPTER 3

Trade Policy and Development

3.1 Introduction

Economists of almost all persuasions acknowledge a role for government in the management of economic activity. Disagreement tends to revolve around the optimal degree of involvement. At one extreme good government intervention is equated with minimal government intervention. As far as possible agents should be permitted to make private contracts with each other in unfettered markets. Intervention should be confined to providing the appropriate legal infrastructure within which such contracts are enforceable. In such a world there are no areas of economic activity which require greater state involvement. Such a vision would be held by modern day Austrian economists. The antithesis of this view is that associated with neo-Marxists. Here a fundamental mistrust of the ability of markets to 'deliver' economically efficient outcomes combines with a belief that whatever the allocational outcome it will be distributionally inefficient, to identify a role for the state which is all-pervasive. The state is not simply seen as a vehicle for providing a framework of law within which free exchange can occur, but rather that body which plans economic activity at the macro level and, through publication of targets and guidelines, implements the plan through microeconomic policy. These are extreme views of the framework within which the fundamental allocative problem is to be solved. In between there are various shades of opinion which envisage, to a greater or lesser degree, some involvement in demand and supply management.

In a book of this type it is simply not possible to discuss the entire spectrum of views on trade and development – nor given its orientation is it desirable. However since policy appraisal is concerned with policy reform, and since policy reform presupposes a given set of policies, it is necessary to have some familiarity with the intellectual underpinnings of a given

strategy and to see that strategy in an historical context. This chapter is directed to those ends. We begin in Section 3.2 with a brief historical overview of economic thought on development in general and the role of trade policy in particular. As we shall see in that section, the dominant 'schools of thought' over the postwar period have been structuralism and neo-classicism. Sections 3.3 and 3.4 address these respectively. Section 3.5 pulls together our analysis of policy instruments in Chapter 2 and the analysis of this chapter to evaluate policy orientation and trade policy. Finally, Section 3.6 offers some concluding comments.

3.2 Evolution of thought on trade and development

Many analysts have attributed to Adam Smith the accolade of the first development economist (which sits alongside his accolades as the first public finance economist, the first industrial economist and so on!) To the extent that Smith was concerned in *The Wealth of Nations* with problems of accumulation and allocation in an industrialising economy (the UK), this is an entirely reasonable suggestion. We will not however take such a long-term frame of reference. Interesting as the longer term is, this is simply not the place to address it. For two reasons our time frame will be restricted to the post-Second World War period: first it is really only over that period that a body of economic analysis dealing with the problems of developing countries has evolved; second the policy stances we are interested in appraising are essentially postwar.

One of the most influential postwar strands of thought on development is 'structuralism'. This is a body of analysis associated with the output of the United Nations Economic Commission for Latin America (ECLA) in the 1950s and 1960s, much of which is associated with the name of Raul Prebisch (who was in fact its first director). At the heart of the structuralist view of the world is a 'centre–periphery' dichotomy. At the 'centre' are the mature industrialised economies, specialised in manufactures and benefitting from scale economies. Moreover they produce commodities with an income-elastic demand. At the periphery are the developing countries. In the main they are specialised in producing low-productivity primary products. These fundamental structural differences ensure that the gains from trade are steered towards the centre, and ensure a dependency status on the part of the periphery. Moreover the periphery cannot rely upon international trade to break out of this situation. Industrialisation is the key ingredient in structural transformation:

> But this could not be expected to take place spontaneously, for it would be inhibited by the international division of labour which the centre would attempt to impose, and by a series of structural obstacles internal to the peripheral economies (Palma, 1989, p. 319).

This last point is elaborated by Little (1982) as follows:

> The structuralist sees the world as inflexible. Change is inhibited by obstacles, bottlenecks and constraints. People find it hard to move or adapt, and resources tend to be stuck. In economic terms, the supply of most things is inelastic. . . . Peasants were hardly economic men and were stuck in the mud; people were ruled by custom and authority; entrepreneurs were lacking; and communications were poor. There was little choice as to what to produce from the land. As a result of poverty, demands, too were inflexible, especially for food. If there was to be any development, the demand for imports would be highly inelastic, since capital goods must come from abroad. Demands also were inelastic, especially for food, for imports into developing countries, and for their exports (Little, 1982, p. 20).

In the next section we shall explore in detail the nature of these inelasticities and 'structural obstacles'. For the moment the important point to note is that they provided the justification for widespread intervention to regulate trade, finance, production and distribution.

Structuralist ideas have turned out to be a very influential input to policy formulation in developing countries. There can be no doubt that they provided the intellectual underpinnings to the inward orientation which is such a pervasive feature of many developing countries. Over the last fifteen years or so, however, very significant revisionism has occurred and as a result, what Toye (1987) refers to as neo-conservatist ideas have enjoyed a resurgence. This can be attributed to the interaction of several factors: first, a noticeable change in the intellectual climate in industrialised countries towards 'new conservatism'; second, the juxtaposition of the spectacular economic progress of outward-oriented developing countries with the poor performance of many of the most inward-oriented economies (Greenaway and Nam, 1988); third, growing evidence on and greater exposure being given to the costs of protection; fourth, growing evidence from fieldwork studies suggesting that agents in LDCs for the most part behaved as rational optimising agents (Stern, 1989); and finally the 'enforced' liberalisation associated with policy-conditioned lending in the 1980s.

There are at least two avenues along which this line of thinking has developed: an essentially neo-Austrian view associated in particular with the work of Bauer, and a more mainstream neo-classical view to be found in the work of, *inter alia*, Little (1982) and Lal (1983). The former takes an extreme view along the lines that dirigiste economic policies are fundamentally misconceived and misplaced, in part because problems of market failure are trivial and in part because dirigisme replaces market failure with government failure. The neo-classical position is less extreme. Most, though not all, neo-classical analysts acknowledge the existence of market imperfections and market failure. However they would distance themselves from structuralist commentators both with regard to the extent of

the 'malady' and its remedy. Market failure would not be regarded as a general phenomenon, and where it is identified intervention should be carefully thought out and introduced. Where intervention is regarded as necessary it should be selective and chosen to minimise the 'by-product distortions' (Corden, 1974) associated with the intervention. Failure to assign appropriate instruments to given distortions not only raises the costs of intervention, but may also make the situation worse.

At the heart of this approach to policy, which emphasises microeconomic considerations, is social cost benefit analysis. As we shall see in Chapter 6, there are analytical problems with this technique, most notably second-best considerations, and implicit assumptions about income distribution. Nevertheless the 'new conservatism' generally, and neo-classical ideas in particular, have found willing sponsors in the form of the major multilateral lending agencies, especially the World Bank. Not only has the institution openly endorsed these ideas, it is clear from an inspection of the policy reform packages introduced by a wide range of developing countries as a condition for structural adjustment loans (SALs) that these ideas have influenced policy in a very profound way. Time will tell, but it may be that the counter-revolution will turn out to have just as profound an impact on policy formulation and implementation as structuralist ideas in the 1950s and 1960s. The SAL programme will be the subject of more detailed analysis in Chapters 12 and 13. In the meantime let us examine more thoroughly some aspects of structuralist and neo-classical thinking.

3.3 Trade as a source of impoverishment: structuralism

As we saw in the previous section, 'structuralism' is best thought of not as a school of thought, but rather as a touchstone for the belief that the structural characteristics one finds in developing countries ensure that unfettered markets cannot be relied upon to allow developing countries to gain from trade in the same way as industrialised countries can. At the heart of the structuralist case is a belief in market failure on a widespread scale. Thus market failure ensures that the vital signalling function performed by the market mechanism not only operates imperfectly, but may even emit signals that are quite misleading. Sources of market failure are manifold – capital market imperfections, production externalities, a complete absence of some markets. Moreover many of the imperfections are allegedly exogenous. Thus rather than giving the market a helping hand, policy should be directed at market replacement. Since most, if not all, developing countries were small open economies, this invariably meant that markets for traded goods were prime candidates for intervention. As indicated above, many market imperfections have been alleged but we will consider briefly the most influential (in the context of structuralism), namely terms of trade decline, export instability, pervasive infant

industries and a maldistribution of the gains from trade. In terms of explaining the revealed preference of so many developing countries for inward orientation, these are the most important.

Terms of trade decline

The allegation that developing countries are faced with a secular tendency towards declining terms of trade can be traced back to the influential contributions of Singer (1950) and Prebisch (1950) – hence the nomenclature 'the Singer – Prebisch thesis'.

The argument is grounded in a simple 2 × 2 × 2 north–south model of the world economy. Southern developing countries are labour abundant, primary products are labour intensive, thus southern countries specialise in and export primary products. In contrast northern countries are relatively capital abundant, manufactures are relatively capital intensive, thus the north specialises in and exports manufactures. So far this is simply a description of the simple H-O-S model. In Figure 3.1 we would expect production to settle at a, consumption at b, and gains from trade to result. So what is the problem? The problem is that in a dynamic context this equilibrium shifts in a way that is disadvantageous from the standpoint of the south. T_1 shows a chronic tendency to drift towards T_2 with consequent welfare losses. The tendency for the terms of trade to deteriorate is explained by the structural characteristics of world markets for primary commodities and manufactures. It is claimed that demand for primary commodities is income inelastic. In the case of soft commodities this is simply an application of Engel's Law; in the case of hard commodities it follows from the emergence of fabricated substitutes for natural products. Thus as income grows in the north, the demand for primary products grows less than proportionately. This places downward pressure on prices which is exacerbated by the fact that world markets in these products are highly competitive. The presence of surplus labour ensures that productivity gains are passed forward in the form of lower prices. In contrast world markets in manufactures are dominated by multinational firms and uncompetitive markets. The fruits of any productivity gains are captured by cartelised groups and organised labour. Moreover demand for manufactures is income elastic. Thus income growth keeps upward pressure on their prices.

The initial support for this thesis was provided by Prebisch (1950). His examination of the British net barter terms of trade over the period 1870–1930 led him to a belief in the chronic tendency to secularly declining terms of trade. As we shall see, there are both theoretical and empirical question marks which can be placed against this alleged trend. For the moment however we shall take the argument as given, and return to the critique later.

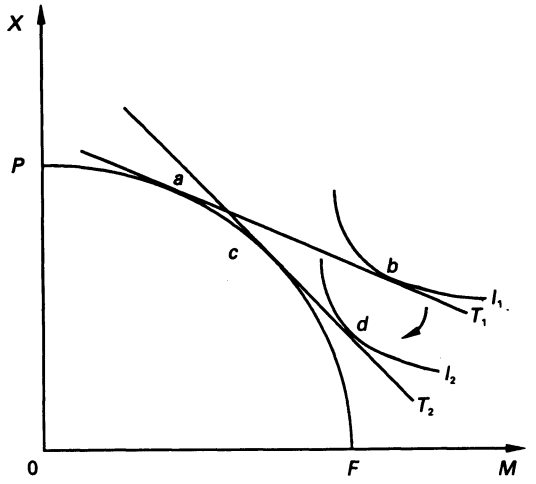


Figure 3.1 Terms of trade effects in a small open economy

Export instability

The potential problem of export instability is often confused with that of a decline in the terms of trade, although conceptually it is quite separate. It has the same starting point, namely dependence on primary commodity exports and the structural characteristics of primary markets. The structural characteristics emphasised are different here, namely price elasticities of supply and demand which are highly inelastic over the relevant range, and supply and demand schedules which are subject to random and unpredictable shocks. Thus (northern) demand for soft commodities is price inelastic (since we are dealing primarily with foodstuffs), and these products are particularly susceptible to supply side shocks (due for instance to pestilence, adverse weather conditions and so on). Demand for hard commodities is also price inelastic. In this case however the problem is demand side shocks driven largely by cyclical movements in output in the north.

As can be seen from Figure 3.2, when the appropriate schedules are inelastic over the relevant range small perturbations to supply and/or demand can result in relatively large perturbations to price. Moreover, if elasticities have the appropriate values, once the initial equilibrium is disturbed the adjustment path to a new equilibrium may be protracted and/or divergent. In some circumstances the classic 'cobweb adjustment' is possible. The essential point is that even if a cobweb does not result there may nevertheless be price instability which is then transmitted through to export earnings instability. One can certainly often find spectacular

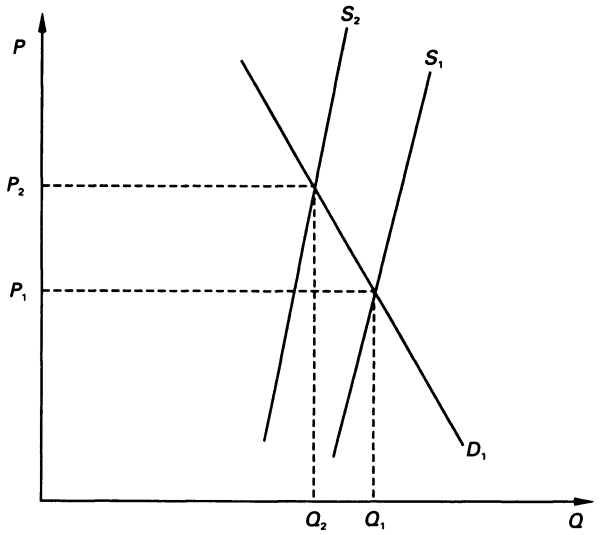


Figure 3.2 Supply shocks and export instability

examples of this phenomenon. For example the change in coffee prices in 1975 following the late frost in Brazil, the increase and decrease in hard commodity prices following the commodity price boom of the early 1970s, the aftermath of the oil shock of 1973–4 and so on. As with terms of trade decline one can question both the underlying theory and the empirical evidence. For now however we will again take the argument as given and note that it was influential in creating pressure for inward orientation. The argument is quite simple – to ameliorate the effects of export instability one must reduce dependence upon primary product exports. The most effective means of accomplishing this is via planned diversification. Although we shall consider some of the counter arguments later, one might be forgiven for asking at this point why the diversification does not come about 'naturally'. Why do producers need to be directed into the manufacturing sector? Why does the combination of secular decline in the terms of trade and export instability fail 'to stimulate manufacturing activity? The structuralist answer to this question is, as for many others, market failure. Many branches of manufacturing activity are infant industries. As such they require state support to nurture them.

Infant industry protection

Of all the arguments for inward orientation that have been advanced in developing countries, the infant industry argument has without question been the most pervasive, and probably the most influential. This is in part

because it is an argument which is compatible with a range of market imperfections, and in part because it has a very obvious and very seductive appeal in a developing country context.

The crudest infant industry arguments are framed by reference to scale economies. The argument is quite simple. Established, mature producers benefit fully from scale economies. As a result they produce at minimum efficient scale and supply at minimum unit cost. So long as the scale curve is declining over the relevant range, developing countries are unable to compete. In Figure 3.3, established producers operate with unit costs of C_1, new entrants begin at C_2. They do not have the market share required to compete, nor are there any immediate prospects of acquiring that share. Thus temporary protection serves to raise the selling price of mature competitors. This allows the new entrant to expand capacity, gain market share and move down the scale curve. In time the infant matures and the protection can be removed. However, as Johnson (1970), Baldwin (1969) and others have argued, scale economies in themselves do not constitute a defensible argument for infant industry protection. After all scale economies are a pervasive feature of manufacturing activity in industrialised countries and the capital market has a mechanism for dealing with them: all 'infant' producers have to do is demonstrate that once scale economies are fully exploited, profits will be sufficient to offset initial losses and guarantee a rate of return at least equivalent to what could be earned elsewhere. However in a developing country the capital market may not exist! Even if it exists it may operate imperfectly. For example the inability to satisfactorily insure against possible inappropriate returns to investment in physical and/or human capital can result in first-mover disadvantages. Alternatively private discount rates may be significantly in excess of social discount rates. In such circumstances it is argued that infant industry protection is required. Since manufacturing activity is a key element in the industrial sector, and since the entire manufacturing sector may potentially be in its infancy, it follows that widespread protection of manufacturing is necessary. As with the other elements of structuralist thought we have discussed, there are counter arguments – again we will defer these until later.

3.4 Trade as a source of enrichment: neo-classicism

As we saw in Section 3.2, at a time when the influence of structuralist ideas was waning in the 1970s and 1980s the influence of neo-classical ideas was waxing. As we saw, this resurgence was partly associated with the perceived failure of structuralist policies and partly with a change in the intellectual climate. Fundamentally the revisionism is grounded on a belief that if markets are allowed to work in LDCs they will work. Even in the context of peasant economies, agents are claimed to be rational, optimising

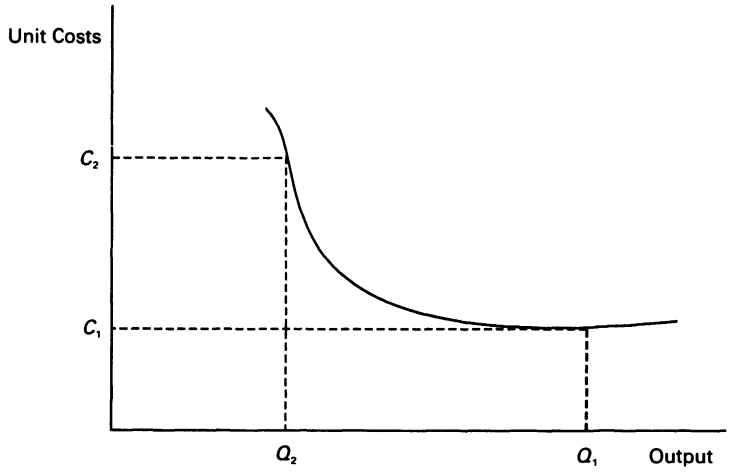


Figure 3.3 Unit costs and minimum efficient scale of production

subject to whatever constraints they face. In such circumstances international exchange, like intranational exchange, can be a source of enrichment rather than impoverishment. The sources of enrichment are argued to be static gains from interindustry exchange, dynamic gains from interindustry exchange and gains from intraindustry exchange. To underpin these sources of gain it is argued that the constraints alleged by structuralists are overstated. We shall deal with each of these in turn.

Static gains from interindustry exchange

The static gains from interindustry exchange are identified in Figure 3.4. In autarky the domestic price ratio is T_A, production and consumption taking place at a. The opportunity to trade at the price ratio T_T shifts the location of production from a to b, and consumption from a to c. The total gains from trade are represented by the shift from I_1 to I_3. Conceptually this gain can be broken down into two elements: a gain from specialisation and a gain from exchange. The latter can be isolated by bringing T_T back parallel to itself until it intersects the production frontier at a. In effect we are constraining production to the mix described by a, but allowing the country to exchange at the more favourable price ratio of T_T. This is a pure gain from exchange and can result without specialisation in production occurring. The benefit is represented by the move from indifference curve I_1 to I_2.

To benefit fully from trade, the economy's production mix has to be altered from a to b. When this occurs the net gain from specialisation results, that is the shift from I_2 to I_3. These gains from specialisation and

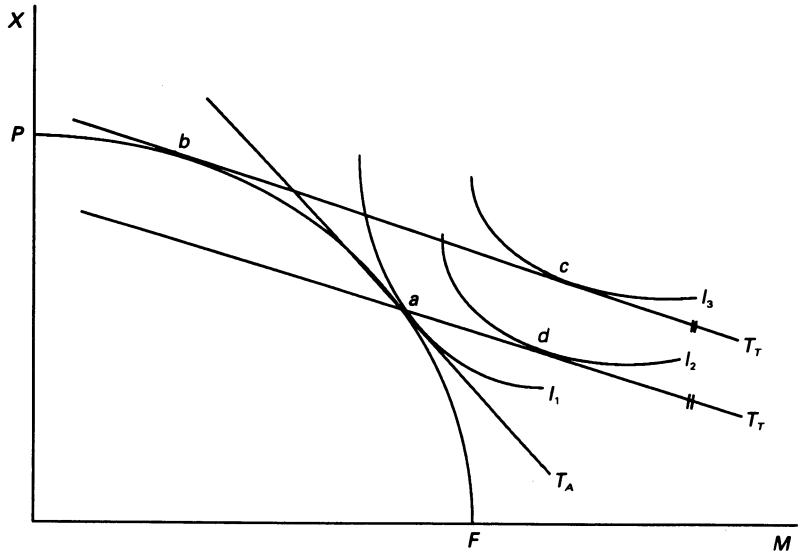


Figure 3.4 Static gains from trade

exchange are static gains in that they result from once and for all reallocations of resources. Placing orders of magnitude on these gains is rather difficult, if only because we rarely, if ever, have the opportunity to observe a discrete change from autarky to free trade. Analysts have however attempted to calibrate these gains via cost of protection analysis, in other words by calculating the static changes associated with tariff liberalisation. Typically these turn out to be of relatively small orders of magnitude (see Milner, 1985).

Dynamic gains from interindustry exchange

Most analysts argue that dynamic gains from interindustry exchange are quantitatively likely to be of greater magnitude than static gains. These can arise through various routes. If we stay within the confines of constant cost industries, the principal benefits arise from X-efficiency gains and a more rapid diffusion of technology. The former essentially refers to procompetitive effects of openness. If industries are sheltered they do not have an incentive to minimise costs. When exposed to international competition they have to eliminate management slack, overmanning and so on in order to meet that competition. The resulting gains are often labelled 'X-efficiency gains'.

Disentangling the contributory factors to economic growth is a notoriously difficult process. Most analysts argue however that technical change is the principal driving force behind the process. Growth-accounting exercises,

which break down actual growth into that due to augmentation of the stocks of labour and capital and that due to improvements in the quality of capital and labour, consistently identify quality improvements as being overwhelmingly important. These quality improvements go under the generic heading of technical change. The forces responsible for technical change – education, investment in R&D, innovation and so on are not easily analysed, nor are the empirical relationships precise. One thing is clear however, developing countries tend not to enjoy a comparative advantage in promoting technical change – indeed relatively slow rates of technical change is one of the distinguishing characteristics of developing countries. One can legitimately argue that openness will tend to be associated with a more rapid rate of technical progress than autarky, especially where developing countries are concerned. Many technical improvements are 'embodied' in goods. Thus even armslength trade can stimulate new developments by promoting new ideas, prompting copying and so on. Of course many technical developments are 'disembodied' from goods but embodied in capital – access here can be gained, and is gained, via foreign direct investment (FDI). Capital flows from north to south to benefit from relatively cheap labour. Joint ventures, licencing agreements and direct production all offer the potential for direct access to new technology and human capital improvements through learning by doing.

Not all productive activities operate under conditions of constant costs. Indeed where manufacturing activity is concerned, decreasing costs are pervasive. For the vast majority of developing countries the domestic market is too small to facilitate efficient exploitation of economies of scale. This is so because the minimum efficient scale of production (MES) in many industries will exceed the 'average' market in a 'typical' developing country. Thus to produce a product efficiently the target market must be global rather than domestic. The pervasiveness of scale economies ensures that this is a major source of potential benefit from trade.

Estimates of dynamic benefits are not easily arrived at. Computationally it is difficult to calibrate technical change or X-efficiency gains with real precision. Benefits from scale economies are more tractable – even here however there are problems. Nonetheless many studies have attempted to gauge orders of magnitude, particularly with regard to scale economies and technical change, albeit largely in the context of industrialised countries. These studies suggest that greater competition and scale economics may bring benefits which exceed the deadweight gains by a factor of six or seven (Cline *et al.*, 1978; Cox and Harris, 1985). A recent study of the 1992 programme in the EC argued that the benefits of technical progress resulting from market integration might exceed the benefits from scale economies by a factor of seven or eight (Baldwin, 1989). Even if these estimates are on the optimistic side, it could be argued that the potential dynamic benefits from trade in developing countries are considerable.

Static and dynamic gains from intraindustry exchange

The foregoing refers to potential gains from trade in an interindustry exchange context. One of the most marked features of postwar trade has been the expansion of intraindustry exchange (see Greenaway and Milner, 1986a). This tends to be most prevalent in trade between industrialised countries. However there has been a significant growth of such trade among developing countries in general and NICs in particular (Havrylyshyn and Civan, 1985). Moreover it is probable that as these countries industrialise intraindustry trade will increase in importance. The welfare analytics of the gains from intraindustry trade are still being explored. Qualitatively there are both similarities with and differences from those arising from interindustry trade. On the production side there are deadweight production gains and scale economy benefits, on the consumption side the standard gains from exchange are augmented by benefits from greater product variety. Whether collectively these are likely to exceed or fall short of the gains from interindustry trade is an open question which would have to be explored on a case-by-case basis. What is clear however is that there are net benefits associated with such trade and it is argued that the benefits can only be realised through a policy of openness.

Rent seeking and directly unproductive activity

Public choice analysis applies the tools of optimising behaviour to the analysis of political action. In recent years neo-classical economists have deployed this framework in assessing interest group behaviour in developing countries (see for example Bhagwati, 1984). From this analysis it is argued that economies which rely heavily on direct controls (such as import licencing procedures, import quotas, planning licencing and so on) create an incentive structure which generates rents. Thus, as we saw in Chapter 2, when an import quota is binding, rents accrue to those licence holders fortunate enough to be in possession of an import licence. In turn the existence of rents gives rise to rent seeking. Agents compete for the attention and favours of bureaucrats and politicians in an endeavour to secure the rents. As a result much if not all of the rents are dissipated in the process of lobbying (through bribes and time spent). This activity is unproductive in that it does not add anything to national output. Indeed, insofar as the resources invested have an alternative use, it may even deplete output. Thus this kind of activity is growth inhibiting rather than growth enhancing. It is argued that if a policy of free trade is followed, the kind of incentive structure which engenders this kind of directly unproductive activity cannot arise. As a result energies are diverted into productive activity and the level and rate of growth of national output are higher than they otherwise would be.

Evidence against structural problems

A final element in the neo-classical case in favour of trade as a source of enrichment is an appeal to the evidence on alleged structural problems. As we saw above, potential terms of trade decline, export instability and infant industries have been powerful arguments in the structuralist case for intervention and import protection. The ground here has been fiercely contested, and the evidence is at best inconclusive. After an exhaustive review of the evidence, Spraos (1980) claimed there was no discernible evidence of a decline in the terms of trade of developing countries. Sapsford (1985) among others has contested this, arguing that if one acknowledges the existence of a structural break around the time of the Korean War, a long-term decline is evident. Bleaney and Greenaway (1993) confirm this, albeit with a smaller time trend (0.5 per cent per annum). However they and others have argued that even if a long-term decline is found, its welfare implications are far from clear for two reasons: first because broad indices of primary commodity and manufactures prices take no account of quality changes, which are likely to be more important in manufactures; second because not all primary producers are LDCs, nor are all LDCs primary producers.

The evidence on export instability is also conflicting (see MacBean and Nguyen, 1988). It is not clear that the prices of primary commodities are any more unstable than those of manufactures. If they are, the importance of this would derive from the impact of export instability on growth instability. The evidence here is again conflicting, however some analysts point to a positive association between export instability and unstable growth, others can find no such association (see Stein, 1978 and Krueger, 1984).

The evidence on infant industry protection is arguably more conclusive – most infants appear not to reach maturity (see Bell, Ross-Larson and Westphal, 1984). Protection provides the infant with access to rents in sheltered market, politically it then becomes a problem to remove the shelter. As a result inefficient production takes place behind productive barriers. Some of the evidence suggests that this may not be a feature of infant industry protection per se but rather of the form in which the support is given, namely a protected environment that relies heavily on direct controls.

This brings us to the final point to be made in this section – optimal intervention. The response of policy makers in many developing countries to alleged distortions such as unstable export prices, or infant industries, has been to provide protection from imports. As we saw in Chapter 2, there are alternative instruments for providing support. More importantly these instruments are not perfect substitutes for each other. For a given distortion it is possible to rank instruments of intervention according to the by-product distortions they create. To the neo-classical economist this is a

crucially important point for the following reason: even if we find evidence of terms of trade decline and/or export instability and/or infant industries it does not follow that protection is the optimal form of intervention. Invariably some alternative instrument will be more efficient: in the case of terms of trade decline/export diversification via direct subsidies; in the case of export instability, price stabilisation through hedging or buffer stocks; in the case of infant industries, support through R&D or training subsidies. Appropriate instruments have a chance of efficiently correcting the distortion; inappropriate instruments may actually make the situation worse.

3.5 Policy orientation and trade policy

Before going on to the main theme of this book, namely techniques of policy appraisal, we will conclude Part I by clarifying how trade policy interlocks with the other levers of economic policy, and considering how the overall posture or orientation of policy can feed back onto trade policy.

Chart 3.1 schematically outlines the levers of economic policy. For purposes of exposition it is possible to distinguish between macroeconomic, microeconomic and social policy. Macroeconomic policy is directed at influencing the overall *level* of economic activity in the economy. Thus the classic targets of macropolicy are the rate of growth of national income, the level of unemployment, the rate of change of prices and aggregate payments balance. The instruments generally assigned to these targets are fiscal policy, monetary policy and exchange rate policy.

In contrast microeconomic policy is primarily concerned with influencing the *allocation* of resources across activities – the balance between industry and agriculture, between heavy industry and light industry and so on. To this end governments can make use of such instruments as competition policy, industrial policy and labour market policy. Thus anti-trust legislation could be used to expand output in monopolistically-controlled industries, or training subsidies could be offered to increase employment in manufacturing vis-à-vis non-manufacturing and so on.

Finally, social policy is essentially concerned with the *distribution* of resources between individuals and groups. Unfettered markets may generate distributional outcomes that are not regarded as socially optimal. A variety of instruments may be deployed to alter this distribution. For instance income transfers to low income groups, or income in kind via education and health which are free at the point of consumption.

All of the foregoing is in terms of the primary thrust of each of these types of policy. It is important to recognise that there will be secondary effects. Thus it is plausible, perhaps even inevitable, that microeconomic policy will impact upon the distribution of income, that social policy will influence the allocation of resources across activities and so on. Despite the fact that this may be so, the distinction being made is a useful one, and not

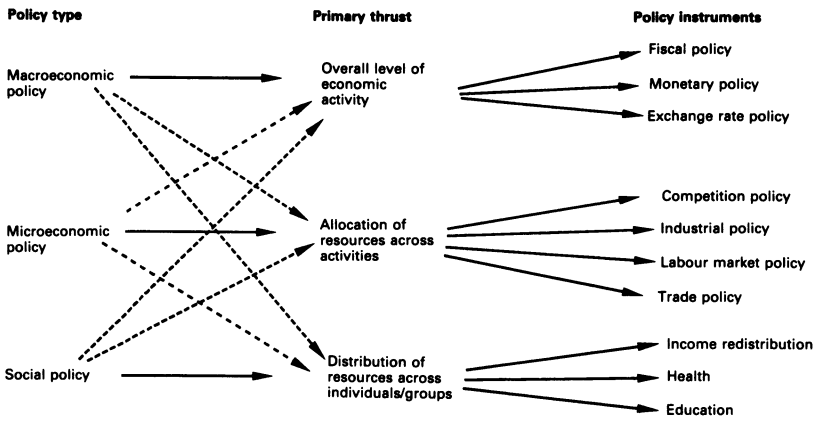


Chart 3.1 The levers of economic policy

simply for expositional convenience. In evaluating policy intervention one needs to assign policies appropriately. Thus, even if particular microeconomic policy instruments have macroeconomic effects, this is *not* an argument for using microinstruments to meet macroobjectives (or vice versa). This is an important principle which helps us in the appropriate classification of trade policy: trade policy is primarily an instrument (or to be more accurate, a collection of instruments) of microeconomic policy. As we saw in Chapter 2, protection is a relative concept. If one introduces an import tariff its purpose is to encourage production in the import substitute sector *relative to* the export sector (and vice versa with an export subsidy). We are therefore dealing with an instrument aimed at influencing the allocation of resources across activities. Trade policy can have macroeconomic consequences – even the GATT charter acknowledges this by sanctioning (under Article XII) temporary protection during balance of payments crises. Likewise it has consequences for the distribution of income – via the use of tariff revenue or the distribution of rent-yielding quota licences. This does not however mean that trade policy should be used to meet these objectives. As a general rule it should not. If trade policy has consequences for the level of macroeconomic activity or the distribution of income, then these should be countered by appropriate macroeconomic or social policies. This is not however always the case because the precise form which trade policy takes can be conditioned, at least in part, by a country's overall policy orientation.

Chart 3.2 outlines a scheme of alternative policy orientations. Of necessity this is simplistic and later in the volume we can consider possible extensions and embellishments. For the moment however it is an instructive basis for classifying further an important distinction already made – namely that between dirigisme and laissez-faire. Both are very general

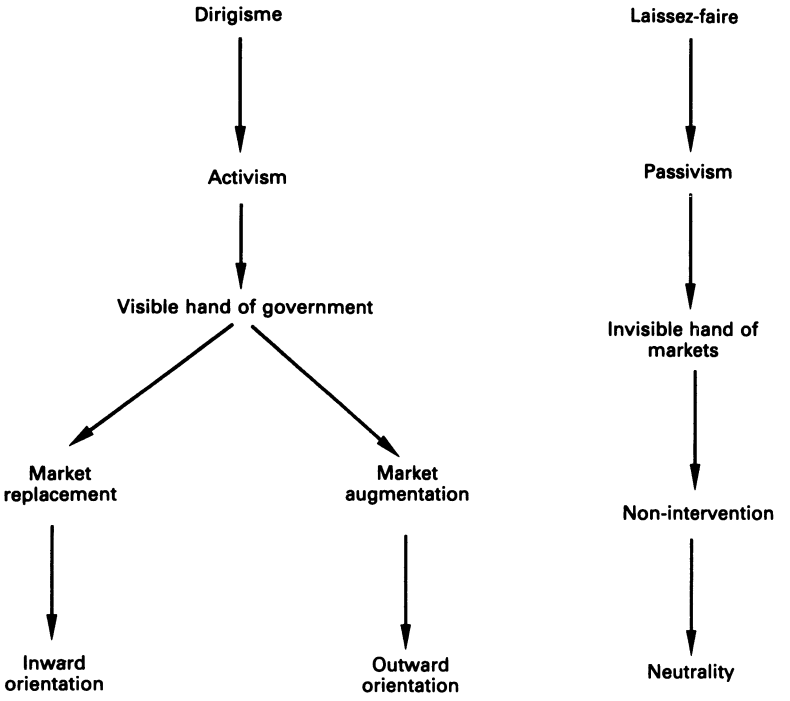


Chart 3.2 Alternative policy orientations

terms which describe the broad thrust of policy. It is important to note at the outset however that these terms cannot and should not be equated in any simple way with structuralism and neo-classicism.

Dirigisme describes a willingness on the part of the policy maker to become involved in all aspects of economic policy in a very active manner. Dirigiste policy is therefore activist policy guided by the visible hand of government. In its broadest sense dirigisme can be consistent with structuralist or neo-classical philosophy depending on what the precise role of government is seen to be. If this is in line with the structuralist vision of pervasive market failure then intervention will be pervasive, and very likely inward oriented. This is so by virtue of the extent of intervention perceived as necessary. Investment is controlled via planning licences; entry and therefore output is regulated; factor rewards may be constrained by minimum wage regulations; prices regulated by price controls and so on. If policy has this kind of thrust, trade policy is likely to emphasise import licencing, quantitative restrictions and the like. These are the kinds of instruments which provide the planner/regulator with most control. When trade policy analysts talk of dirigiste, inward-oriented regimes this is very much what they have in mind. As we shall see later, economies such as India, Nigeria and Tanzania have been held out as good examples of this form of regime.

Intervention however may also be a feature of a regime based on neo-classical principles, although its scale and form will differ from a structuralist scenario. As we saw earlier, neo-classical prescriptions on economic policy are guided by the principles of effective market classification and optimal intervention. Where market failure is found to exist, the policy maker should respond by appropriately assigning instruments to targets. This involves careful analysis of the relationships concerned and assigning policies in order to minimise by-product distortions. Fundamentally policy is directed at market augmentation rather than market replacement. The presumption is that with appropriate surgery, markets can continue to function well even where market failure precedes the surgery. This means there will be a tendency to rely upon market-based instruments such as subsidies and tariffs. Moreover, insofar as the intention is to reinforce market tendencies, it is likely to mean that the resultant policy orientation is outward. Thus although outward orientation is often associated with non-intervention, in fact it is a policy posture which generally results from interventionist policy, albeit interventionism aimed at market augmentation rather than market replacement. The strategy followed by South Korea is a good example of this.

Laissez-faire is qualitatively different. Whereas dirigisme is characterised by activism, laissez-faire is characterised by passivism. With the possible classic exceptions of defence, the judiciary and administration, everything is left to the invisible hand of markets. One does not need to worry about market imperfections because they are either trivial or transient. Thus so long as entry is free, monopoly cannot be a problem; externalities need not be a problem so long as agents can pursue claims on property rights to clean air, unpolluted rivers and so on through the courts. Non-intervention to this extent would be associated with the neo-conservatism of Bauer discussed earlier. From the standpoint of trade policy, the relevant outcome would be a posture of neutrality, that is classical free trade. There is no intervention whatsoever to support the import substitute sector or the export sector. Hong Kong is probably the sole example of this strategy in recent decades.

The terms we have used in this section are conceptually fairly precise. In practise however they are often difficult to apply. This is so for several reasons. First, countries often pursue mixed strategies, that is policy packages that combine elements of dirigisme and laissez-faire. Second, through time the emphasis of policy may change from dirigisme to laissez-faire, and vice versa. Third, there are no widely accepted, unambiguous indicators of policy orientation. From the practical standpoint, the last of these is particularly intractable. Some analysts have proposed alternative indicators. For example Agarwala (1983) reports a distortion index that is an unweighted average of seven different types of price distortion index (ranked as severe, less severe, and so on). Greenaway and Nam (1988) worked with a four-way classification which ranged from strongly outward

to strongly inward oriented. Countries were classified using a wide range of information on, *inter alia*, effective protection, reliance on direct controls and exchange rate overvaluation. Krueger (1978) worked with a bias indicator calculated to reflect any distortions between domestic and world prices. All of these are useful, but not one is foolproof. For most dirigiste and most laissez-faire economies these indicators at least all point in the same direction. Inevitably it is in the intermediate cases that one faces most difficulties.

For the remainder of this book we shall use the terms in the senses discussed in this section. Thus neutrality in trade policy will denote free trade; inward orientation will denote active intervention to promote the import substitute sector; and outward orientation, active intervention to support the export sector.

3.6 Concluding comments

Like Chapter 2 this has been a scene-setting chapter. In Chapter 2 we were concerned with identifying the tools of trade policy. Here we have been concerned with the links between trade policy and development. We have seen that over the postwar period thinking on trade policy and development has evolved quite dramatically. In the early decades after the Second World War structuralism was in the ascendancy. This emphasised market failure as a pervasive feature of developing countries and stressed the role of active intervention. More recently neo-classical ideas have enjoyed something of a revival. Greater optimism with regard to the role markets can play in development is a recurring feature of these ideas. Both these schools of thought have exerted an impact on policy orientation in developing countries. Equipped with this background we are now in a position to proceed to Parts II and III and an evaluation of the tools of policy analysis.

PART II

TOOLS OF POLICY EVALUATION: PARTIAL ANALYSIS

CHAPTER 4

The Structure of Nominal Protection

4.1 Introduction

Part I of this volume was concerned with setting the scene for policy appraisal. There we reviewed arguments for inward and outward orientation and evaluated the impact of tariff and non-tariff measures in some simple models. These were essentially by way of revision. Now we turn our attention to estimating the impact of intervention. Some of the approaches we will evaluate are partial equilibrium, some are general equilibrium. Part II is devoted to partial equilibrium approaches.

In this chapter we begin by focusing on the initial impact of intervention. In order to estimate concepts such as effective protection, or to calibrate CGE models, we need the raw material of information on tariff and non-tariff measures. How do we acquire such information and/or estimate it? In the case of tariffs this may appear to be a non-question, after all does one not simply look at the tariff schedule? The answer to this question is 'yes and no'! 'Yes', one does begin with the schedule but 'no' it may not tell the whole story if there are exceptions, exemptions and so on. These and other aspects of estimating nominal tariffs are addressed in Section 4.2. As we have seen in Chapter 2, non-tariff measures are pervasive in developing countries and we need to be able to identify their extent and, if possible, estimate their tariff equivalence. This is the subject of Section 4.3. In Section 4.4 we report some evidence on both tariff and non-tariff measures. Finally in Section 4.5 we offer some concluding comments.

4.2 Measuring nominal tariffs

In terms of frequency, tariffs remain the most widely-used instrument of commercial policy in developing countries. Many of the measures we will discuss in subsequent chapters are concerned with evaluating the economic

impact of tariffs in one way or another; by evaluating their restrictiveness, or their potential impact on resource reallocation, or their welfare effects. Before doing any of these things however we need to be able to clearly identify an import or export tariff, as well as being able to measure it. At one level this is quite straightforward: a tariff is an indirect tax, its rate is set by the fiscal authorities and, once set, is published in the tariff schedule as in Table 4.1 which, for illustrative purposes, reproduces a section from the tariff schedule of the Ivory Coast. The rates reported therein are the practical equivalent of the rate t in Figure 2.1. Thus, measuring nominal tariffs may be no more difficult than reading or even, given modern information technology, scanning a tariff schedule. The practicalities are however somewhat more complicated for four reasons: (1) the existence of secondary tariffs; (2) exceptions and exemptions to the scheduled tariff; (3) tariff redundancy; (4) aggregation problems. Let us consider each of these in turn.

Table 4.1 Extract from the tariff schedule of the Ivory Coast

Code	Chapter 15 Vegetable Oils *Product*	Tariff rate *(per cent)*
15–07–21	Soya oil – unrefined	6
15–07–24	Soya oil – refined	5
15–07–25	Cotton oil – unrefined	6
15–07–28	Cotton oil – refined	5
15–07–31	Groundnut oil – unrefined	6
15–07–34	Groundnut oil – refined	5
15–07–35	Olive oil – unrefined	6
15–07–36	Olive oil – refined	5
15–07–41	Sunflower oil – unrefined	6
15–07–44	Sunflower oil – refined	5
15–07–45	Mustard seed oil – unrefined	6
15–07–48	Mustard seed oil – refined	5
15–07–51	Linseed oil – unrefined	6
15–07–54	Linseed oil – refined	5
15–07–61	Palm oil – unrefined	4
15–07–64	Palm oil – refined	1.5
15–07–65	Coconut oil – unrefined	4
15–07–68	Coconut oil – refined	6
15–07–81	Sesame oil – unrefined	6
15–07–81	Sesame oil – refined	5
15–07–91	Other vegetable oils – unrefined	6
15–07–94	Other vegetable oils – refined	5

The existence of secondary tariffs

One of the reasons why liberal-minded economists favour tariffs over direct controls is their transparency: being indirect taxes they operate through the price mechanism and their price-raising effects are clearly visible. It is not unusual in developing countries to find, however, that the waters are a little bit muddied by the presence of other forms of interven-

Table 4.2 Nominal tariffs in Mauritius, 1980 (in per cent)

Activity	*Nominal tariff*	
	scheduled	*plus secondary tariffs*
Beverages	188	220
Tobacco	300	332
Textiles	13	45
Clothing	48	80
Leather products	75	107
Footwear	50	82
Wood products	25	57
Furniture	88	120
Paper products	40	72
Printing	16	48
Basic chemicals	5	37
Other chemicals	29	62
Rubber	53	85
Plastic	20	52
Glass	40	72
Base metals	2	34
Fabricated metals	32	64
Lime etc.	21	53
Non-electrical machinery	19	51
Electrical machinery	41	53
Transport equipment	70	102
Watches and lenses	37	69
Arithmetic mean	55.1	86.2
Standard deviation	65.8	66.0
Coefficient of variation	1.19	0.76
Range	2–300	34–332

Source: Greenaway and Milner (1989).

tion which do not go under the heading of 'tariffs" but which de facto are tariffs in that they apply discriminatorily to imported products. Such interventions might go under the heading of fiscal duty, or stamp duty, or import surcharge, or import surtax, or special levy, or even statistical tax! All of these are actual taxes which are in fact tariffs, and have been identified by the authors in case-study work. One might legitimately enquire why it is necessary for governments to have more than one import tariff, with some masquerading under different names. The most common reason is that they are introduced as part of a crisis package, often as alleged temporary measures. Developing countries are heavily dependent on trade taxes for government revenue. Faced with a need to raise taxes, it may be politically expedient to do so in the form of a new measure packaged as temporary. This increases the opacity of the action.

Whatever the justification for this proliferation it makes measurement more difficult. This would not be a great cause for concern if the measures in question were set at negligible rates. Often however these levels are well beyond nuisance values. Table 4.2 illustrates the impact of including hidden tariffs in the calculation of total nominal rates in Mauritius in 1980.

Then, as well as import tariffs and fiscal duty there was also an import surtax and stamp duty. These secondary tariffs added 32 per cent to the primary tariff, a non-marginal increment. In evaluating nominal protection it is important to seek out and incorporate these secondary tariffs.

Exceptions and exemptions to the scheduled tariff

The tariff rates reported in Table 4.1 for the Ivory Coast do not apply to all imports. Different rates apply to imports from different sources. Specifically, the Ivory Coast is a member of two different preferential trading arrangements (PTAs), ECOWAS and CEAO,[1] to which lower rates of tariff are applied. This is not at all uncommon. Of the 22 main preferential trading arrangements worldwide in 1990, 19 were agreements between developing countries involving over 90 different countries. So long as the preferential rates (which could of course be zero) apply to some share of imports, the implicit tariff will be less than the scheduled tariff. (These can also be referred to as ex-post and ex-ante rates respectively.)

The implicit, or ex-post, rate can be easily calculated as follows:

$$tp_i = \Sigma TR_i / \Sigma P_i Q_i \tag{2.1}$$

where tp_i is the implicit tariff for product i, ΣTR_i is total customs collections for i and $\Sigma P_i Q_i$ is the total value of imports of i.

Thus the implicit tariff is that rate implied by actual customs collections. The method of calculation allows one to take account of duty-free and preferential-rate imports. Moreover it turns out that tp_i is a weighted average of all of the rates that apply, with the weights being the share of imports from each source. This can therefore be a very useful measure, although it is not problem free.[2] As we shall see below, it is sensitive to aggregation. Moreover it may also be sensitive to underinvoicing of import value if the tax is graduated (but not of course if the same rate applies to all imports) or corruption of the bill of origin. Notwithstanding these complications, this remains a useful and quite widely-used measure of nominal protection. Table 4.3 reports ex-ante and ex-post tariffs for Burundi for illustrative purposes. As one would expect, the ex-post rates are always less than the ex-ante rates, given the fact that some imports enter at less than the scheduled rates, partly due to Burundi's membership of several regional PTAs[3] and partly as a consequence of preferential rates applying to some 'priority imports' under the country's investment code.

Tariff redundancy

The concept of a redundant tariff is straightforward. It means exactly what its name implies, a tariff which has no impact on the level of imports. Why bother to introduce such a tariff in the first place? one may be tempted to

Table 4.3 'Ex-ante' and 'ex-post' nominal tariff rates for Burundi 1984

Product	*'Ex-ante' rate (%)*	*'Ex-post' rate (%)*
Coffee	154	148
Tea	154	114
Cigarettes	154	77
Concentrated milk (sugared)	31	0
Biscuits	104	57
Envelopes	46	39
Batteries	104	98
Cement	9	3
Sheets of corrugated iron	24	0
Paint (water)	64	2
Acetylene	19	0
Car tyres	36	33
Mineral water	104	75

Source: Greenaway and Milner (1990b).

ask. Perhaps the redundant tariff is a theoretical curiosm? In fact it is a relatively common phenomenon in developing countries. An obvious source of a redundant tariff is where an import prohibition applies to a given product but that same product has a scheduled tariff rate, possibly because the latter preceded the former. As we noted earlier, incrementalism is a common characteristic of the evolution of protectionist regimes. Another possibility is that the tariff rate is set above the prohibitive tariff. In such circumstances not all of the tariff is redundant, only that part beyond the prohibitive rate, a phenomenon sometimes referred to as 'water in the tariff'.

When measuring nominal protection, tariff redundancy can create problems, especially if we rely upon ex-ante/scheduled tariffs. In the event that there is some degree of redundancy, scheduled tariffs will overstate nominal protection. The phenomenon is less worrisome if we are using ex-post/implicit tariffs – clearly redundant tariffs do not yield revenue. This then is another reason why it might be preferable to rely on ex-post rather than ex-ante tariffs.

Aggregation problems

We measure tariffs because we are interested in their economic effects, in particular their impact on resource reallocation. For this purpose, as we shall see in subsequent chapters, we combine tariff line data with production data. Invariably however the former is much more disaggregated than the latter. Typically in developing countries, tariff lines run to thousands of items whilst production/input–output categories run to dozens of items. Thus, for instance when calculating nominal or effective protection for a

given industry, one has to average data across a large number of tariff lines. A comparison of the components of Tables 4.1 and 4.2 gives an indication of the differences in detail with which we are dealing.

The process of averaging invariably creates problems. A simple average may not be terribly meaningful if it embraces a large number of lines covering different products and different sources of supply. Some kind of weighted average is invariably superior although the choice of weighting system is an issue: does one weight according to share of imports or share of domestic value added? The answer to this will be fashioned by the purpose to which the estimates are being put and, more importantly, data availability. The latter tends to be the key consideration. One often-used expedient is to calculate the ex-post tariff at the 'industry' level. As we saw earlier, this measure has the virtue of being a weighted average of sub-group tariffs, with the weights being the share of imports of different sub-groups in the total. If different origins of supply for a given product were the only source of differences in tariff rates this would be a reasonably satisfactory measure. Unfortunately however, when we work at relatively high levels of aggregation it is not. Different products from a given source that attract different rates become aggregated. This can make the resultant ex-post tariff more difficult to interpret. Moreover the measure is also known to be sensitive to changes in product composition through time. When working at relatively high levels of aggregation therefore, this measure must be used with some caution.

4.3 Measuring non-tariff barriers

Our discussion in Chapter 2 revealed that there are intrinsic problems associated with identifying non-tariff measures (NTMs). This is so because of grey areas between trade policy, industrial policy, investment policy and even fiscal policy. It is also hampered by the fact that there is a strong incentive on the part of governments not to disclose particular measures if at all possible. These problems clearly carry over to complicate measurement.

Assuming one can identify measures, there are two distinct approaches to quantifying NTMs – documentation and restrictiveness. The former essentially involves attempting to evaluate the extent of non-tariff protection and is sometimes referred to as the inventory approach; the latter attempts to go further in calculating the extent to which a given NTM influences prices and is sometimes known as tariff equivalence analysis.

Documentation of NTMs

A number of organisations, most notably UNCTAD and The World Bank, have amassed substantial inventories of NTMs, largely though not exclus-

ively in industrialised countries. These data sets record the presence of NTMs at the tariff line and two different measures have been devised to summarise the information, namely the *frequency ratio* and the *coverage ratio*. The frequency ratio (*Fj*) is estimated as:

$$Fj = \sum D_i N_i / \sum N_t \tag{2.2}$$

where D_i is the dummy variable, which takes a value of unity if one or more NTM applies to the product line i, and ΣNt is the total number of product lines in the import category.

Clearly the measure basically adds up the number of product lines subject to NTMs and expresses these as a proportion of all products, hence the term frequency ratio. The measure clearly has the virtue of simplicity, both in its computation and its interpretation. Thus a ratio of 0.6 tells us that 60 per cent of all imports in a given product line are subject to NTMs. Against this however the measure has a number of important limitations. First of all, and perhaps most obviously, NTMs are recorded as present or absent. Thus it does not matter if product *m* has four NTMs whilst product *n* only has one; both enter the ratio with equal weight. Second, and related to the previous point, it is implicitly assumed that all measures are equally restrictive. In other words a quota on product *r* is treated in the same way as one on product *w*, even if the former only applied to 10 per cent of the market, whilst the latter applies to 90 per cent. Thus although variations in the ratio through time can give some idea as to trends in the use of NTMs, they have to be interpreted cautiously.

The coverage ratio is calculated differently, as follows:

$$C_j = (\sum D_{i,t-m} V_{i,t-n}) / \sum V_{t,t-n} \tag{2.3}$$

where D_i is as before, V_i is the value of imports affected by the NTM and V_t is the value of total imports.

Clearly what this ratio does is record the share of trade in a given product range subject to NTMs, hence the term coverage ratio. It is in fact analogous to the ex-post tariff. Because it incorporates import values it may appear to have a higher information content than the frequency ratio. However it shares its limitations in that non-tariff barriers are only recorded as present or absent, with no regard to their restrictiveness. In fact it may even be misleading regarding restrictiveness, depending upon the trade weights used. If the country's own trade weights are used then heavily restricted items enter with a low weight because the amount of trade taking place is restricted to a relatively low level. Clearly then the ratio is biased downwards. In practise analysts attempt to get around this problem by using global trade weights rather than own-country trade weights.

Tariff equivalence analysis

One can draw closer to proxying restrictiveness by calculating the tariff equivalent of a given NTM. What this involves is estimating the price-raising effect of the measure P_wP_Q in Figure 2.5. This does not of course give us full information on the economic impact of the measure, we would need information on demand and supply elasticities for that. What it does do is provide us with a measure of restrictiveness that is presented in the same terms as a tariff and can be readily compared with a tariff. Moreover it presents the information in a form which can then be used in investigating resource allocation effects using the techniques outlined in subsequent chapters.

What we want to get at with tariff equivalence analysis is the extent to which a particular measure raises the domestic price of the product concerned above the world price. For some of the measures listed in Table 2.1 this is well nigh impossible, for instance with 'import surveillance measures' or additional customs formalities. With some of the measures however there are procedures for estimating the price wedge.

For illustrative purposes, let us focus on an import quota. There are several ways in which the price-raising effect of a quota can, in principle, be estimated, namely *direct price comparisons*, *border price comparisons* and *border price–final price comparisons*. The first of these involves comparing the price prevailing in the quota-restricted situation with the price of an identical commodity in an unrestricted 'control'. In cases where this method has been used, Hong Kong has often been taken as the free-trade control. This approach has certain merits. It can be applied to identical products and one can rely upon the prices at which trade actually takes place. However one must be confident that supply conditions in the sample and control countries are similar. Moreover one is dealing with quotas that are not source specific. Where quotas are source specific, foreign exporters are generally in a position to capture the rent and the border price is inclusive of the quota rent. In those circumstances border-price comparisons might be the appropriate methodology. This involves comparing the border price of the restricted commodity in the restraining country with the border price in a country without restraints. The great advantage of this approach is that trade data for the computation of import unit values tends to be readily accessible. Against this however, one faces the difficulty of obtaining information on transportation costs in order to make the required adjustment to border prices.

The method of 'border price–final price' comparisons involves, as the name suggests, a comparison of border prices of a given commodity with retail prices of the same commodity. The former is taken as a proxy for the world price, the latter for the domestic distorted price. This methodology has certain features which commend it. First, one can make comparisons with an identical product. Second, the commodity concerned is entirely

specific to the economy in question and there is no need to make cross-country comparisons. Third, the methodology is applicable to cases where there are general rather than source-specific quotas, which tends to be the typical situation in developing countries. Against this however, the major problem is one of 'stripping out' other influences on the border price–retail price wedge – import tariffs, retail margins and sales taxes for instance.

4.4 The extent of tariff and non-tariff protection

So much for techniques and problems of measurement; what of actual results? To some extent we need not spend a great deal of time on this as some of the specifics will be drawn out in later chapters and we have already commented briefly on these in Chapter 2. As we saw there, in Table 2.1, tariffs in developing countries are generally higher than those in industrialised countries. Developing countries have not been obliged to reciprocate in the GATT process of trade liberalisation and they have been allowed greater discretion in terms of introducing new tariffs under Article XVIII(b) of the GATT Charter (which covers action for balance of payments reasons). Developing countries also make more extensive use of tariffs for revenue purposes and to support infant industries. These are of course generalisations which have to be qualified in at least two important respects. First, as we have seen, some countries are more inward oriented than others and place greater reliance on tariffs than others. Second, considerable trade liberalisation has taken place recently in developing countries (see Whalley, 1991). Despite this the fact remains that for the most part tariff protection in developing countries exceeds that which we typically observe in industrialised countries.

As we emphasised at the outset, with so many countries in the set 'developing' there are dangers in generalising. Equally there are dangers in focusing on particular cases for illustrative purposes. Nevertheless it is helpful to take a few examples for discussion. Table 4.4 reports nominal tariffs for a number of East Asian countries, whilst Tables 4.5 to 4.8 report similar information for several African countries. Table 4.4 breaks down the information by tariff ranges, whilst Tables 4.5 to 4.8 categorise by product ranges. As one would expect, average nominal tariffs differ from one country to another. There is some tendency for tariffs to be lower in East Asia than in Africa, but one would anticipate this on a priori grounds from what is known about trade orientation in the two regions. The averages reported in these tables are certainly higher than those observed for industrialised countries and there are a greater number of 'tariff peaks'. Again, given what we know of the structure of protection, this much we would expect. One thing that does not show through especially clearly in these tables is tariff escalation, that is nominal tariffs which increase with the stage of production. The sample information is not rich enough to

Table 4.4 Nominal tariff structure and changes for East Asian countries (per cent share)

	Korea		*Indonesia*		*Malaysia*		*Philippines*		*Thailand*	
	1980	*1985*	*1980*	*1984*	*1979*	*1982*	*1979*	*1984*	*1981*	*1985*
Tariff range:										
0–10	22.5	24.4	32.7	52.8	—	—	23.5	33.4	34.2	17.3
11–30	57.2	59.1	33.3	37.1	—	—	29.8	40.9	39.4	34.8
31–60	19.0	15.5	25.9	9.5	—	—	15.8	20.3	13.8	43.4
>60	1.3	1.0	8.2	0.5	—	—	31.0	5.3	12.5	4.6
Average nominal tariff (unweighted)	25.0	21.9	28.0	23.0	11.6	13.6	43.0	29.0	31.0	34.0

Source: World Bank (1987).

Table 4.5 Comparison of protection from tariffs and quantitative controls for selected products; Ivory Coast, 1971 and 1978

	1971		*1978*	
Product	*Nominal protection: tariff*	*Nominal protection: quota*	*Nominal protection: tariff*	*Nominal protection: quota*
Canned and processed food:				
Instant coffee	37	106	37	97
Cocoa powder	35	–	25	–
Cocoa butter	40	–	40	–
Cocoa powder	35	–	40	–
Textiles:				
Cotton grey yarn	27	35	27	28
Cotton grey cloth	35	56	45	40
Fancy prints	40	72	50	68
Wax prints	45	120	50	123
Synthetic cloth	45	146	45	101
Blue denim	–	–	45	97
Blue jeans	–	–	50	68
Cotton blankets	35	–	45	50
Jute bags	30	103	40	249
Sisal bags	20	62	30	145
Chemicals:				
Matches	15	276	30	50
Oil paints	40	47	40	55
Insecticides	20	32	20	20
Ammonium sulphate	–	–	2	6
Superphosphates	–	–	5	6
Other mineral or chemical fertilisers	–	–	5	6
Other salts and peroxy-salts of inorganic acids	–	–	5	6
Sulphuric acid; oleum	25	41	10	6
Chemical fertiliser	0	0	–	–
Plastics:				
Pipes and tubes	–	–	25	30
Average (unweighted)	31	84	31	63

Source: Roger (1985).

Table 4.6 Comparison of protection from tariffs and quantitative controls for selected products, Mauritius, 1984

	Nominal protection: tariff	*Nominal protection: quota*
Foods:		
Jam/Marmalade	12	30
Biscuits	12	*
Sugar confectionery	48	64
Refined salt	12	48
Other consumer products:		
Autocycles	103	*
Bicycles	36	*
Dry cell batteries		
UM1	73	*
UM2	73	*
UM3	73	83
Electric bulbs	24	36
Matches	133	172
Socks	48	*
Brassieres	73	*
Agarbathis	73	83
Toilet paper	73	*
Toothbrushes	73	122
Toilet soap	73	*
Fridge/freezers	103	*
Television sets	103	*
Motorcycles	133	*
Industrial products:		
Poultry feed	12	*
Black steel tubes	24	34
Welding electrodes	48	72
Automotive lub. oil	14	*
Automotive filler	36	*
Paint brushes	73	133
Zip fasteners	73	109
Cotton sewing thread	48	55
Gumboots	73	*
Average (unweighted)	60	80

Source: Roger (1985).

* Tariff equivalent within 5 percentage points of actual tariff. Quota not binding.

Table 4.7 Comparison of protection from tariffs and quantitative controls for selected products, Zambia, 1981

	Nominal protection: tariff	*Nominal protection: import controls*
Consumer goods:		
Breakfast food	0	3
Wheat flour	0	–10
Cooking oil	43	94
Margarine	32	71
Soaps and detergents	43	87
Cotton cloth	49	67
Suiting material	49	67
Bicycles	0	47
Metal furniture	120	143
Intermediate goods:		
Polyethelene bags	43	81
Fertiliser	0	–4
Jute products	43	50
Plywood and block board	27	23
Portland cement	0	62
Capital goods:		
Structural metal products	43	104
Trailers	18	31
Average (unweighted)	32	57

Source: Roger (1985).

Table 4.8 Tariffs and tariff equivalents for a sample of products, Burundi, 1984

	Nominal tariff	*Unadjusted tariff equivalent*[1]	*Adjusted tariff equivalent*[2]		
	%	*%*	*M =10%*	*M =20%*	*M =30%*
Milk (sweet concentrate)	31	190	160	135	113
Butter (salted)	54	0	0	0	0
Cheese	106	209	169	136	108
Salt	19	667	594	533	482
Sugar	9	115	93	75	60
Milk (powdered)	31	399	349	308	273
Jams	111	339	287	243	206
Margarine	29	92	79	60	44
Biscuits	104	185	148	116	89
Vinegar	69	256	215	182	153
Roasted coffee	154	5	0	0	0
Wine	36	73	52	35	21
Vermouth	65	121	93	70	50
Spirit (methylalcohol)	87	0	0	0	0

Table 4.8 continued

	Nominal tariff	*Unadjusted tariff equivalent*[1]	*Adjusted tariff equivalent*[2]		
	%	%	*M* =10%	*M* =20%	*M* =30%
Shirt (male)	59	114	88	65	47
Shoes (male)	36	189	158	132	110
Shoes (female)	36	46	28	13	0
Shoes (children)	36	55	36	20	7
Polish	57	262	222	189	161
Soap powder	57	0	0	0	0
Soap (toilet)	57	98	73	53	35
Tooth brush	51	395	344	300	264
Typewriter	49	0	0	0	0
Calculator	49	0	0	0	0
Cement	9	8	0	0	0
Rolled metal	14	39	24	11	0
Corrugated iron	24	508	449	400	359
Car tyres	36	155	127	104	84
Trucks (over 5 tons)	19	149	123	102	84
Tobacco	154	297	262	232	207
Cigarettes	154	0	0	0	0
Tea	154	154	115	81	53
Flour (wheat)	9	66	49	35	23
Average (unweighted)	59	157	131	110	92

Source: Greenaway and Milner (1990b).

Notes:
1. No adjustment for profit.
2. Adjustment for alternative profit margins(M).

reveal this strongly, although some evidence is apparent (for example in The Ivory Coast and Burundi). We will comment on this further in the next chapter, when we focus on effective tariffs. Finally, note that these tables do not reveal evidence of tariff liberalisation. This does not contradict the earlier observation that in recent years there has been marked liberalisation in a number of developing countries, including some of those covered by the tables. Rather it reflects the time periods covered by the data reported. We will report evidence of this in Part V.

In Chapter 2, as well as earlier in this chapter, we referred to the difficulties of obtaining good information on NTMs: both on their presence and their restrictiveness. Tables 4.9 and 4.10 provide some illustrative details of NTMs in the five Asian countries for which we report tariff data in Table 4.4. Finally, Tables 4.5 to 4.8 report estimates of the tariff equivalence of QRs alongside the estimates of nominal tariffs discussed earlier. As with tariff data, this information is selective, being dictated by data availability. For the countries concerned it does seem as though NTMs are quite widely deployed. Moreover it also appears that they are generally a more restrictive form of protection than tariffs. This is not of course a sufficiently large sample upon which to base strong conclusions.

Table 4.9 Non-tariff trade barriers in East Asian countries

	Banned products	*Import quotas*	*Import licensing*	*Local content programmes*
Indonesia	27 products banned: vehicles, TVs, tyres, matches, etc.	Yes – linked to licensing system but fewer (300 items)	Yes – covers 17% import items	Yes – vehicles, generators, machine tools, tractors.
Korea	Few	Yes – quotas aimed unilaterally	12% of import items require import approval	Localisation for infant industries
Malaysia	Few	Yes – 32 products as of 1982	16 items in 1984	Yes – mainly motor vehicles
Philippines	On some agricultural products	Few formal quotas	Import approval on protective grounds required for 10% of import items	Mainly vehicles and electronics
Thailand	23 banned products: vehicles, sugar, ceramic products, etc.	No	22 products licensed – gold, tea, silk, used vehicles, etc.	Yes – vehicles, diesel engines, milks

Source: World Bank (1987).

Table 4.10 Trends in quantitative import restrictions in East Asian countries

Country	*Year*	*Proportion of import items subject to import restrictions (per cent)*
Indonesia	1985	28.0
	1986	21.9[1]
Malaysia	1984	less than 5
Korea[2]	1980	31.4
	1985	12.3
	1988	4.6
Philippines	1977	35.2
	1983	29.0
	1986	10.0
	1988	5.0
Thailand	1985	less than 5

Source: World Bank reports.

Notes:
1. An additional 4.2% of import licenses were substantially relaxed as part of October 1986 reforms.
2. Items not on 'automatic approval' list; about 40% of imports are still subject to exceptions and special laws.

The findings are not, however, inconsistent with work of a more qualitative nature (see for example the summary of evidence in Greenaway, 1988).

4.5 Concluding comments

This chapter has been essentially descriptive. It has briefly evaluated issues in measuring nominal protection and discussed some illustrative work on nominal protection. Much of what follows in this book is concerned with techniques used in evaluating the consequences of industrial and trade policies. A key data input to this process is information on nominal tariffs and the tariff equivalents of non-tariff measures.

As we have seen, even though the measurement of nominal protection may appear on the surface to be straightforward, in fact it can actually be quite complicated. This is especially true of non-tariff measures. It also applies to tariffs however. Having evaluated the various measurement complications we then went on to report some findings on both tariff and non-tariff measures. Notwithstanding the fact that these were from restricted samples, the data used does tend to suggest that tariff and non-tariff measures are typically deployed more widely in developing than industrialised countries and that NTMs are a more restrictive form of intervention than tariff barriers. We are now in a position to investigate further the impact of these various forms of intervention on resource allocation and economic welfare.

CHAPTER 5

Effective Protection Analysis

5.1 Introduction

Chapters 2 and 3 focused on the range of instruments of intervention available to the policy maker which go under the heading of 'trade and industrial policy'. In Chapter 4 we extended this analysis to the estimation of the nominal protection. Our interest there lay in the measurement of nominal tariffs and the estimation of the tariff equivalents of non-tariff barriers. As we argued in Chapter 4, the measurement of nominal protection can serve a very useful purpose. There are important respects however in which it can also be misleading. In particular it disregards the fact that the degree of protection conferred on an activity will depend not only on any interventions which affect the price of the final good produced, but also by any interventions which affect the price paid for inputs into the production process. This is a major shortcoming. Effective protection analysis offers a framework designed to overcome that shortcoming. This chapter is directed at outlining and explaining the effective protection method. Section 5.2 explains the concept formally. In Section 5.3 we explore a number of possible extensions to the basic model. Although, as we shall see, effective protection is in theoretical terms a very precise concept, there are a range of complications which arise when we attempt to estimate it empirically. These are discussed in Section 5.4. Section 5.5 continues by reviewing the evidence on effective protection in developing countries. As we shall see there is now an extensive literature on this subject. Section 5.6 explores the welfare and policy aspects of the measure and Section 5.7 offers some concluding comments.

5.2 The effective protection concept

Credit for the refinement of the effective protection concept is generally ascribed to Corden (1966) and Johnson (1960), although it is in fact explained fully in Meade (1951). Like many important concepts in economics, the basic idea is very simple and can be easily explained in intuitive terms.

As we saw in Chapter 2, trade policy affects consumers by raising the price of imports/importables relative to other commodities. Thus a 10 per cent tariff on imported personal computers (PCs) will raise the price of imported and locally produced PCs by 10 per cent. In the simple theory of nominal protection this encourages domestic suppliers of import substitutes to increase their output. Intuitively this seems obvious. However whether they increase their output, and the extent to which they do so, depends not only upon the tariff on PCs, but upon any protection given to inputs used in their manufacture. Thus, for example, if semiconductors are the sole input into the production of PCs, and if a tariff is levied on semiconductors at the same time as that levied on PCs, PC manufacturers may be no better off than they were before the tariffs. This follows because at the same time as they are given an implicit subsidy on their final good (the output tariff) they face a tax on their imported input (the input tariff). The latter in effect neutralises the former. The effective protection concept explicitly recognises that we should be concerned with the *net* protection conferred on a production *process*, rather than *gross* protection to an industry's *output*.

To elaborate the concept more formally, let us make the following assumptions:

- Initially we have a two stage production process. A single, homogenous, intermediate input (i) is used to produce a single, homogenous output (j).
- There are fixed physical input coefficients in the production of j.
- Both the inputs and output remain traded after any commercial policy changes.
- The home economy is a small open economy.
- Domestic markets are competitive and efficient.
- There is international immobility of factors of production.
- Initially the only instrument of intervention is a tariff (t).

Industry j therefore purchases inputs of i, combines these inputs with primary factors to add value and generate output of j. The effective protection provided to *value added* can therefore be defined as:

$$e_j = \frac{V_j^* - V_j}{V_j} = \frac{V_j^*}{V_j} - 1 \tag{5.1}$$

where V_j is the value added to the final product j at free trade prices and V_j^* is the value added to the final product j at tariff distorted prices.

Given our assumptions we can define V_j and V_j^* as follows:

$$V_j = P_j(1 - a_{ij}) \tag{5.2}$$

$$V_j^* = P_j([1 + t_j] - a_{ij}\,[1 + t_i]) \tag{5.3}$$

where P_j is the world price of the final product j, t_j is the nominal tariff on j, t_i is the nominal tariff on i and a_{ij} is the share of final value of j accounted for by input i at world prices.

If (5.2) and (5.3) are substituted into (5.1) and rearranged we can write:

$$e_j = \frac{t_j - a_{ij}\,t_i}{1 - a_{ij}} \tag{5.4}$$

Differentiation of e_j with respect to t_j and t_i yields:

$$\frac{\delta e_j}{\delta t_j} = \frac{1}{1 - a_{ij}} > 0 \tag{5.5}$$

$$\frac{\delta e_j}{\delta t_i} = \frac{-a_{ij}}{1 - a_{ij}} < 0 \tag{5.6}$$

Thus from this analysis it should be obvious that when $a_{ij} < 1$,

$$e_j \gtreqless 0 \tag{5.7}$$

and

$$e_j \gtreqless t_j \gtreqless t_i \tag{5.8}$$

These are well-known results and are worth dwelling upon. They tell us that the effective protection rate is determined by three factors, t_j, t_i and a_{ij}. Other things being equal:

- Effective protection will be higher, the higher the nominal tariffs on output.
- Effective protection will be higher, the lower the nominal tariffs on inputs.
- Effective protection will be higher, the higher the value of a_{ij}.

The first of these two properties are intuitively obvious, the third less so. It follows because as a_{ij} rises, value added falls in absolute terms. As a result a given nominal tariff on output has a greater proportionate effect on value added. This point is worth noting – it is often what lies behind some

spectacularly high rates of effective protection recorded in developing countries.

As Equation 5.8 indicates, effective protection will exceed nominal protection when the nominal tariff on the output exceeds that applied to the input. As we shall see later it is not unusual to find effective rates which are not only positive, but are in excess of nominal rates. As Equation 5.7 indicates however, it is also possible for effective protection to be negative. This arises when $t_j < a_{ij}t_i$. When $e_j < 0$ this indicates that value added in the industry concerned is actually *lower* than under free trade conditions. At first sight this may appear counter-intuitive. In fact it is quite a common phenomenon. For example it is frequently observed in export-oriented activities that typically enjoy zero tariff protection on their outputs, but find tariffs levied on their inputs.

As indicated above, all of the foregoing results depend upon the assumption that $a_{ij} < 1$. For the vast majority of cases this is an appropriate assumption. Occasionally however one finds circumstances where $a_{ij} > 1$. This arises when the value of inputs used in producing j exceeds the final value of j *at world prices*. Superficially this may appear to be a theoretical curiosus. What it is telling us is that value added at world prices is *negative*. Strange as it may seem this is not empirically irrelevant, because however agents observe distorted prices, the phenomenon does not readily manifest itself. Examples have been uncovered. In these circumstances the effective protection conferred on the activity in question is infinitely high. Where we do observe negative value added the value of resources used in producing a given product exceeds the value of the product itself, when both are valued at world prices.

Even from this account of the simplest possible concept of effective protection we can see that it is potentially a much richer measure than nominal protection. It forces us to direct our attention to the full range of interventions that may affect a given production process. As a result the information content of the measure is greater than in the case of nominal protection. We can see how, even with positive nominal tariffs, effective protection to an industry may be less than nominal protection. We can see how effective protection can be negative, such that the industry is actually penalised by intervention, and we can see how under certain circumstances it may be possible for an industry to be 'producing' negative value added, at world prices. Before we consider how, in practise, effective protection is measured, we should look at the ways in which the simple concept can be extended.

5.3 Extensions to the effective protection concept

The foregoing analysis is predicated on a number of simplifying assumptions, not all of which concur with reality. Thus it is rare to find a produc-

tion process with a single intermediate input, some intermediate inputs are non-traded, tariffs are often not the sole form of protection, and tariff imposition itself may have induced exchange rate effects which influence the net protection conferred on a given activity. The simple effective protection concept elaborated in the previous section can be extended in various ways to incorporate these features of industrial market structure.

Take for example the case of many inputs. Most production processes employ a range of intermediate goods – the list can run to scores or even hundreds. Where many traded inputs are used Equation 5.4 should be revised to:

$$e'_j = \frac{t_j - \sum_{i=1}^{n} a_{ij}t_i}{1 - \sum_{i=1}^{n} a_{ij}} \tag{5.9}$$

where $\sum_{i=1}^{n} a_{ij}$ is the sum of the shares of intermediate inputs $(1, \ldots, n)$ in the final value of j and $\Sigma\, a_{ij}t_i$ is the weighted average of input tariffs on all intermediate inputs with weights applied according to input shares.

In principle this is a very straightforward amendment to make. Note that this does not mean it is straightforward in practise. There are for example possible measurement problems arising from tariff averaging. Nonetheless at the theoretical level it is very straightforward.

Less straightforward, even at the theoretical level, is the incorporation of non-traded inputs. Most production processes make some use of non-traded inputs like sewerage services, energy supplies, postal services and so on. Suppose we denote such inputs by b. We could then rewrite Equation 5.9 as:

$$e''_j = \frac{t_j - \sum_{i=1}^{n} a_{ij}t_i - \sum_{r=1}^{z} b_{rj}t_r}{1 - \sum_{i=1}^{n} a_{ij} - \sum_{r=1}^{z} b_{rj}} \tag{5.10}$$

where $\Sigma\, b_{rj}t_r$ is the sum of the shares of non-traded intermediate inputs $(r, \ldots, z)$ in the final value of j and t_r is the weighted average of implicit import tariffs on all importable inputs into non-tradeables.

There are at least two complications with Equation 5.10. First it assumes that non-traded inputs enter into the production function independently of tradeable inputs. In practise some non-tradeable inputs may be inputs into tradeable inputs. This is a measurement problem we shall return to later. The second problem relates to t_r. If inputs are non-traded, why should we incorporate an implicit tariff on such inputs? Analysts take different positions on this point. Balassa (1965c) argued that non-traded inputs could be treated as if they were traded inputs in infinitely elastic supply. In such circumstances their price would be insensitive to protection and t_r would

equal zero. In contrast Corden (1966) argued that value added in non-traded inputs should be aggregated with all other value added. In effect then, non-traded inputs enjoy the same level of protection as primary factors. It can be argued that we can expect the price of non-traded inputs to increase with protection. This follows because of competition for resources and aggregate expenditure effects (of the type discussed in Chapter 7). The extent to which their price increases then depends upon elasticities of substitution between non-tradeables and tradeables, both in supply and demand. Quite how one measures this is another matter – it could be via the shift parameter discussed in Chapter 7, or via CGE modelling as in Chapter 8. However we arrive at the estimate, this is then proxied by t_r.

As we saw in Chapters 2 and 3, tariffs are not the most common nor, in the context of developing countries, necessarily the most important instrument of intervention. Other instruments such as subsidies and quotas are important. These can in principle be incorporated. For example if a subsidy were provided to a given production process, we would rewrite Equation 5.10 as:

$$e_j''' = \frac{t_j + s_j(1 + t_j) - \sum_{i=1}^{n} a_{ij}t_i - \sum_{r=1}^{z} b_{rj}t_r}{1 - \sum_{i=1}^{n} a_{ij} - \sum_{i=1}^{z} b_{rj}} \tag{5.11}$$

where s_j is the net subsidy available to producers of j.

So long as information is available on s_j the adjustment is straightforward. This also applies to quantitative restrictions. If a quota 'bites' it will have a price-raising effect. If this price-raising effect can be calibrated, Equation 5.11 should be revised to:

$$e_j^* = \frac{t_j^* + s_j(1 + t_j^*) - \sum_{i=1}^{n} a_{ij}t_i - \sum_{r=1}^{z} b_{rj}t_r}{1 - \sum_{i=1}^{n} a_{ij} - \sum_{t=1}^{z} b_{rj}} \tag{5.12}$$

where t_j^* is the nominal tariff on activity j, plus the tariff equivalent of any quantitative restraint.

If any QRs applied to traded inputs, t_i would be similarly adjusted. Note again that we are abstracting from measurement problems. Tariff equivalents are notoriously difficult to measure. Again this is something to which we shall return later. For the moment we should simply note that, so long as they can be measured, Equation 5.12 gives us a fully elaborated measure of effective protection, capable of incorporating all interventions that distort border prices.

There is one final point we should note, namely that protection may induce exchange rate changes. Thus if one group of industries are given protection (say import substitute activities), whilst some other group is not

(say exporters), we might expect the trade balance to improve. Other things being equal this should result in exchange rate appreciation, thereby eroding some of the benefits of protection. Some analysts attempt to adjust for induced exchange rate changes. We shall return to this in the next section.

5.4 Measurement problems in effective protection analysis

Many of the measurement problems inherent in effective protection analysis have already been raised. This section will do two things. First it will briefly summarise the range of problems one could potentially confront. Many of these complications are 'study specific' however. Therefore this section will also develop a case study to illustrate some of these problems in a country-specific context.

Summary of measurement problems

As we saw in the previous section one can measure anything from an effective tariff through to total effective protection. What one does depends in large measure on data availability and measurement complications. Some combination of the following may turn out to be relevant.

(1) CHOICE OF TARIFFS

In theory a tariff is a tariff! In practice however there are alternative means of defining a tariff. One could use the scheduled rate – what might be called the ex-ante rate. If there are no exemptions or preferential access agreements, this would be entirely appropriate. Where however such agreements exist, the scheduled tariff may be misleading. Thus if a country is a member of a customs union, and 90 per cent of its imports enter duty free, it may not be appropriate to use the ex-ante tariff, but to rely instead on the ex-post tariff, that is the tariff rate calculated from customs returns, sometimes called the implicit tariff). This has the advantage of being a weighted average of scheduled rates, with the weights being the shares of imports by source in total imports.

(2) TARIFF AVERAGING

Effective protection can be calculated from cost-based data or input–output returns. The latter is the more common. Either way, but particularly in the case of the latter, the number of production categories is

invariably significantly smaller than the number of tariff lines. To take a specific example (from a non-LDC), the UK input–output tables comprise 101 sectors whilst the tariff classification runs to some 10 000 lines. Inevitably therefore tariff rates must be averaged in some way. The most common response here is to calculate weighted averages using trade shares. As Tumlir and Till (1971) demonstrate however, estimates of effective protection are in fact very sensitive to the averaging procedure used.

(3) Input–Output Coefficients

As we can see from Equation 5.4 , a fixed input–output coefficient (a_{ij}) is imposed in calculating effective protection. There are two issues here. First, when working with a published input–output table we are implicitly assuming that input–output relationships are identical across firms in a given sector/industry. By implication therefore all firms enjoy the same degree of effective protection from a given set of tariffs. Intraindustry differences will probably exist however, and there will almost certainly be differing output responses across firms. The second difficulty is that a_{ij} tends to be a post-protection input–output coefficient. If a_{ij} is unaffected by protection this does not matter. Clearly however, if there is scope for substitution between taxed inputs and primary factors, a_{ij} can be expected to alter. If substitution away from taxed inputs occurs, reliance on unadjusted a_{ij}s will lead to measured effective protection understating actual effective protection.

(4) Choice of Non-Traded Inputs

What are non-traded inputs? Even at the conceptual level this is not a simple question to answer. One response is to define non-tradeables as those commodities which are not traded at *undistorted* international prices. There is a problem however in operationalising this definition. We do not observe undistorted international prices. A product which is not traded at distorted prices could be tradeable in the absence of distortions. Invariably one has to make a judgement here by reference to the data.

(5) Import Content of Non-Tradeables

As we saw above, it is possible to incorporate non-tradeables into the effective protection measure in various ways depending upon how we think protection will affect the price of non-tradeable inputs. One way of attempting to estimate this price effect is by reference to the import content of non-tradeables. In principle this is a potentially worthwhile approach. The

problem is however that the data requirements for so doing are very demanding. One may need to go 'behind' the input–output tables to uncover the detail of input–output relations in the input-supplying industries.

(6) NON-TARIFF BARRIERS

One of the advantages of tariffs over non-tariff barriers is that their price effects are generally more transparent. In contrast the price effects of non-tariff barriers in general, and quantitative restraints in particular, are opaque. If one wants an estimate of effective protection that includes non-tariff barriers, some means of estimating their tariff equivalent must be found. Different analysts have approached this problem in different ways. In a study of Burundi, Greenaway and Milner (1990a) begin from the price wedge between border prices and distorted prices and attempt to break down the wedge into its constituent components (sales taxes, import taxes, mark-up and quota rent). An alternative approach is to compare prices in distorted and undistorted markets. These and other approaches are both complicated and exacting in terms of data requirements. In the context of developing countries, this is not a trivial consideration.

(7) TREATMENT OF EXPORTABLE OUTPUT

In the simple trade models analysed in Chapter 2, industries conveniently fall under the headings of 'exportable' or 'importable'. Tariffs and other distortions in a given sector therefore only apply to importables or exportables. In practise industries may supply output to *both* the home and overseas market. In such circumstances, to what should the effective protection measure pertain – value added on total output, or value added on that share of total output produced for the home market only? One could make a case for either on theoretical grounds. A practical complication arises if one decides that it is desirable to separate output destined for the export market from output destined for the home market. Again there may be a data constraint. It should be noted however that this is potentially much more of a problem in the context of industrialised countries where intraindustry trade is more important than in developing countries.

(8) EXCHANGE RATE EFFECTS

We noted that protection can be expected to have induced exchange rate effects and one should take these into account in calculating net protection. Quite how this can be done is another matter however, as the exchange

rate is itself a distorted price in many LDCs! In practise one approach here is to simply 'correct' the effective rates by some uniform adjustment factor designed to proxy the degree of induced exchange rate distortion. As output from different sectors is likely to vary in its sensitivity to exchange rate movements this is far from being a satisfactory procedure.

These then are the kinds of difficulties one can expect to confront in the measurement of effective protection. One can often gain a better 'feel' for the nature of the problems by reference to a specific example. Let us then focus upon the estimation of effective protection in the context of a developing country, drawing upon Greenaway and Milner, 1990b.

A case study of effective tariffs in Madagascar

As we can see from Equation 5.10, estimation of effective tariffs has two basic data requirements: input–output information on production techniques and information on the price-raising effects of tariffs. With regard to the former, two sources of information were used in this study. First, detailed cost data from a comprehensive survey of the Madagascan manufacturing industry grounded in 1983. This provided highly disaggregated data on ex-factory output values and detailed information on imported and locally-produced intermediate inputs. One major deficiency of the survey information however was the absence of information on the import content of non-tradeable inputs. This was estimated separately using an input–output table based on 1979. Using this it was then possible to impute a weighted-average import tariff applicable to each of the non-traded inputs.

In order to estimate the price-raising effects of protection, information on nominal tariffs is required. This may be gleaned from ex-ante or ex-post tariff information. As we saw earlier, arguments can be advanced for reliance on both measures. Ex-ante rates were relied upon due to the fact that customs collections were only available at a relatively high level of aggregation, raising the possibility of biased estimates as a result of product heterogeneity. The estimating equation used was:

$$e_j = \left[\frac{P_j^* - \sum a_{ij}' P_j^* - \sum b_{rj}' P_j^*}{\frac{P_j^*}{1+t_j} - \frac{\sum a_{ij}' P_j^*}{1+t_i} - \left(\sum\sum \frac{b_{rj}' P_j^* q_{ir}}{1+t_i} + \sum\sum b_{rj}' P_j^* q_{vr} \right)} \right] - 1 \qquad (5.13)$$

where P_j^*, a_{ij}, t_j and t_i are as defined in Equation 5.2, b_{rj} is the share of non-traded input in the final value of product j, q_{ir} is the direct and indirect input–output coefficient for intermediate inputs used in producing non-traded goods in domestic prices, q_{vr} is the direct and indirect input–output coefficient for value added embodied in the production of non-traded goods in domestic prices and $q_{ir} + q_{vr} = 1$. (A ' denotes a coefficient at distorted prices.)

Thus the effective rate is estimated for each processing activity alone; it is assumed that non-traded inputs are supplied at constant cost, but this cost is influenced by tariff-induced changes if traded inputs enter into the production of non-traded goods. The effective rate for j is in effect an equivalent subsidy to value added in j which has the same impact as tariffs on j and its direct and indirect inputs.

The results of estimating Equation 5.13 are reported in Tables 5.1, 5.2 and 5.3. Table 5.1 provides details of effective tariffs on a product-by-product basis, 5.2 reports average effective tariffs by sector as well as the range and standard deviations of rates by sector and 5.3 reports the frequency distribution of rates. In reviewing these results particular attention will be paid to the interproduct variation in rates, the intersectoral variation and the intrasectoral variation. Interproduct variations are provided in Table 5.1. The maximum recorded effective tariff exceeded 4000 per cent. Strictly speaking however this does not represent the upper limit of the range of estimates since there were a number of instances of negative value added at world prices; in other words, cases where the level of effective protection was infinitely high. At the other end of the distribution, seven examples of negative effective protection were identified. These are activities where the tariff structure results in removal of protection. The largest concentration of rates is in the 50–99 per cent range, with some 30 per cent of activities falling into this category. The average for all products is 156 per cent. The intersectoral pattern is reported in Table 5.2. Three sectors have average effective tariffs in excess of 100 per cent, and five sectors are in the 50–100 per cent range.

As a result of the fact that most effective protection studies have to rely on fairly aggregate input–output data, it is rarely possible to comment on the intrasectoral pattern of protection. This study worked from highly disaggregated/establishment-based data and provides therefore a rare opportunity to comment on this pattern. As we can see from Table 5.2, the intrasectoral range of rates is very wide in some cases – from 20 per cent to infinitely high in chemicals and from 24 per cent to 310 per cent in construction materials. There are likely to be several sources of bias inherent in the above results. The fact that ex-ante rather than ex-post tariffs have been used may have imparted an upward bias. Since however the extent of preferential access of imports into Madagascar is limited this is probably not a serious problem. Another possible source of upward bias derives from the fact that the estimates calculate protection to all production. Where exports are important, reported effective tariffs will overstate actual effective tariffs. Manufactured exports are however of negligible importance in Madagascar. As a result any bias from this source is probably trivial. One other source of possible upward bias derives from the fact that the results are not adjusted for protection-induced exchange rate changes. The imposition of protective measures will generally permit

Table 5.1 Effective tariffs on manufactured products, Madagascar, 1983 (in per cent)

Food and Drink:	
Beer	81.9
Carbonated drinks	131.7
Processed meat	852.5
Concentrated milk	7.1
Sweets	131.1
Chocolate products	174.3
Boiled sweets	102.1
Sugar	24.4
Conserves	
Processed fish	87.5
Vegetable oil	0.6
Pharmaceuticals:	
Toilet soaps	61.9–65.0
Household soaps	40.8–49.3
Detergents	80.7
Tablets	26.4
Aspirins	256.8
Serums	–23.5
Syrups	10.6
Chemicals:	
Cellophane	–19.5
Plastic bags	139.5
Plastic	240.9
Paint	
Acetylene	–4.3
Mineral compounds	28.8
Industrial glues	154.3
Insecticides	58.1
Rubber products	69.5
Textiles:	
Elastic trimming	98.9
Fabric trimming	243.0
Elastic	47.7
Bags	
Lining	86.5
Leather and Footwear:	
Footwear components	78.2
Rubber footwear	102.3
Sandals	88.1
Leather footwear	79.7
Leather	55.8
Suitcases	14.8
Wood Products:	
Chipboard	5.9

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Table 5.1 continued

Wooden doors	–10.6
Furniture	191.2
Metal Products:	
Metal cartons	23.5
Tin cans	84.2
Metal furniture	221.1
Aluminium bars	
Metal components	83.8–127.7
Cartons	10.3
Electrical Products:	
Batteries	73.1
Accumulators	81.9
Paper Products:	
Paper	–17.6
Cartons	–2.2
Stationery	13.5
Construction Materials:	
Bars	309.5
Nails	24.3
Miscellaneous:	
Pens	–93.2
Bottles	245.8
Glasses	157.7
Remoulded tyres	57.6

Source: Greenaway and Milner (1990b).

Table 5.2 Intersectoral pattern of effective tariffs, Madagascar, 1983

Industrial sector	*Average (%)*	*Standard deviation (%)*	*Range of effective tariff rates (%)*	*Number of activities with negative value added*
Food and drink	159.3	237.3	1–∞	2
Pharmaceuticals	40.0	27.7	24–81	0
Chemicals	83.4	83.0	20–∞	3
Textiles	961.4	1686.1	48–∞	1
Leather and footwear	70.9	26.3	15–102	0
Wood products	62.2	91.5	11–191	0
Metal products	90.0	65.3	24–222	0
Electrical goods	77.5	4.4	73–82	0
Paper products	–2.1	12.7	–18–14	0
Construction Materials	166.9	142.6	24–310	0
Miscellaneous	92.0	125.9	–93–245	0

Source: Greenaway and Milner (1990b).

Table 5.3 Distribution of effective tariffs, Madagascar, 1983

Range (%)	*Number of products in sample*
∞	6
>4000	1
1000–3999	0
500–999	1
250–499	1
200–249	4
150–199	4
100–149	6
50–99	21
0–49	17
>0	7

Source: Greenaway and Milner (1990b).

equilibrium in the trade balance to be reached at a lower exchange rate than under free trade. The elimination of protective measures in Madagascar would necessitate a devaluation. Net effective rates could therefore be estimated by downwardly adjusting the rates estimated at the prevailing exchange rate. The resulting estimates would indicate which activities were favoured (positive net rates) and which were disfavoured (negative net rates) compared to the free trade situation. But given the considerable scope for error in estimating the hypothetical free trade exchange rate and the uniform nature of the adjustment it was not undertaken.

A more important potential source of bias, insomuch as it may affect the rank order of the estimates, arises out of the fact that the results only take account of tariff barriers and ignore non-tariff barriers. There is a complete absence of information on the tariff equivalents of non-tariff barriers in Madagascar. Given the widespread use of quantitative restrictions, this is likely to be a non-trivial source of downward bias. It should be noted however that allowance for the price-raising effects of quantitative import restrictions (QRs) in effective protection studies is invariably for final output prices only. By ignoring the impact of QRs on input prices there is a tendency to upwardly bias the estimates, and therefore the consistent treatment of input and output protection may be viewed as a virtue.

5.5 Empirical evidence on effective protection

The preceeding section examined in detail the estimation of effective tariffs in Madagascar, paying particular attention to measurement aspects. In this section we review more generally the results of a wider set of studies. Table 5.4 reports details of a range of studies which encompass economies for various years between 1958 and 1985. For some economies (such as Brazil

Table 5.4 Evidence on effective protection in LDCs and NICs

Country	Year	Number of industries	Average EPR	Range of EPRs	Negative effective protection	Negative value added	Source
1. Brazil	1958	n.a.	108*	17–510	n.a.	n.a.	Krueger et al., 1981
2. Brazil	1963	n.a.	184*	60–687	n.a.	n.a.	
3. Brazil	1967	n.a.	63*	4–252	n.a.	n.a.	
4. Pakistan	1963–4	n.a.	356*	–6–595	n.a.	n.a.	
5. Pakistan	1970–1	n.a.	200*	36–595	n.a.	n.a.	
6. Korea	1968	n.a.	–1*	15–82	n.a.	n.a.	
7. Uruguay	1965	n.a.	384*	17–1014	n.a.	n.a.	
8. Colombia	1969	n.a.	19*	–8–140	n.a.	n.a.	
9. Chile	1967	n.a.	175*	–23–1140	n.a.	n.a.	
10. Indonesia	1971	n.a.	119*	–19–5400	n.a.	n.a.	
11. Thailand	1973	n.a.	27*	–48–236	n.a.	n.a.	
12. Tunisia	1972	n.a.	250*	1–737	n.a.	n.a.	
13. Ivory Coast	1973	n.a.	41*	–25–278	n.a.	n.a.	
14. Korea	1968	150	10	–67–164	(76)	n.a.	Balassa et al., 1982
15. Israel	1968	94	76	–943–750	(9)	n.a.	
16. Singapore	1967	69	6	–1–86	(29)	n.a.	
17. Taiwan	1969	61	46	–18,728–89	(26)	(6)	
18. Argentina	1969	82	94	–596–1308	(15)	(0)	
19. Colombia	1969	22	46	–51–215	(10)	(0)	
20. Brazil	1980–1	22	46	–16–97	(6)	n.a.	Tyler (1985)
21. Pakistan	1980–1	90	60	–799–1543	(22)	(13)	Naqvi et al., 1983
22. India	1968–9	69	n.a.	27–3354	n.a.	(4)	Bhagwati and Srinivasan 1975
23. Mauritius	1980	22	55	2–300	(0)	(0)	Greenaway and Milner, 1988
24. Madagascar	1983	58	156	–93–852	(7)	(5)	Greenaway and Milner, 1990a
25. Burundi	1985	46	–	–4–7896	(2)	(4)	Greenaway and Milner, 1990b

Notes:
* sample includes only manufacturing industries.
n.a. = not available.
Figures in parenthesis indicate number of activities falling into this category.

and Pakistan) several studies have been completed, which facilitates some intertemporal comparisons. In most cases however the studies pertain to a single year.

Before commenting on the detail of Table 5.4 it is important to make a number of caveats. As we saw in the previous section, complications in measurement exist relating to *inter alia*, the treatment of non-tradeable inputs and the treatment of exportable output. Conventions on the resolution of such complications vary from study to study. Having said this, many of the studies reported in Table 5.4 were prepared as part of larger projects. As a result some standardisation of methodology has taken place. For instance the first thirteen studies in Table 5.4 were prepared as part of a National Bureau of Economic Research (NBER) research programme and used a common methodology. This is also the case for studies 14–21, prepared as part of a World Bank study. One other difficulty is that the level of aggregation is not constant across studies. Finally, in addition to methodological differences and differences in the level of aggregation, most of the studies pertain to different years, and there is no guarantee that in all cases we have representative years. In summarising each of the studies we have provided information on the average rate of effective protection, the range of effective rates, details of whether or not evidence of negative effective protection was found, and details of whether or not evidence of negative value added was found.

Intercountry comparisons

Take first of all studies 1–13, since these use a common methodology. Here we observe a minimum *average* effective rate of −1 per cent (Korea in 1968) and a maximum average of 384 per cent (Uruguay in 1965). For the former the suggestion is that the protective structure is, on average, almost neutral with regard to effective rates. In Uruguay however, value added in the manufacturing industry would appear to have been some three and a half times the world value added. Of the thirteen studies, the average EPR exceeded 100 per cent in eight cases (Brazil in 1958 and 1963, Chile in 1967, Indonesia in 1971, Pakistan in 1963–4 and 1970–1, Tunisia in 1972), suggesting highly protective incentive structures. In four cases the average rates were moderately low, suggesting more neutral incentive structures (−1 per cent in Korea in 1968, 19 per cent in Columbia in 1969, 27 per cent in Thailand in 1973 and 41 per cent in the Ivory Coast in 1973).

Although studies 14–21 apply to roughly the same time period as studies 1–14 and there is some country overlap, the reported average EPRs are somewhat lower. The maximum for this group is recorded as 94 per cent (Argentina in 1969). Superficially the minimum here appears to be −300 per cent, for Taiwan in 1969. This however is a misleading estimate and is biased by the inclusion of activities which produce negative value added

and whose EPR rates are estimated as negative. If one excludes the largest of these rates (−18 728) the average changes to a more realistic 46 per cent, which is the figure reported in the table. (The same remarks apply, *mutatis mutandis*, to Korea.) The most highly-protected economies in this group appear to be Argentina, Israel and Pakistan, with average EPRs of, respectively, 94, 75 and 60 per cent; the least protected appear to be Columbia, Singapore and Korea with averages of −2, 6 and 10 per cent respectively.

As we noted in our earlier discussion, *the range of EPRs* is of interest because it provides some guides as to the potential resource allocation effects of the protective structure. Referring first to studies 1–13, it would appear to be the case that the range of estimates is wider in the more highly protected economies. Thus in Burundi the range is −4–7896 per cent, in Indonesia the range is −19–5400 per cent, for Chile it is −23–1140 per cent and for Uruguay it is 17–1014 per cent. Those economies with relatively low average EPRs also appear to have somewhat narrower ranges. In the Ivory Coast it is reported as −25–278 per cent, in Colombia −8–140 per cent and in Korea −15–82 per cent. The potential for protection-induced resource misallocation would seem to be greater in the high-protection than in the low-protection economies. This inference can also be supported by studies 22 and 21 on India and Pakistan, two highly-protected economies, where the ranges are −27–3354 per cent and −799–1543 per cent respectively. The results from studies 14–21 are more ambiguous however. The ranges here are consistently wider than those for the NBER studies (1-13). This may be due to the fact that the data set for these studies is more disaggregated. Notwithstanding this, there is further support for more highly-protected economies having ranges which are wider than those recorded for the less highly-protected cases – compare, for instance, Argentina and Israel with Colombia and Taiwan. The association however is not as clear as with the NBER studies.

Table 5.4 also provides information on *negative effective protection* and *negative value added* for cases where these are reported. The former is not at all unusual. In Korea no less than seventy industries seem to have negative rates, almost half of the entire sample. There were over twenty instances in Taiwan, Singapore and Pakistan. It would seem then that cases where the protective structure works to the disadvantage of activities, that is leaves them without protection, are not at all unusual. Moreover, as we noted earlier, it will often be the case that these are (actual or potential) export activities that do not benefit from protection of their output but are subject to tariffs on their inputs.

It will be recalled that negative value added describes a sitution where domestic value added at world prices is negative. Such activities actually make a negative contribution to GNP. Some of the studies have discovered evidence of the phenomenon. In India in 1968–9 four instances were recorded, in Madagascar seven cases, while in Pakistan in 1980–1 thirteen

cases were identified. What is particularly interesting in this context is the fact that the phenomenon is not confined to the most highly-protected economies. In both Taiwan in 1969 and Singapore in 1967 six cases of negative value added were reported. It is often assumed that the phenomenon only arises in the most highly-protected regimes. Clearly this would appear not to be the case.

It is not possible to say very much on *intertemporal comparisons*. As can be seen from Table 5.4, there are only two economies for which studies pertaining to several points in time exist, namely Brazil and Pakistan. Moreover even in these cases the same data set has not been consistently used, nor the same methodology, therefore any remarks must perforce be tentative. The evidence on Brazil seems to suggest that the economy became less protected between 1958 and 1980–1. The average EPR rose from 106 per cent to 184 per cent between 1958 and 1963, subsequently fell, and in 1980–1 was 46 per cent. This evidence that the economy was to some degree liberalised over that period is corroborated by other evidence (see for example Teitel and Thoumi, 1986). The evidence on Pakistan is more difficult to interpret. There are two average rates for the earliest years, 1963–4, which are significantly different – 200 per cent and 356 per cent. Comparing the 1980–1 figure with either does suggest a fall in the average EPR to 60 per cent. However the range for 1980–1 is wider than that reported in both of the 1963–4 studies. Clearly there must be some ambiguity in deciding whether or not the economy is more or less highly protected than in the earlier period.

Taking all these results together, it is clear that the structure of protection varies from one country to another, and in a given country from one period to another. Some economies are highly protected, others less so. In most economies there appears to be evidence of negative effective protection, suggesting that some activities are actually left without protection by commercial policy.

5.6 Policy appraisal issues

Having reviewed the theory of effective protection, and the evidence of the phenomenon for a range of developing countries, let us consider the usefulness or otherwise of the measure in the context of policy appraisal. In this regard one should begin by noting that the concept has been very widely used indeed, probably more widely used than any other single measure of the incentive structure in LDCs. This applies both to preappraisal and postappraisal analysis. Over the last twenty years or so a substantially larger amount of research effort has been expended in examining effective protection in developing countries than in industrialised countries. Why have so many policy appraisal studies relied upon the measure?

One factor which is undoubtedly relevant here is relative tractability. Notwithstanding the measurement and conceptual complications discussed above, effective protection remains a more tractable methodology than most alternatives, such as DRC or CGE modelling. The fundamental theory is well understood, and the data requirements less demanding than is the case of many alternatives. These of course are necessary but not sufficient conditions in explaining its popularity. After all it would be inadvisable to say the least to rely on a 'bad' or theoretically unsound indicator just because it was easy to measure! Some analysts have in fact argued that it is not theoretically sound. Thus Bhagwati and Srinivasan (1973) contend that the fundamental failing with effective protection analysis is that we are essentially using a partial equilibrium measure to make inferences about the general equilibrium effects of protection. They would argue that it is inappropriate to make statements about resource movements when we do not have information on supply elasticities across activities. Thus to argue that resources will be drawn from industry A into industry B because the former benefits from a 40 per cent rate of effective protection whilst the latter enjoys a 45 per cent rate is misleading and potentially quite wrong.

Strictly speaking this is quite correct. Does that mean we are misallocating resources in measuring effective protection? The answer to this question is 'no'. The measure most certainly does have some uses. Although it is potentially misleading to make inferences about resource allocation effects along the chain of effective rates, this does not invalidate the measure. Thus we can still make use of it in commenting upon the likely direction of resource pulls. This is why analysts devote attention to discussing the range of effective rates in a given set of estimates. For instance where the range is from 0 per cent to 4000 per cent one can state with some confidence that relative protection is having an impact on resource allocation, and in a particular direction. It may admittedly be more difficult where the range is from 40 per cent to 45 per cent; that however is another matter.

Average rates of effective protection are also of value in focusing attention upon the extent to which import substitute activities in general may be protected relative to other activities, such as exportables or non-tradeables. Since averages conceal useful information they should of course be used with caution. Sensibly used alongside information on the range of effective rates, the mean can be a useful indicator. Taken together the mean and variance can comprise valuable inputs into the process of appraising the impact of past policy intervention.

This also applies to negative effective protection and negative value added. Policy makers often introduce interventions on the assumption that they impact only on those sectors to which they are directed. This is a fallacy. The measurement of negative effective protection is one way of highlighting that fallacy, and a very useful way at that. Where negative

effective protection is recorded, it signals quite clearly that the activity/industry in question is actually being penalised by the protective structure. In the context of policy appraisal this is useful in highlighting such possible cases.

Negative value added is, as we have seen, a quite different concept. From an empirical standpoint it is not an empty box. Where it does occur it illustrates just how costly an 'unplanned' protective regime can be. Incentives in this case draw resources into activities to produce commodities at a very high cost. If the objective of policy appraisal is to assist in the process of industry rationalisation, evidence of negative value added can contribute to this process in a very obvious way.

Overall then, effective protection analysis can be a potentially useful input into the process of policy appraisal, both in evaluating the possible impact of past policy and in assessing the possible effect of changes in policy regime. It is not a precise measure and can not be used for slide-rule type calculations. As we have seen there are conceptual and measurement complications which mean that the measure must be used with some caution. When sensibly used with appropriate 'health warnings' it has a useful and useable level of information content.

5.7 Concluding comments

This chapter has focused on a widely-used measure of protection, namely effective protection analysis. As we saw from the theoretical discussion, the measure is more complete than nominal protection and has a somewhat higher information content. The cost of this higher information content is inevitably greater complexity, both conceptually and empirically. As we saw however, procedures for dealing with many of the empirical complications have been developed and a substantial literature has evolved, providing us with a clearer perspective on the structure of protection in LDCs and a clearer notion of its potential resource-allocation effects. In Chapter 6 we examine more specifically the welfare effects of protection.

CHAPTER 6

Domestic Resource Cost Analysis

6.1 Introduction

As we saw in Chapter 5, a great merit of the effective protection concept is that it provides a summary measure of the impact of trade interventions. As a result both input tariffs and output tariffs are incorporated. If the only distortions to relative prices are those present in the market for traded goods, this makes it a complete measure. However tariffs and non-tariff measures are not the only source of distortion to relative prices in developing countries. There are a range of other direct controls and fiscal measures that can result in a divergence of market prices and shadow prices. Good examples are price controls, minimum wage legislation, repatriation limits on profits, state trading companies and so on. The domestic resource cost (DRC) ratio is in the same genre as the effective protection coefficient. It is however a broader measure. It attempts to take all distortions in a particular sector or production process into account when calculating the social opportunity cost of a given activity. The technique is more demanding in its data requirements than effective protection. Nevertheless it has been relatively widely used.

Our focus in this chapter is the DRC measure. The material is organized as follows. Section 6.2 outlines the basic idea behind the concept, explaining it intuitively and mathematically. Section 6.3 concentrates on the nature and problems of estimating DRC ratios and Section 6.4 looks specifically at applications of DRC methodology. Finally Section 6.5 offers concluding comments.

6.2 Domestic resource cost concepts

Basic principles

The idea behind DRC analysis is a very simple one: it attempts to provide an estimate of the value of domestic resources used in producing a particular product when all intermediate inputs are valued at world prices and all factor inputs are valued at their true opportunity cost prices. In other words, factor inputs are valued by reference to the rewards they could obtain when employed in some alternative activity – not any alternative activity, rather the activity they would most probably be engaged in if they were not employed in their current activity. A specific example can be used to explain the concept. Suppose a worker is engaged in the production of soap and his hourly wage is \$1.80. Suppose also that were the worker not employed by the soap manufacturer he would be a farm labourer, earning \$1.00. The higher rate of \$1.80 may apply because there is minimum wage legislation in force which applies to the manufacturing sector. Alternatively labour may be organised and effective in the use of its bargaining power. Either way a distortion is present, such that wage rates do not reflect social opportunity costs. When estimating the DRC ratio for soap manufacture the worker's labour should be valued at \$1.00 per hour and not the \$1.80 per hour he is actually paid. This follows because \$1.00 per hour is the *social opportunity cost* of the worker. In other words the cost *to the economy* of the worker being employed by the soap manufacturer is \$1.00.

Analogous remarks apply to domestic capital. If the private rate of return differs from the social rate of return then some allowance should be made for this difference when estimating the DRC ratio. The social rate of return is the return the capital would earn in its best alternative use, for example investment in agriculture or even a bank deposit. The private rate of return may be higher than the social rate as a consequence of excessive protection being provided to a domestic firm enabling it to earn excess profits, or as a result of capital investments being subsidised. As with labour costs, whatever the reason for the divergence, where a divergence exists it must be allowed for so that capital can be valued at its true social cost. In both cases the intention is to estimate the shadow price of the factor, that is the price which would prevail if the market concerned were free of distortions.

Thus the domestic resource cost coefficient of a commodity compares the opportunity cost of the primary factors (land, labour and capital) used in the production of that commodity with value added in border prices. The coefficient shows the border priced value of the resources in their best alternative use per unit of border priced return from the resources in their existing use. If the estimated coefficient exceeds unity, it can be concluded that, in principle, the resources could be put to better use in an alternative activity, while if the estimated coefficient is less than one, resources are

being used relatively efficiently. The DRC ratio can also be thought of as indicating the comparative advantages of competing activities. If a product is found to have a DRC of one then it takes a dollar's worth of resources to produce output that could be purchased internationally for one dollar. Consequently DRCs of less than one identify activities in which the country appears to have an international comparative advantage, whilst those in excess of one can be interpreted as indicating comparative disadvantage.[1]

The DRC ratio for a given activity can be estimated as:

$$DRC_j = (DC_j)/IVA_j \tag{6.1}$$

where: DC_j is the domestic cost of producing j with factors valued at their social opportunity costs and IVA_j is the value added to activity j at border prices.

The higher the DRC_j the more costly in terms of domestic resources it is to produce this product. Another infinitively more appealing, way of interpreting this ratio is to think of it as the cost to the economy of saving foreign exchange (through import substitution) or acquiring foreign exchange (through exporting). For example, if for a given activity the estimated DRC ratio comes out at two, this tells us that the value of domestic resources used up in producing a unit of the relevant product is twice what it would cost to import it. In contrast if the estimated DRC ratio were 0.5, then the domestic resources required to produce the commodity are 50 per cent of the foreign exchange required to import it. Other things being equal the DRC ratio can therefore be thought of as an (ex-post) index of comparative advantage. Ratios of less than one indicate activities of comparative advantage in the sense that they should be net foreign exchange earners; ratios in excess of one indicate comparative disadvantage in the sense that the value of domestic resources used up in producing the product exceeds the value of foreign exchange required to import it. The higher the ratio the greater the domestic resources needed to produce it.

More formally we can write Equation 6.1 as:

$$DRC_j = \frac{\sum_h v_{hj}\, s_h + \sum_n \sum_h d_{nj}\, v_{hn}\, s_h}{1 - \sum_i m_{ij} - \sum_f r_f\, v_{fj}} \tag{6.2}$$

where v_{hj} is the amount of the h^{th} domestic factor of production used in the j^{th} value-adding process (of traded goods), s_h is the shadow price of the h^{th} factor, v_{hn} is the amount of the h^{th} domestic factor of production used in the n^{th} value-adding process (of non-traded goods), d_{nj} is the amount of non-traded good n used in the production of a unit of good j, r_f is the repatriated return per unit of the foreign-owned factor of production f, v_{fj} is the amount of the foreign-owned factor of production f used in the production of one unit of good j, m_{ij} is the amount of the traded input i

used in producing one unit of good j and all international prices are normalised at unity.

Relationship to other measures

Clearly the pivotal concepts in this measure are shadow prices, and in the next section we will evaluate this fully. Before we do however, let us consider how the DRC ratio relates to other indicators of intervention. Take first of all effective protection (e). To simplify, assume there are no distortions in factor markets, no expatriate labour or capital and an absence of non-traded goods. In these circumstances we could write.

$$DRC_j = \frac{DC_j}{IVA_j} = \frac{VA_j}{IVA_j} \tag{6.3}$$

It will be recalled from Chapter 5 that

$$e_j = \frac{VA_j - IVA_j}{IVA_j} = \frac{VA_j}{IVA_j} - 1 \tag{6.4}$$

Therefore:

$$DRC_j = e_j + 1 \tag{6.5}$$

Thus the DRC ratio is closely related to the e_j measure. It is even more closely related to the net social profitability (NSP) measure. This is equal to value added in world prices less domestic factors priced at their opportunity costs, viz,

$$NSP_j = \sum_i a_{ij}\, p_i - \sum_h f_{hj}\, s_h + E_j \tag{6.6}$$

where a_{ij} is the quantity of the i^{th} commodity output produced by the j^{th} activity (or the quantity of the i^{th} material input used by j^{th} activity, in which case the term is negative, $i = 1, 2, 3, \ldots n$, p_i is the shadow price of the i^{th} commodity output (or of the i^{th} material input) (in domestic currency), f_{hj} is the quantity of the h^{th} factor of production used by the j^{th} activity, s_h is the shadow price of the h^{th} factor of production (in domestic currency) $h = 1, 2, 3, \ldots$ m and E_j is a measure of the net external benefits or costs imported by the j^{th} activity on the rest of the domestic economy.

Two adjustments to Equation 6.6 facilitate comparability of NSP with the DRC. First, all outputs are assumed to be tradeable. Second, all factor costs, incurred directly in the j^{th} activity or indirectly in producing material

inputs used by the j^{th} activity, are divided into foreign and domestic costs.[2] With these two modifications, a second definition of NSP is:

$$NSP_j = (u_j - m_j - r_j)v_j - \sum_s f_{hj}\, s_h + E_j \tag{6.7}$$

where u_j is the total value at world prices (in foreign currency) of the output of the j^{th} activity, m_j is the total (direct plus indirect) value (in foreign currency) of imported materials used by the j^{th} activity, r_j is the total (direct plus indirect) value (in foreign currency) of repatriated earnings of foreign-owned factors of production employed by the j^{th} activity (including repatriated portions of direct foreign factor costs, $f_{1j}\, V_1$, and of the indirect foreign factor costs), v_j is the shadow price of foreign exchange, expressed as a ratio of local currency to foreign currency and f_{hj} is the total (direct plus indirect) quantity of the h^{th} domestic factor employed by the j^{th} activity.

As Bruno (1967, p. 106; 1972, p. 20) noted, the DRC can be derived directly from the NSP. The DRC measure can be subtracted from the shadow price of foreign exchange and the difference multiplied by net foreign exchange earned or saved to find net social profitability. Note that if net foreign exchange earned or saved is negative, NSP must also be negative. When NSP is zero, the DRC measure is equal to the shadow price of foreign exchange. Similarly, when NSP is positive, DRC is less than v_j, when NSP is negative, DRC is greater than v_j.

Hence an activity is socially profitably if its DRC ratio, which measures its efficiency in transforming domestic resources into foreign exchange, is less than the shadow price of foreign exchange, which can be thought of as a weighted average of the efficiency of all tradeable activities in the economy in transforming domestic resources into foreign exchange.

6.3 Applications of the DRC methodology

The bulk of this section will concentrate on two case studies. Before we do that however, some comment on shadow pricing is appropriate. There is a vast literature on this subject (see Tower, 1991). In economies with long and extensive histories of government intervention, the need to have a set of prices which reflect as closely as possible the social gains and losses associated with actual policy and changes in that policy is apparent. Ideally one would attempt to calculate 'first best' shadow prices which assume that all government interventions will be dismantled. In this sense the shadow prices reflect true opportunity costs generated by a system completely free of distortions. In practice however one is frequently engaged in estimating 'second best' shadow prices, that is those which prevail on the assumption that preexisting non-optimal policies will remain in effect. The distinction matters, for as Findlay and Wellisz (1976) and Srinivasan and Bhagwati

(1978) have shown, shadow prices will vary according to whether first-best or second-best conditions hold.

As we shall see later, CGE modelling techniques offer a technology which can simulate the effect of removing a number of, or sub-set of, or all distortions in a given situation. Even here though the shadow prices one observes are driven by the model structure rather than the true structure of the economy. In the context of DRC analysis one is invariably estimating second-best shadow prices. Moreover the exercise tends, as with many of the other techniques we have discussed, to be constrained by data availability. The easiest way to illustrate this is to focus on a couple of case studies.

Domestic resource costs in Madagascar[3]

In a study of Madagascar grounded in 1984, Greenaway and Milner (1990) worked with the following estimating equation:

$$DRC_j = \frac{\sum v_{hj}\, s_h}{p_j\,(1 - m_{ij})} \tag{6.8}$$

where v_{hj} is the amount of primary factor h used in producing a unit of j, s_h is the social opportunity cost of primary factor i, p_j is the world price of commodity j and m_{ij} is the share of imported inputs in final value of j at world prices.

This differs from Equation 6.2 in two respects. First, the social opportunity cost of factors employed in the production of non-traded inputs into j are excluded; second, the income repatriated by foreign-owned factors of production is excluded. Both exclusions were necessitated by data constraints. Unfortunately the input–output table did not provide a breakdown of value added in non-tradeable activities (so as to obtain v_h separately for capital and labour). It was not therefore possible to include this component. The omitted component is likely to be of a fairly small order of magnitude for most activities (because it is in effect an input into an input). The extent of any error should be small and should not alter rank orders significantly. It should be obvious from a comparison of Equations 6.2 and 6.8 that the omission should result in a tendency for our DRC estimates to underestimate the true DRC ratios for manufacturing activity in Madagascar.

The omission of repatriated income may be even less of a problem. Madagascar does not have any foreign migrant labour and very few expatriate workers. Thus repatriation of wage income is likely to be negligible. Some companies are however either wholly or partly foreign owned. Therefore there exists at least a potential for repatriation of profit. It is however impossible to establish anything about the magnitude and pattern

of any such transfers. Over the period 1972–82 repatriation provisions were suspended and in principle no profits could be transferred from a Madagascan subsidiary to a foreign parent. As a condition of an IMF credit these provisions have been relaxed somewhat. Since 1982 transfers have been permitted, up to a maximum of FMG 1 000 000 000 ($1.66 million). It is probable that some transfers occurred during the year to which our estimates apply (1983). In the absence of any detailed information however this had to be ignored. As with labour and capital inputs into non-tradeable goods this should, if anything result in the calculated DRC ratios being biased downwards.

In order to shadow price labour in manufacturing one must first ascertain what alternative employment labour would be engaged in, and secondly what the remuneration in this alternative activity is. The most probable alternative employment for manufacturing labour is either in the informal sector or in the agricultural sector. Information on the former is non-existent, therefore shadow prices were calculated using the wage differential between labour employed in the agricultural and manufacturing sectors. Various approaches to identifying the agriculture–manufacturing differential were explored. One possibility considered was to take the differential between the minimum wage in agriculture and the minimum wage for the lowest category of unskilled labour, which amounted to 13 per cent. This could have been used to adjust the firm's total wage bill.

Since wages for all categories of manufacturing labour, including the lowest category of unskilled labour, are in excess of minimum rates this is undoubtedly an understatement. A second possibility was to take the differential between the agricultural rate and the average wage *actually* paid in the lower category of unskilled labour, a differential which amounts to 47 per cent. In order to err on the side of caution and avoid possible upward bias in the DRC ratios, it was decided to regard this as the maximum differential and 13 per cent as the minimum differential. Taking the average of the two gives a differential of 30 per cent. Since the average wage actually paid for all categories of manufacturing labour was over 2.5 times the agricultural minimum wage rate, a figure of 30 per cent is very likely to be an underestimate of the differential. This was used to deflate actual wage bills.

Using the information contained in a survey of manufacturing firms it was possible to estimate the actual rate of return achieved by most companies in our sample. This was computed by expressing pre-tax profits as a proportion of total capital assets net of depreciation. Arriving at a shadow rate of return to capital proved problematic, primarily due to the paucity of alternative investment opportunities. One possibility was to estimate this by reference to the marginal cost of foreign borrowing. Since, however, most recent borrowing was on concessional terms this possibility was eschewed. With no detailed information available on the productivity of Madagascan capital an approximation to the shadow rate of return was

Table 6.1 Distribution of DRC ratios in Madagascar, 1983

Range	*Product DRC*
< 0.99	7
1.00–1.49	11
1.50–1.99	9
2.00–2.49	6
2.50–3.00	2
> 3.00	8
Number	42
Mean	3.70 2.18(n − 1)

Source: Greenaway and Milner (1990).

generated by assuming that funds not invested in manufacturing would be deposited with the banking system. This probably understates the real cost of capital to the Madagascan economy. Nevertheless it can be viewed as a feasible alternative and it had the merit of supplying an identifiable rate of return. Accordingly the nominal deposit rate of 14 per cent was taken as the shadow rate of return. To arrive at an estimate of shadow capital costs this 14 per cent return was applied to each firm's total assets net of depreciation. As we shall see below in some instances, frequently in cases where companies benefited from a relatively high effective tariff the shadow rate of return was less than that actual rate of return. In most instances however the shadow rate exceeded the actual rate.[4]

The sample size for the DRC estimates was dictated by data availability. It was seen as desirable to extract as much information as possible from a single data source. Labour and capital costs were available in the survey for some 29 firms producing 43 products. Table 6.1 provides details of the distribution of DRC ratios for the entire sample. The estimates range from a low of 0.60 for cartons to a high of 9.35 for processed meat. The (unweighted) mean DRC is 3.7, or 2.18 if the highest DRC is taken out. Even if we take the lower figure this implies that with an official exchange rate of around FMG 600 to $1, the average cost to the Madagascan economy of saving $1 through import substitution or earning $1 through exporting is FMG 1308 in terms of domestic resources. If one thinks of the DRC ratio as a cost–benefit ratio, the costs being domestic resources and the benefits being the potential foreign exchange contribution of the firm, then it would seem that this ratio is relatively disadvantageous.

Table 6.2 reports average DRCs by industry. Some caution must be exercised in interpreting these results given the fact that for some industries results for only one activity are available. Notwithstanding this some inferences can be drawn. The lowest average DRC appears to be in paper

Table 6.2 Pattern of DRC ratios by industry in Madagascar, 1983

Industry	*Number of firms*	*Average DRC*	*Industry range*
1. Food and drink	5	3.99	0.82–9.35
2. Pharmaceuticals	3	2.49	0.79–3.68
3. Chemicals	4	1.40	0.78–2.38
4. Textiles	1	1.71	–
5. Footwear and leather	2	1.65	1.39–1.91
6. Wood products	2	3.04	2.49–3.58
7. Metal products	5	2.15	1.33–3.02
8. Electrical products	1	1.40	–
9. Paper products	2	0.64	0.60–0.68
10. Construction goods	1	1.70	–
11. Miscellaneous	1	2.68	–

Source: Greenaway and Milner (1990).

products. Indeed this is the only industry for which an *average* DRC of less than one is found. (It is notable that this is also the only industry for which an *average* negative effective tariff was estimated.) At the other extreme food and drink has an average DRC of 3.49. It should be noted that in the case of food and drink there are two recorded instances of negative value added at world prices for which DRC ratios could not therefore be computed. The reported DRC average may therefore be an understatement. Moreover it is the industry with the third-highest average effective tariff. Of the remaining industries, six have below average DRCs (chemicals, textiles, footwear and leather, metal products, electrical products and construction goods) and three are estimated to have above average ratios, (pharmaceuticals, wood products and miscellaneous).

Since the simple average masks quite a wide range of estimates, in some cases it is instructive to consider interproduct variations in DRC ratios. As can be seen from Table 6.1 there are seven products with a DRC ratio of less than one, namely vegetable oils, serums, syrups, acetylene, paper and cartons.

Notwithstanding the caveats identified above a number of inferences can be drawn from this DRC analysis. First, the average DRC ratio in Madagascar is in excess of two. Thus on average the value of resources required to earn/save a unit of foreign exchange is more than twice that suggested by the official exchange rate. Secondly, the range of estimates is relatively wide, i.e. 0.60 to 9.35. This implies there may be considerable resource misallocation associated with commercial and industrial policy. It also suggests that greater allocative efficiency could be achieved by encouraging resources to shift from activities with relatively high DRCs to activities with relatively low DRCs.

Thirdly, the DRC analysis seems to reinforce the effective tariff analysis reported in Chapter 5 by suggesting that there are considerable potential

gains to be reaped from policy reform. Fourth, with all analyses of this type there is inevitably a margin of error associated with the estimates, due in part to data deficiencies and in part to the nature of the assumptions which (of necessity) must be made. Where assumptions have had to be made they have consistently erred on the side of caution. Therefore if the results are systematically biased they are likely to be biased downwards. This point is reinforced by the fact that for those firms which enjoyed infinitely high protection, that is their value added was negative at world prices, a DRC could not be calculated (with the present methodology).[5]

Finally, in interpreting these results we have consistently used the official exchange rate. In practice many transactions may occur at a rate other than the official one. Indeed it would be surprising if the shadow rate was not less than the official. A black market exchange rate at some 30 per cent below the official rate is an imprecise estimate of the shadow rate. Using this rate would alter the detail of the results of course. However the use of any lower exchange rate would simply serve to raise, on average, the estimated value of Madagascan resources required in saving/acquiring foreign exchange without significantly altering the ranking and dispersion of DRC estimates.

Domestic resource cost ratios in Egyptian agriculture

Hassan, Greenaway and Reed (1992) have compiled a set of estimates for the Egyptian agricultural sector. Two sets of price data were collected. Domestic market prices were collected for all inputs and outputs. World prices were collected for all tradeable inputs and outputs. If the product is imported (exported), the world price is defined as the c.i.f (f.o.b) price (adjusted by the appropriate exchange rate). Shadow prices for domestic factors and the world price equivalent for non-traded inputs and outputs are calculated from the results of survey data (discussed below).

All traded inputs in the production process were treated as components of value added at world prices. If non-traded, however, the input was broken down into two categories. The first contains inputs that are defined as 'primary factors', for instance labour and land; the second category consists of inputs that are non-traded, for example manure, animal draft and sundries for irrigation. As Table 6.3 shows, primary factors are the most important component for the DRC. In general primary factors account for not less than 50 per cent of total domestic costs in Egypt.

For all commodities the market wage in Egyptian agriculture was considered to be the appropriate measure of the shadow price of labour. The rationale for taking the market wage was as follows. Labour is fully employed in the agricultural sector and acts as a reservoir for supplying demand in construction, services, expatriate production and so on. Thus a reserve army of unemployed labour does not exist. In shadow pricing for

Table 6.3 Relative importance of agricultural inputs in total production costs, Egypt 1980–7 (in per cent)

Crops	*Labour*	*Land*	*Machines*	*Seeds*	*Fertilizers*	*Insecticides*	*Animal draft*	*Manure*	*Sundries**
Wheat	34.4	23.3	16.5	4.6	8.1	0.0	4.8	3.7	4.5
Barley	30.5	22.8	18.7	4.8	7.8	0.0	5.0	5.6	4.8
Rice	43.1	12.9	16.6	7.5	5.6	0.6	6.2	3.1	4.4
Maize	42.8	14.7	12.9	2.3	9.7	0.0	3.8	8.8	5.0
Sorghum	50.2	16.3	15.6	1.6	8.7	0.0	2.2	1.2	4.2
Broadbeans	38.7	22.5	14.9	11.2	4.1	0.9	3.0	0.1	4.4
Soybeans	37.3	17.3	16.6	5.7	8.6	3.0	2.2	4.5	4.8
Groundnuts	45.6	20.3	9.6	7.2	4.4	0.8	4.0	4.3	3.9
Sesame	46.5	22.8	12.8	1.9	6.1	0.0	8.0	4.0	1.9
Cotton	53.6	17.3	8.5	0.7	5.0	3.1	1.9	6.2	3.7
Lentils	26.4	26.9	15.6	20.2	3.3	0.0	3.7	0.0	3.9
Onions	36.1	12.7	7.0	21.7	8.0	6.2	1.6	4.0	2.8
Flax	35.1	22.9	12.8	11.9	6.1	0.0	3.4	3.8	4.0
Sugarcane	47.4	13.8	12.4	5.3	11.2	0.5	4.9	0.4	4.1
Garlic	40.2	18.1	9.4	13.6	6.5	0.1	4.1	4.5	3.5
Potatoes	18.2	9.0	4.5	47.4	6.0	4.3	2.7	5.0	2.5
Tomatoes	41.7	15.5	7.3	6.3	8.2	7.5	2.5	8.2	2.7
Oranges	39.5	19.5	4.1	0.0	6.9	13.2	0.0	4.2	12.5

Source: Collected and computed from Egyptian Ministry of Agriculture data.
* Expenditure on water wheels, animal-powered irrigation, storage, haulage, interest and depreciation, and so forth.

non-agricultural activity, the agricultural wage is taken as the opportunity cost of labour. The labour market can be assumed to be fairly competitive and wages probably reflect fairly accurately the value of labour's marginal product, and therefore need only to be adjusted to take into account the impact that valuing tradeables at world prices would have on the value imputed to domestic resources. In the DRC calculations it has been assumed that the market wage of labour during the peak periods of May–June and October–November reflect the opportunity cost. In order to obtain its actual shadow cost for each crop, the market wage is multiplied by the crop's input–output coefficient for labour to obtain the labour shadow cost per feddan. To compute the labour shadow cost per unit (ton), it is divided by yield per feddan.[6]

Unlike labour, land is a basic depository of value and productive potential for agriculture. Its value is difficult to assess since it is not only a factor of production but also an asset, and related markets are often thin, unreliable and complex so that rental rates are not necessarily related either to the price of land or to its marginal product. The appropriate measure of the cost of land as an input is the producer's willingness to pay for the aggregate production benefits made possible by use of the land. In Egypt, with government intervention, rents are fixed by the land reform legislation to seven times the level of land tax. These taxes tend to remain constant at the same nominal level over long periods of time (about 10 years).

Table 6.4 shows the land tenure patterns in Egypt resulting from government intervention in the land market. It appears that about 60 per cent of the land is owner-operated and about 40 per cent is still cultivated by tenants. Tenancy tends on balance to consolidate land. Maximum rentals with protection of tenants against eviction were introduced in 1952 by the land reform legislation. The area rented decreased from about 42.6 per cent in 1972/73 to 35.1 per cent in 1981–82.

The cost of land is what it would have been worth in alternative uses. Thus the appropriate value for the opportunity cost of land in any crop is the return to land from the next best alternative use. In each sector, and for each district, the next best alternative crops were determined by comparison of (economic) returns to land. The opportunity cost of land in its existing use is then the result arrived at by taking the alternative crops with the highest return. Table 6.5 shows the crop alternatives assumed.

Although some farmers own tractors, they increasingly rely on tractor services provided by machinery renting stations to meet the needs of their production. These stations are under the supervision of the Ministry of Agriculture. Until recently, the charges for machinery services were controlled by the government, at £E 12 per hour for a farm tractor with driver and equipment. Even so, the farm tractor charge is subsidised, according to official data. The opportunity cost of tractor services are calculated using information on rentals in the British market. This involved computing costs

Table 6.4 Land tenure patterns in Egypt (1972–82)

Year	*Owners (%)*	*Tenants (%)*	*Share croppers (%)*	*Total area (000 feddan)*
1972/73	57.4	34.4	8.2	5642
1973/74	57.0	34.7	8.3	5625
1974/75	57.6	34.5	7.8	5661
1975/76	58.4	33.7	7.8	5675
1976/77	59.5	32.8	7.7	5667
1977/78	60.4	32.3	7.3	5655
1978/79	60.4	33.2	6.4	5648
1979/80	61.7	32.1	6.3	5635
1980/81	62.9	31.0	6.1	5610
1981/82	64.9	29.3	5.8	5645
Average	60.0	32.8	7.2	–

Source: Collected and computed using data from the Egyptian Ministry of Agriculture and the Agricultural Economics Research Institute, Cairo.

per hour after adjusting for the exchange rate (official and shadow exchange rates) for all crops.

Non-traded factors do not exceed 11.5 per cent on average of total production costs. Since their value to the economy cannot be measured in terms of border prices they should be assessed in relation to prices in the domestic market. To compute non-traded inputs, one could work with integrated industries in the 'sophisticated' Corden fashion. Alternatively, one could work with the disaggregated industries, but define the DRC in one of two different ways. The first would be to leave the numerator defined as the amounts of primary factors evaluated at shadow prices, while the denominator would be the value added at border prices. The second alternative would be to treat the non-traded inputs just like the primary factors of production and place them in the numerator instead of the denominator. This is the one used there.

On the basis of the above assumptions, DRC coefficients were derived for each agricultural product. These were computed twice, using official and shadow exchange rates. The main results are summarised in Tables 6.6 and 6.7. Table 6.6 presents DRC coefficients at the official exchange rates while Table 6.7 presents the coefficients at shadow exchange rates.

The results suggest a comparative advantage in all export commodities studied for 1980–7 (onions, tomatoes, oranges, groundnuts, garlic, potatoes, rice and cotton), either at the official exchange rate or the shadow exchange rate. They also show that DRC coefficients for all import and self-sufficient commodities are more than one, indicating that Egypt clearly does not have a comparative advantage in these crops. The estimates suggest a number of conclusions regarding comparative advantage within agriculture for the period 1980–7. In the import crops, for instance, sugar-

Table 6.5 Summary of next-best crop alternatives in Egypt

Crop	*Alternatives**
Wheat	Barley, lentils, onions, flax, garlic, tomatoes, broadbeans, *cotton*
Barley	Wheat, lentils, onions, flax, garlic, tomatoes, *broadbeans*
Rice	Groundnuts, soybeans, sesame, potatoes, maize, tomatoes, sorghum, *cotton*
Maize	Groundnuts, soybeans, sesame, potatoes, *rice*, tomatoes, sorghum, cotton
Sorghum	Groundnuts, soybeans, *sesame*, potatoes, rice, tomatoes, maize, cotton
Broadbeans	Wheat, barley, *lentils*, flax, onions, tomatoes, garlic
Soybean	Groundnuts, maize, rice, potatoes, sorghum, tomatoes, *sesame*, cotton
Groundnuts	Maize, rice, sorghum, potatoes, soybeans, tomatoes, *sesame*, cotton
Sesame	Maize, rice, sorghum, potatoes, soybeans, tomatoes, sesame, *cotton*
Cotton	Maize, rice, sorghum, potatoes, soybeans, tomatoes, sesame, *wheat*
Lentils	*Wheat*, barley, broadbeans, onions, flax, tomatoes, garlic
Onions	Wheat, barley, broadbeans, *lentils*, flax, tomatoes, garlic
Flax	Wheat, barley, broadbeans, *lentils*, onions, tomatoes, garlic
Sugarcane	*Cotton*
Garlic	Wheat, barley, broadbeans, lentils, *onions*, tomatoes, flax
Potatoes	Maize, *rice*, groundnuts, soybeans, sesame, tomatoes, sorghum, cotton
Tomatoes	Maize, rice, groundnuts, soybeans, *potatoes*, sesame, sorghum, cotton
Oranges	*Cotton*

* The italicised crops are the best alternative use.

Table 6.6 Egyptian agricultural crops, domestic resource costs (using official exchange rates), 1980–7

Crop	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1980–7*
Import-competing crops:									
Wheat	2.29	1.64	1.13	1.04	1.41	1.33	1.18	1.19	1.40
Maize	2.84	2.46	2.86	3.33	1.94	2.70	3.95	5.71	3.22
Soybean	1.06	1.01	0.77	1.28	1.12	1.21	2.43	2.74	1.46
Sesame	1.85	2.05	1.81	0.97	1.52	1.56	0.97	0.99	1.46
Lentils	0.97	1.14	1.24	1.21	1.02	0.92	0.94	0.99	1.05
Flax-seed	1.50	1.69	1.71	1.33	1.25	1.53	1.68	2.02	1.59
Sugarcane	0.72	0.56	0.65	1.54	1.89	2.27	1.42	3.11	1.52
Self-sufficient crops:									
Barley	0.74	0.74	1.12	1.46	1.15	1.23	1.41	1.66	1.19
Sorghum	1.48	1.34	1.30	1.48	1.71	1.88	2.31	2.21	1.71
Broadbeans	1.57	1.57	1.13	0.89	1.16	1.38	1.15	1.10	1.24
Export crops:									
Rice	0.98	0.79	0.52	0.59	1.04	0.99	0.74	0.82	0.81
Groundnuts	0.56	0.43	0.36	0.59	0.52	0.66	0.73	0.66	0.56
Cotton	0.52	0.68	0.95	1.00	0.82	0.85	1.02	1.00	0.86
Onions	0.25	0.23	0.21	0.29	0.35	0.35	0.40	0.22	0.29
Garlic	0.23	0.36	0.35	0.32	0.64	0.91	0.85	1.39	0.63
Potatoes	0.77	0.71	0.75	0.82	0.54	0.87	1.22	0.76	0.80
Tomatoes	0.29	0.40	0.40	0.35	0.60	0.51	0.33	0.28	0.40
Oranges	0.49	0.41	0.28	0.38	0.47	0.50	0.47	0.44	0.43

Source: Collected and computed from Egyptian Ministry of Agriculture data.

cane and lentils have a DRC coefficient which in some years turns out to be below one and in some years above one, depending on what was happening to world prices. The increased comparative advantage on lentils after 1984 is due to lower wheat prices.

6.4 DRC analysis and policy appraisal

These examples illustrate well the principles behind the technique, as well as some of the difficulties associated with its application. As we have seen, the key problem is the estimation of shadow prices. As with many other economic concepts, the contrast between theoretical precision and practical application is striking. The theorist enjoys the luxury of being able to disregard questions of data availability and policy evaluation in a second-best context. The analyst is not in such a luxurious position and invariably has to take a pragmatic perspective when it comes to estimation. Does this mean that the resultant estimates are of no value when it comes to policy appraisal? The answer to this question is 'no'. DRC analysis has been quite

Table 6.7 Egyptian agricultural crops, domestic resource costs (using shadow exchange rates), 1980–7

Crop	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1980–7*
Import-competing crops:									
Wheat	2.51	2.04	1.57	1.61	2.26	2.42	2.84	3.60	2.36
Maize	2.89	2.53	2.93	3.57	2.01	3.06	4.76	8.42	3.77
Soybean	1.04	0.99	0.76	1.29	1.14	1.24	2.67	3.37	1.56
Sesame	1.92	2.20	2.10	1.23	1.90	2.13	1.50	1.74	1.84
Lentils	0.95	1.09	1.19	1.29	0.95	0.77	0.95	0.98	1.02
Flax-seed	1.55	1.83	1.91	1.51	1.53	2.09	2.58	5.07	2.26
Sugarcane	0.70	0.53	0.60	1.39	1.74	2.07	1.19	2.38	1.33
Self-sufficient crops:									
Barley	0.75	0.78	1.23	1.65	1.29	1.57	2.12	3.04	1.55
Sorghum	1.47	1.36	1.29	1.46	1.65	1.79	2.37	2.29	1.71
Broadbeans	1.55	1.55	1.08	0.86	1.17	1.51	1.19	1.21	1.27
Export crops:									
Rice	0.99	0.82	0.56	0.68	1.19	1.14	0.91	1.07	0.92
Groundnuts	0.55	0.41	0.33	0.54	0.45	0.53	0.62	0.52	0.49
Cotton	0.47	0.55	0.73	0.74	0.56	0.53	0.47	0.43	0.56
Onions	0.22	0.19	0.16	0.20	0.24	0.23	0.23	0.12	0.20
Garlic	0.24	0.37	0.36	0.33	0.69	0.99	0.93	1.47	0.67
Potatoes	0.76	0.69	0.72	0.75	0.47	0.76	1.01	0.59	0.72
Tomatoes	0.29	0.40	0.39	0.34	0.58	0.47	0.30	0.27	0.38
Oranges	0.47	0.36	0.23	0.29	0.37	0.34	0.30	0.25	0.33

Source: Collected and computed from Egyptian Ministry of Agriculture data.

widely deployed in the process of policy appraisal by agencies like the World Bank, as well as by independent analysts. As it is more data demanding than effective protection it is not so widely used. Nevertheless, in the pre-appraisal stage of a structural adjustment programme, its use is not unusual.

The methodology has its attractions. As we saw earlier, it has a higher information content than the effective protection coefficient. In the context of developing countries this is a considerable virtue, given the pervasiveness of intervention. It is a measure with considerable intuitive appeal in that it can be interpreted as an indicator of comparative advantage. As such it can be used as an input into reflections on resource reallocation. Of course the measure also has its limitations, and one must interpret it with care. It would be unwise to rely on it to make judgements about the relative merits of investing in alternative activities with small differences in their DRCs. However one can use it in a similar way to the effective protection measure, using information on the mean DRC, its range and the ranking of activities in that range.

The mean can reveal something about the impact of intervention 'on

average'. A mean of unity would suggest that, on average, activities are competitive internationally, a mean value of over two, as reported above in the Madagascan case, suggests quite the opposite. The distribution around the mean conveys information about potential damage in terms of resource misallocation associated with intervention, whilst the ranking within the distribution can convey information helpful to policy reform. Overall therefore the measure is a useful one. Used judiciously it is a valuable input to the policy appraisal process.

6.5 Concluding comments

DRC analysis belongs to the same family of policy-appraisal measures as effective protection and net social profitability in that it uses information on the relationship between domestic and world prices to describe the effects of intervention at a fairly disaggregated level. In this respect it has obvious similarities with the effective protection measure discussed in the last chapter. However it goes beyond effective protection in that it takes into account the impact of non-border distortions. Potentially therefore the measure has a high information content and can provide a neat summary of the relative efficiency of alternative activities. However, since it relies heavily on estimated shadow prices, it is a more complicated measure to work with. Moreover it is also inherently more difficult to estimate. Thus one has to use the measure judiciously. Notwithstanding this, it is a potentially useful tool in the analyst's toolbox.

PART III

TOOLS OF GENERAL EQUILIBRIUM ANALYSIS

CHAPTER 7

Shift Analysis and the Incidence of Protection

7.1 Introduction

The partial equilibrium tools of analysis outlined in Part II tend to focus on the impact of commercial policy interventions at the product or industry level. By design these tools are intended to comment on the impact of production and consumption effects and the resulting costs of discriminatory and protective measures. Analysts nonetheless are often drawn into using cross-sectional information on partial equilibrium estimates of the structure of protection to comment on resource allocation effects. As discussed in Chapter 5, information on average levels and the ranking and dispersion of effective protection can be used to make inferences about resource pulls between industries and sectors. But there are dangers in using partial equilibrium estimation techniques to comment upon general equilibrium effects. If the purpose of policy analysis is to comment upon *relative* incentives to invest and produce in particular sectors of the economy, then it would be preferable to set up a general equilibrium framework for the analysis of protection; one which focuses on the relative price effects of interventions across sectors of activity.

Incidence or shift analysis attempts to focus on these relative price effects, or true protection, as opposed to the nominal or net price effects. By examining the subsequent relative price adjustments to nominal interventions (tariffs, subsidies and so on) it is possible to comment on the ultimate incidence or burden of protective measures. In circumstances where countries simultaneously attempt to intervene or promote across the board, for example where LDCs try to both import-substitute and export-promote, it is also possible to use true protection measures to comment on

policy conflicts and compatibility. In addition, as we shall see, this potentially powerful analytical tool is, in comparison with many of the other tools of analysis discussed in this book, relatively undemanding in terms of data requirements.

This chapter outlines the nature and uses of incidence analysis and illustrates its application in a number of developing countries. The rest of the chapter is organised as follows. Section 7.2 sets up the theoretical framework. Section 7.3 uses this framework to illustrate true protection and the incidence of protection under alternative conditions. Section 7.4 describes the estimation methodology required to operationalise the model and illustrates its application in a number of countries. Section 7.5 reviews the analytical value of the empirical work to policy appraisal. Finally section 7.6 offers some concluding comments.

7.2 The theoretical framework

The neoclassical model of international trade is usually based on two sectors, two factors of production and two goods. Such a model allows us to predict which *factor* loses from trade restriction and which gains. As Sjaastad (1980a) points out however, since it is generally assumed that both factors are used in both sectors it is not possible to examine the incidence of protection in *sectoral* terms. Import protection raises the price of importables relative to exportables but nothing can be inferred from this about the *incidence* of protection across the sectors. If a third sector is introduced, namely non-tradeables, a second relative price ratio, the price of non-tradeables relative to tradeables, is introduced. An examination of how an import tariff alters the price of importables relative to exportables *and* non-tradeables can provide an indication of the 'true' protection of importables and the extent to which the incidence of the tax is shifted onto exportables and non-tradeables. The incidence depends essentially on the degree of substitutability (in demand and production) between the products of the importables sector and the other unprotected sectors.

The model

Consider a simple general equilibrium model based on the following assumptions.[1]

- A small open economy with given factor endowments which produces and consumes importables (M), exportables (X) and non-tradeables or home goods (H).
- Initial (free-trade) internal relative prices of all goods which are unity. Moreover it will be assumed that the relative prices of both importables

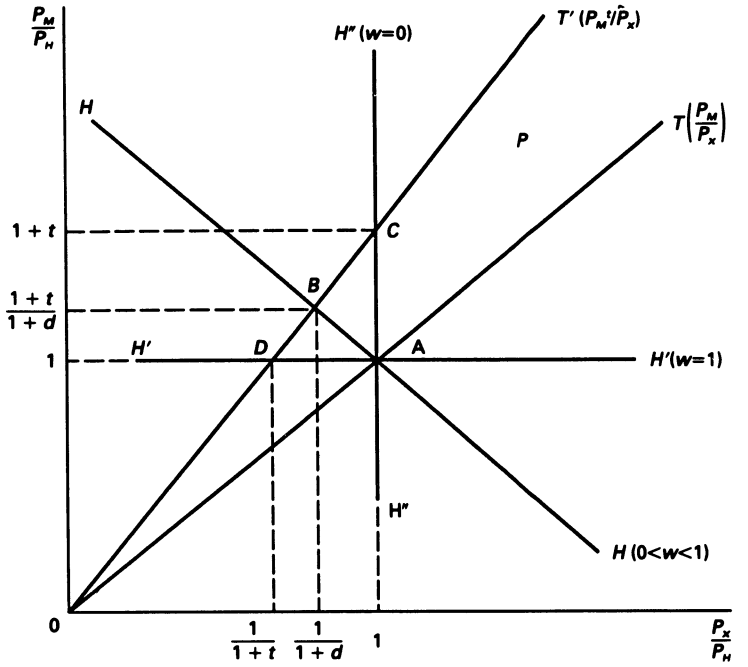


Figure 7.1 Relative prices and commercial policy interventions

and exportables in terms of home goods are flexible so as to allow market clearing.

- Commercial policy interventions which take the form of uniform tariffs on imports and/or uniform subsidies on exports.
- Factor intensities are such that $(K/L)_M \geq (K/L)_H \geq K/L)_X$, where K/L refers to the capital-labour ratio in each sector, and factor intensity reversals are ruled out.
- A fixed exchange rate and initial balanced trade.

As Dornbusch (1974) shows, equilibrium in the home goods market implies balanced trade. Therefore the equilibrium properties of the model can be examined in terms of equilibrium in either the market for non-tradeables or tradeables. Figure 7.1 illustrates a particular case. Here it is assumed that home goods are substitutable for exportables and/or importables in both production and consumption. Exportables and importables are not, however, substitutable.[2] The domestic price of importables relative to exportables (P_M/P_X) is determined by the given world terms of trade and any commercial policy intervention. This is represented by the ray OT. The schedule HH demonstrates alternative prices of importables and exportables (relative to home goods) that clear the home goods market. At points along HH, excess demand for home goods is zero. At points above

and to the right, excess demand is positive, whilst at points below and to the left, excess demand is negative. HH is negatively sloped, reflecting the assumption that home goods substitute with *both* tradeables. A fall in P_M (relative to P_H) generates negative excess demand for non-tradeables and must be offset by an increase in P_X (relative to P_H). Free trade equilibrium is at A where OT intersects HH.

Using this framework one can examine the *relative* price effects of commercial policy interventions. Since initial relative prices are unity, a uniform tariff t on all importables raises the relative price of importables P_M/P_H to $1 + t$. In Figure 7.1 this rotates the ray OT to OT' as the domestic relative price of importables in terms of exportables rises by the amount of the nominal tariff. The new equilibrium will be at point B where OT' intersects HH. The price of exportables relative to home goods has fallen to $1/1 + d$, whilst the price of importables relative to home goods has increased to $1 + t/1 + d$. d refers to the proportional increase in the price of home goods ($\hat{P}_H$). This increase in the nominal price of home goods relative to the price of traded goods is necessary to remove the incipient tariff-induced trade surplus and corresponding positive excess demand for non-tradeables. The nominal tariff raises the price of importables in terms of both exportables and home goods as it initially moves the economy from A to C. The fall in the relative price of home goods induces a shift in demand towards home goods and a shift in production away from home goods, the extent of these shifts depending upon the substitutional relationships between M and H. The stronger the substitutional relationships the greater the proportional change in $\hat{P}_H$ $(=d)$. In Figure 7.1, $0 < d < t$ and full equilibrium is restored at B.

The role of substitutional relationships can be formally demonstrated as follows. The proportional increase in the price of home goods generated by an import tax is that required to restore equilibrium in the home goods market. Thus, following Sjaastad and Clements (1981),

$$\hat{S}_H = \hat{D}_H \tag{7.1}$$

where $\hat{S}_H$ and $\hat{D}_H$ refer to the proportionate change in the supply of and demand for home goods respectively.

$$\hat{S}_H = h_X^S \hat{P}_X + h_M^S \hat{P}_M + h_H^S \hat{P}_H \tag{7.2}$$

$$\hat{D}_H = h_X^D \hat{P}_X + h_M^D \hat{P}_M + h_H^D \hat{P}_H \tag{7.3}$$

Since income effects are ignored, h^S and h^D are compensated supply and demand price elasticities for home goods with respect to the price of X, M and H, and $\hat{}$ denotes a proportionate change.

These elasticities are subject to the homogeneity constraint:

$$\sum_{i=1}^{n} h_i^S = \sum_{i=1}^{n} h_i^D = 0 \tag{7.4}$$

From Equations 7.1, 7.2, 7.3 and 7.4 we obtain:

$$\hat{P}_H = w\hat{P}_M + (1 - w)\hat{P}_X \tag{7.5}$$

where

$$w = \frac{h_M^D - h_M^S}{h_H^S - h_H^D} \tag{7.6}$$

The effects of a tariff as shown by Equations 7.5 and 7.6 depend on the substitutional relationships between home goods and the two traded goods. In fact, the *shift parameter* (w) is an index of substitutability between home goods and importables in production and demand and will lie between zero and unity. Where importables and home goods are close substitutes, w will tend towards unity. In the limit where home goods and importables are perfect substitutes, $w = 1$. In this case the absolute price of both increases by the same extent, relative to the price of exportables, and the incidence of an import tax falls totally on exporters. Here the tariff, in fact, is fully equivalent to an implicit export tax. This is represented by point D in Figure 7.1, with HH being horizontal over the relevant range. In contrast, where exportables and home goods are close substitutes for each other the price of importables rises relative to both exportables and home goods and the incidence of the import tax is shared equally by those two sectors. In this case, $w = 0$ and we are at C in Figure 7.1 with HH being vertical over the relevant range.

Pre- and post-intervention equilibrium compared

Although both points A and B (for the case of an intermediate value for the shift parameter w or substitutability in production and demand) involve trade balance, there are some important differences in the characteristics of these equilibrium situations. First, the sectoral pattern of production, and consumption is different. Since the price of importables has risen relative to both non-tradeables and exportables, and the price of non-tradeables has risen relative to exportables, there has been a shift of resources away from the production of exportables and towards the production of importables, and a shift of domestic demand towards exportables and away from importables. The result is a larger importables sector, a smaller exportables sector and a reduced volume of both exports (the excess supply of exportables) and of imports (the excess demand for importables). Thus this discriminatory intervention alters the relative price

and incentive structure, and has resource allocation effects. In this particular case import protection introduces a trade-regime and anti-export bias, although there has been no change in the nominal protection and therefore price of exportables. Protection and promotion are ultimately both relative, rather than nominal, concepts. (Measures of relative, or true protection, are set out in the next section.)

The second significant difference between the pre- and post-tariff equilibria concerns the real exchange rate. The initial effect of a tariff tended to move the economy from trade balance into trade surplus, as P_M/P_H rose to $1 + t$. The restoration of trade balance at B was achieved by an increase in the nominal price of non-tradeables (d), as P_M/P_H fell back to $1 + t/1 + d$. Although the nominal exchange rate is assumed to be fixed, this rise in P_H results in an implicit appreciation of the real exchange rate (a fall in the border price of tradeables relative to the price of non-tradeables). This same adjustment could have been achieved by a nominal currency appreciation, which would lower the nominal price of tradeables. Thus discriminatory commercial policy measures tend to cause exchange rate misalignment: import substitution measures for instance cause a country to maintain a given balance of trade position at a higher real (that is over-valued) exchange rate than would apply in the absence of intervention.

7.3 True protection and the incidence of protection

If we use the change in the price of importables or exportables relative to home goods as a measure of the 'true' effect of protecting or promoting a sector, we can define the true tariff ($\overset{*}{t}$) and true export subsidy ($\overset{*}{s}$) as:

$$\overset{*}{t} = \Delta\,(P_M/P_H) \tag{7.7}$$

and

$$\overset{*}{s} = \Delta\,(P_X/P_H) \tag{7.8}$$

In terms of Figure 7.1 the proportional change in P_H equals d and therefore Equations 7.7 and 7.8 can be rewritten as:

$$\overset{*}{t} = \left(\frac{1 + t}{1 + d}\right) - 1 \quad = \frac{t - d}{1 + d} \tag{7.9}$$

and

$$\overset{*}{s} = \frac{s - d}{1 + d} \tag{7.10}$$

where s denotes the nominal export subsidy.

Thus the pattern of true protection depends upon the structure of protection (for example whether $t \geqslant s \geqslant 0$) and upon d.

Import protection only

In the case where import substitution measures ($t > 0$) are applied in the absence of any export promotion measures ($s = 0$) then:

$$d = wt \tag{7.11}$$

Therefore if we substitute Equation 7.11 into Equation 7.9 and 7.10:

$$\overset{*}{t} = \frac{t - wt}{1 + wt} \tag{7.12}$$

and

$$\overset{*}{s} = \frac{-wt}{1 + wt} \tag{7.13}$$

Thus $t \geqslant \overset{*}{t} \geqslant 0$ and $\overset{*}{s} \leqslant 0$ as $0 \leqslant w \leqslant 1$ (see Figure 7.2). If importables and home goods are perfect substitutes, that is $w = 1$, and $d = t$ the true tariff is zero. There is no net protection of importables relative to non-tradeables. But in this case the rise in P_H means that there is a negative true subsidy of exportables (if $s = 0$); $\overset{*}{s}$ equals $-t/(1 + t)$ where $w = 1$. Thus all the burden of import protection falls upon the exportables sector in this case.[3] It is somewhat ironic that this highest level of burden on exportables is associated with the lowest level of true protection for importables. It serves to illustrate however how the actual effects of policy intervention may differ substantially from the intended effects. It might be noted parenthetically that this may provide one explanation of the tendency for protection of importables in many less developed countries to increase through time. If true protection is low there is a motive to press for further nominal protection!

As w falls below unity (that is there is less than perfect substitutability between M and H and $d < t$), then the true tariff is positive (but less than the nominal tariff where $d > 0$) and the negative true subsidy becomes smaller in absolute terms. In this intermediate cause the burden of import protection falls on both exportables and non-tradeables (though more on exportables than non-tradeables). In the extreme, if exportables and home goods are perfect substitutes ($w = 0$) and import protection results in no change in P_H (that is $d = 0$), then $\overset{*}{s} = 0$ and the true tariff equals the

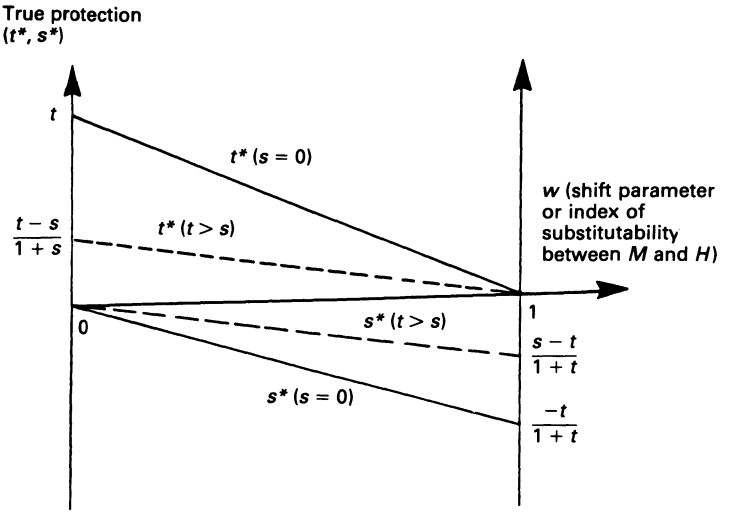


Figure 7.2 True protection and the structure of protection

nominal tariff. The cost of import protection falls equally on exportables and non-tradeables.[4] Thus the shift parameter w determines the pattern of true protection and the distribution of the incidence or burden of protection. The incidence on exports (y) in the import protection only case is as follows:

$$y = \tfrac{1}{2}(1 + w) \tag{7.14}$$

Thus the share of burden, which ranges between 50 per cent and 100 per cent as w ranges from 0 to unity, is endogenously determined by substitutability characteristics of the economy and not influenced by policy interventions.[5]

Mixed strategies

In many less developed countries the desire to industrialise has induced simultaneous attempts at import substitution and export promotion. In general the actual, net effects of simultaneously operating conflicting policies (in terms of their effects on internal relative prices) will be considerably different from the intended effects. Because protection alters *relative* prices, the protection of import-competing activities in isolation must 'disprotect' exporters, while the promotion of exports in isolation must 'disprotect' import-substitution activities. If import protection would, in isolation, result in a marked fall in the price of exportables relative to home goods, then the imposition of an export subsidy merely acts as a counter-

vailing distortion. Similarly if the provision of an export subsidy raises the price of exportables relative to non-tradeables, an import tariff acts as a countervailing distortion.

The extent to which export subsidies offset the effects of import duties on relative prices depends on the relative magnitudes of the nominal rates of duty and subsidy and the nature of the substitutional relationships present in the economy. Traditional exports of primary products are invariably raw material or resource intensive. As such, one would anticipate somewhat limited substitution possibilities in demand and production between these and other sectors. In contrast, *non-traditional* exports (that is manufactures), tend to be relatively labour intensive and often have closer substitutional relationships with other sectors, in particular the home goods sector. As a result of this one might expect differences in the proportion of protection which is shifted, with a higher incidence on traditional exports.

Equations 7.9 and 7.10 show formally that what happens to the price of home goods has a critical influence on true rates of protection. The proportionate increase in the price of home goods ($\hat{P}_H$) following the imposition of an import tariff and export subsidy is composed of two elements: that part of the increase shifted on from the rise in the price of importables due to the tariff (wt) and that part shifted on from the domestic price of exportables due to the subsidy ($[1 - w]s$). That is, Equation 7.11 is amended so that:

$$d = wt + (1 - w)s \tag{7.15}$$

Consider first the uniform intervention case. If $t = s$, we have the result that $d = t = s$; the prices of all goods (tradeables and non-tradeables) have risen by the same proportion and no sector is protected because relative prices are unaltered. In other words, if import tariffs are used to protect the import substitute sector, whilst equivalent export subsidies are offered to the export sector, the overall pattern of relative prices will not differ from the preprotection level. This may seem self-evident. It is nonetheless an important point. To make a specific example, it implies that using resources to create an export processing zone, as many LDCs have done, may simply be a second-best means of achieving a 'free trade' pattern of relative prices!

The case where $t > s$ is probably of greater practical relevance. The division of true protection now depends critically on the value of w. The policy makers can set the extent to which actual or nominal t exceeds nominal s but the final relative price structure and therefore the true tariff and subsidy are determined by substitutional relationships in the economy which are dependent on preferences and technological characteristics. Consider Figure 7.2 again. True protection ($\overset{*}{t}$ or $\overset{*}{s}$) is absolutely smaller for any value of w. (The range of values for $\overset{*}{t}$ and $\overset{*}{s}$ given by the dotted lines in Figure 7.2 are obtained by substituting Equation 7.15 into Equation 7.9

Table 7.1 True protection for alternative substitution possibilities and trade strategies

	Degree of substitutability between M and H		
	Perfect $w = 1$	*Intermediate* $1 > w > 0$	*Zero* $w = 0$
Import protection only ($t > 0, s = 0$)	$\overset{*}{t} = 0$ $\overset{*}{s} < 0$	$0 < \overset{*}{t} < t$ $\overset{*}{s} < 0$	$\overset{*}{t} = t$ $\overset{*}{s} = 0$
Export promotion only ($t = 0, s > 0$)	$\overset{*}{t} = 0$ $\overset{*}{s} = s$	$\overset{*}{t} < 0$ $s > \overset{*}{s} > 0$	$\overset{*}{t} < 0$ $\overset{*}{s} = 0$
A mixed strategy ($t > s > 0$)	$\overset{*}{t} = 0$ $\overset{*}{s} < 0$	$0 < \overset{*}{t} < t$ $\overset{*}{s} < 0$	$\overset{*}{t} < t$ $\overset{*}{s} = 0$
Uniform intervention ($t = s$)	$\overset{*}{t} = 0$ $\overset{*}{s} = 0$	$\overset{*}{t} = 0$ $\overset{*}{s} = 0$	$\overset{*}{t} = 0$ $\overset{*}{s} = 0$

and 7.10 respectively.) But the critical feature of the diagram is that $\overset{*}{t} \geq 0$ and $\overset{*}{s} \leq 0$ as the value of w varies. The policy makers can raise $\overset{*}{t}(\overset{*}{s})$ for a given value of w except where $w = 1(0)$, but raising $\overset{*}{t}(\overset{*}{s})$ will lower $(\overset{*}{s})\overset{*}{t}$ and $\overset{*}{t}(\overset{*}{s})$ is always lower than $t(s)$. Policy conflict is inevitable if the aim is to simultaneously import protect and export promote on an across-the-board basis.

The range of possible true protection structures that can arise under alternative trade regimes and substitution arrangements is summarised in Table 7.1. We turn now to operationalising the model and reporting on a number of empirical studies that employed this framework.

7.4 Empirical application of the model

The extent to which nominal protection interventions confer true protection to particular sectors are shown by the model to depend upon substitutional relationships between the sectors. These substitutional relationships can in principle be measured directly or indirectly.

Direct estimation

Equation 7.6 defines the shift or incidence parameter in terms of demand and supply price elasticities for non-tradeables (H) with respect to the prices of each basket of goods (H, X and M). It is, in principle at least,

possible to estimate these elasticities directly using time series data. Clements (1980) for instance has estimated a small-scale general equilibrium model with the three sectors H, X and M for the US. Using annual data for the postwar period, the estimated structural form price elasticities were; $\hat{h}_M^D = 0.044$, $\hat{h}_M^S = -0.532$, $\hat{h}_H^S = -0.598$ and $\hat{h}_H^D = -0.054$. Entering these values into Equation 7.6 gives an estimate of the shift parameter of 0.88.[6] The information requirements of this type of approach are however fairly high, in particular for developing countries. Although general equilibrium models have been applied to some developing countries, their purpose and form have not been suitable for testing the present three-sector model. Instead all existing work on applying shift analysis to developing countries has relied on indirect estimation methods, which are less demanding in terms of data requirements.

Indirect estimation

Equation 7.5 expresses a relationship between changes in the prices of importables, exportables and non-tradeables. Rearranging Equation 7.5 gives us:

$$\hat{P}_H - \hat{P}_X = w(\hat{P}_M - \hat{P}_X) \tag{7.16}$$

Since the shift model analyses proportional changes in the price of one group of commodities relative to another, a possible estimating procedure is to transform equation 7.16 to a double logarithmic specification, viz,

$$\log\left[\frac{P_H}{P_X}\right] = a + b \log\left[\frac{P_M}{P_X}\right] + u \tag{7.17}$$

where u is the random error term and the estimated coefficient $\hat{b}$ provides an estimate of the shift parameter ($\hat{w}$). Thus we can indirectly estimate w from times series data on prices (P_H, P_X and P_M) only, using regression techniques. A comparison of a number of estimates of w derived from this type of estimation procedure are set out in Table 7.2. These are discussed in greater detail below, but see also Greenaway, 1988a. Although this indirect estimation procedure only requires information on output prices, there are a number of methodological problems to confront.

(1) Time period identification

Since the aim of the analysis is to capture the shifting effects associated with import protection, then one should select a time period associated

with sustained import substitution measures (and preferably increases in the level of protection) and without other significant influences on the structure of relative prices. Thus the nature and extent of the time period are of relevance; too long a period increases the possibility of extraneous influences[7] and too short a period reduces sample size and the probability of fully capturing relative price adjustments. The selection of the time period should therefore be undertaken with care, but the problem of observational equivalence does not disappear. Estimates of a shift parameter derived from this indirect methodology that are consistent with the model (that is lie in the 0–1 range) do not constitute a direct test of the model; the same set of results could be consistent with some alternative adjustment process and with some alternative source of change in the price of importables. What is offered is an empirical application, not a test, of the incidence model.

(2) SECTOR IDENTIFICATION

In theory it is straightforward to distinguish between different sectors of economic activity. In practice it is very much more difficult. It is not always obvious what should comprise the components of a price index for importables or exportables. In principle the price indices P_H, P_M and P_X should exhaust all productive activities in the economy. In practice one has usually to work with a sub-set of information. In principle, also, it is domestic prices of tradeables and non-tradeables that are required. In practice prices may be available only for traded goods (that is imports and exports). Thus in the case of the study on Mauritius by Greenaway and Milner (1986b) a price series was constructed from official consumer price data for importables ($\hat{P}_M$) on furniture, furnishings, household appliances, alcoholic drinks and cotton yarns, and non-tradeables ($\hat{P}_H$) on household operations, shoe repairs, medical care, entertainment and education. The selection of these categories was partly constrained by the prevailing construction of the consumer price index, but was also undertaken after careful consideration of the import, export and production characteristics of the Mauritian economy. Two separate series were constructed for exportables: one for 'non-traditional' exportables (comprising finished clothing as identified also from consumer price data) and one for 'traditional' exportables (comprising sugar and tea but identified from unit value, export data). This configuration of information was influenced therefore by the selectivity of the researchers themselves, but it was also significantly fashioned by data availability.

(3) PRICE INDEX CONSTRUCTION

Having decided on the components of a particular index, it is necessary to decide on whether the aggregrate sector indices should be weighted or not, and for what frequency (monthly, quarterly or annually) they should be measured. Although frequency selection is invariably data constrained, some caution is required; with annual data an adequate sample size may extend the time period unsatisfactorily, while with monthly data adjustments of relative prices to policy changes may well be incomplete within one time period. The frequency of data is therefore likely to fashion the modelling of lag structures. This will invariably be determined by reference to the data and not to theory, which tells us little about the expected length or structure of lags.

Similarly the weighting issue has not been resolved in a common manner. Some studies use weighted composite indices, other unweighted indices. The weights that should be used are determined by relative substitution effects. In practice it is weights in production or consumption that are likely to be available.

Shift parameter estimates

Incidence analysis is of relatively recent vintage, and as a result the number of empirical studies that apply the model to developing countries is as yet relatively small. Studies on Latin American and African economies have been published; Sjaastad (1980b, 1980c) applied the technique to Uruguay and Argentina, Diaz (1980) to El Salvador, Fendt (1981) to Brazil, Garcia (1981) to Columbia, Sjaastad and Clements (1981) to Chile, Greenaway and Milner (1986b) to Mauritius, Greenaway (1989) to the Ivory Coast, Oyejide (1986) to Nigeria, and Milner (1990a, 1992) to Cameroon and Madagascar. Table 7.2 provides a comparison of some of these studies and their results, applying the type of model set out in Equation 7.17.[8]

As can be seen from the table, the studies cover a range of data periods and sets. Nonetheless, there is a degree of consistency between the results and with *a priori* expectations:

- All the estimates of w lie within the range zero and unity. The empirical evidence is to this extent consistent with the model.
- The value of w varies between countries and types of exportables. Substitutional relationships which determine w in the model can be expected to vary between countries and between traditional and non-traditional exportables.
- The estimated (long term) parameters fall within the range of 0.42 to 0.95, with all bar one exceeding 0.5. Thus the model predicts, given

Table 7.2 Shift parameter estimates for some developing countries

Country	*Shift parameter* ($\hat{w}$)	*Short-run shift parameter* ($\hat{w}'$)	*Type of exportable*[1]	*Data*[2]	*Period*	*Study*
Mauritius	0.71	0.22	NT	M	1976–82	Greenaway & Milner (1986b)
Mauritius	0.86	–	T	Q	1976–82	Greenaway & Milner (1986b)
Cameroon	0.81	0.62	NT	Q	1976–87	Milner (1990a)
Cameroon	0.73	0.95	T	Q	1976–87	Milner (1990a)
Ivory Coast	0.55	–	NT	A	1960–84	Greenaway (1989)
Ivory Coast	0.69	–	T	A	1960–84	Greenaway (1989)
Nigeria	0.83	–	AX	A	1960–82	Oyejide (1986)
Nigeria	0.82	–	T	A	1960–82	Oyejide (1986)
Madagascar	0.69	0.39–0.50	NT	M	1974–84	Milner (1992)
Chile	0.55	–	T	M	1959–71	Sjaastad & Clements (1981)
Uruguay	0.57	0.51	T	M	1966–79	Sjaastad (1980b)
Argentina	0.42	–	T	A	1935–79	Sjaastad (1980c)
Colombia	0.95	–	T	M	1970–8	Garcia (1981)

Notes:
1. All (AX), traditional (T) or non-traditional (NT).
2. Annual (A), quarterly (Q) or monthly (M).

Equation 7.14, that in most cases over 75 per cent of import protection is shifted to the export sector. In the case of Colombia (for traditional exportables) the estimated parameter comes close to unity (0.95), suggesting that protection is nearly shifted in its entirety to become an implicit export tax.

- In those cases (Mauritius, Cameroon and the Ivory Coast) where there is an estimate for both traditional and non-traditional exportables, the estimates for non-traditionals are significantly lower for traditionals. This suggests that there is greater substitutability between exportables and non-tradeables when the former are non-traditional. This accords with prior expectations, since there are less likely to be sector-specific factors in the production of non-traditional exportables than in traditional exportables.

For a few of the studies a short-run shift parameter is also reported on in Table 7.2. This distinction can be drawn where a lagged dependent variable is included in the estimating equation, such that:

$$\log\left[\frac{P_H}{P_X}\right] = a + b\log\left[\frac{P_M}{P_X}\right] + c\log\left[\frac{P_H}{P_X}\right]_{t-1} + u \qquad (7.18)$$

Its inclusion is a rather ad hoc attempt to allow for slowness in the adjustment of relative prices to changes in the relative price of importables. The coefficient b is now an estimate of the short-run shift parameter, and in the long-run as both $(P_H/P_X$ and lagged P_H/P_X tend towards each other and in equilibrium, the long-run shift parameter will be given by:

$$w = \frac{\hat{b}}{1 - \hat{c}} \qquad (7.19)$$

where $\hat{b}$ and $\hat{c}$ are the estimated coefficients in Equation 7.18. (Milner, 1992, employs cointegration techniques to examine the dynamic adjustment path of relative prices more formally.)

As Milner (1992) shows, it is possible for the short-run shift parameter to be less or greater than its long-run value, depending on the magnitude of the short-run demand and supply elasticities (see Equation 7.5). Where the adjustment lags are such that the price of non-tradeables or home goods adjusts slowly (upwards) to a rise in the price of importables then the short-run parameter will be lower than the long-run rate. In four of the five cases reported on in Table 7.2 this result is obtained, the exception being the result for traditional exports for Cameroon. There is evidence therefore that if substitutability arrangements remain stable the burden on exportables tends to increase over some adjustment period.

True protection estimates

As explained in Section 3 of this chapter, estimates of the shift parameter can be combined with information on nominal tariffs and subsidies to estimate true tariffs and subsidies (substitute $\hat{w}$, $\hat{t}$ and $\hat{s}$ values into Equation 7.15 and then substitute $\hat{t}$, $\hat{s}$ and $\hat{d}$ into Equations 7.9 and 7.10). Few of the studies cited earlier have undertaken this type of work, largely because comprehensive information on nominal protection (including the effects of non-tariff interventions) and subsidisation is often not available. Greenaway and Milner (1986b) offer some hypothetical calculations for true tariffs and subsidies for Mauritius using the estimated shift parameter, actual data on nominal tariffs and assumed or guesstimated values for nominal subsidies. Greenaway (1989) provides similar estimates for the Ivory Coast, but this time using actual estimates of nominal export subsidies. These results are shown in Table 7.3.

According to these figures, the true tariff on importables ranges from 11.1 to 14.8 per cent depending on the value of the shift parameter and the value of any nominal duties on exportables. Other things being equal, t^* will increase as w falls, and will increase as s falls. Thus if we compare row 1 and row 2 of Table 7.3, we find that t^* falls from 14.1 to 11.1 per cent. The lower shift parameter (0.55 rather than 0.69) should mean a higher true tariff since importable prices rise to a greater extent vis-à-vis non tradeables. This however is more than offset by the change in s from an export tax of 28 per cent to an export subsidy of 2 per cent. Comparing rows 2 and 3, where s is held constant but the shift parameter falls, we observe an increase in the true tariff. Note that for all cases the estimated true tariff is substantially less than the nominal tariff.

In the case of exportables the true subsidy appears to range from -7.1 to -31.5 per cent. In other words, in all three scenarios interventions appear to operate as an implicit export tax. The case where the implicit tax is at a maximum is that which pertains to traditional exportables. This follows in part from the relatively high shift parameter and in part from the presence of explicit export taxes on these commodities. For non-traditional exportables the rates appear to be -7.1 per cent and -9.3 per cent depending on the value of the shift parameter. In other words, a positive export subsidy of 2 per cent is insufficient to offset the 'disprotection' from a 20 per cent import tariff and an *implicit* export tax still results.

7.5 Uses and implications of the analysis

Much of the analysis of industrial and commercial policy in developing countries until recent years has been founded predominantly on partial equilibrium analysis. Shift analysis should not be seen as a substitute for such partial analysis but rather as a complement to those techniques.

Table 7.3 Estimates of true tariffs and true subsidies for the Ivory Coast

	Nominal tariff on importables[1] *(%)*	*Nominal subsidy on exportables*[1] *(%)*	*Shift parameter*	*t** *(%)*	*s** *(%)*
1. Traditional exportables	20	–28	0.69	14.1	–31.5
2. Non-traditional exportables (annual data)	20	2	0.55	11.1	–9.3
3. Non-traditional exportables (monthly data)	20	2	0.34	14.8	–7.1

Source: Greenaway (1989).

Note:
1. Estimates taken from Monson (1981).

Although partial equilibrium analysis of effective protection, tariff equivalents and so on provides a great deal of detailed information relating to intervention in particular processes, product ranges and so on they are less robust as indicators of intersector allocation effects. In contrast shift analysis (which, as we have seen, is less data-intensive) permits one to focus explicitly on the relative price effects of interventions across broad sectors of economic activity. This ability of the technique to focus on ex-post general equilibrium effects has a number of important implications for policy evaluation and formulation:

- Protection or promotion are relative concepts. The technique permits one to make explicit the relative price effects of invisible as well as visible interventions. For example, as long as quantitative restrictions have relative price effects these will influence the value of the estimated shift parameter. Without having to undertake the very demanding (and resource-intensive) exercise of estimating individual tariff equivalents of quotas, one can gain some guidance as to their sectoral relative price effects (along with tariffs) through the shift coefficient.
- Through the medium of the true tariff and true subsidy concepts one can establish the true protection given to a particular sector. As long as separate incentives are given to different sectors, true protection will be less than apparent or (nominal) protection. The authorities can determine the structure of nominal protection, but the true effects are endogenously determined by the substitution arrangements specific to the economy.
- The technique allows one to make explicit the cancelling, or offsetting nature, of many interventions. Since most economies tend to pursue simultaneously policies of import protection and export promotion, this ability to identify policy conflict is an important feature of the methodology.
- Leading on from the above, the technique emphasises the need to design consistent policies in order to meet a given strategic objective – whether this be import protection or export promotion.
- By focusing on relative prices across sectors, one can infer something about relative investment incentives across sectors. Non-traditional exports may for instance fail to grow very rapidly, despite apparently generous incentives, because in relative terms there remains an anti-export bias.
- The analysis suggests that if the overall objective is export promotion, then one of the most direct routes to this goal may be simply to alter relative incentives through import liberalisation.

7.6 Concluding comments

This chapter has investigated the principles of incidence analysis and its implications for relative or true protection across sectors and within a general equilibrium framework. It has shown how the technique can be used to complement more traditional tools of commercial policy evaluation in developing countries. In part it can be used to comment upon the true intersectoral resource pulls induced by the (broad) nominal structure of protection or intervention. The approach clearly has considerable potential in highlighting conflict or inconsistencies between the actual and intended effects of policy. The principal output of the model is the shift parameter. This index is dependent upon the substitutional relationships in the economy – information which could only otherwise be obtained from more sophisticated computable general equilibrium models that are much more demanding in terms of data requirements than the incidence model. It is to a consideration of such alternative, general equilibrium models that we now turn.

CHAPTER 8

Computable General Equilibrium Modelling

8.1 Introduction

The rationale for general as opposed to partial equilibrium analytical techniques has been identified in the discussion in Chapter 7. The purpose of other general equilibrium models discussed there was rather specific and therefore restrictive assumptions allowed us to avoid much elaboration of the underlying structure of the economy. There is however a body of research, applied or computable general equilibrium analysis, that has the explicit aim of representing the (general equilibrium) structure of an economy. The aim is to convert Walrasian principles into realistic and operational models of actual economies by specifying production and demand parameters and using data that relates to the particular economy involved. Once operationalised these models can be used to identify the effects of existing policies and evaluate the medium- to long-term implications of policy reforms on an economy-wide basis.

The use of CGE models for policy analysis has become widespread in both developed and developing countries. In the case of developing countries however such models have been applied to a wider range of issues. This partly reflects the greater interest in wide-ranging policy or development strategy reform in developing countries. It can also be explained by the data-constraints on the use of macroeconometric models (which is dependent on reliable time series data for sufficient time periods) in the case of many developing countries. Our concern here is with the use of CGE modelling for trade and industrial policy analysis. We will focus specifically on illustrations of such applications in Chapter 9. It will be necessary first, however, to understand the principles that underpin the analysis and be aware of the process by which a model is constructed in practice. This chapter will seek to provide that groundwork. It is organised as follows. We begin in Section 8.2 with a brief outline of the origins and

development of applied general equilibrium modelling. In Section 8.3 the principles of general equilibrium modelling are briefly developed. Section 8.4 then provides a systematic explanation of how to implement applied general equilibrium modelling, how to choose the model and specific functional forms, how to select parameter values and how to calibrate, solve and use the model. This is followed in Section 8.5 with a demonstration of the characteristics of a specific CGE model for a developing country. Finally, section 8.6 provides some conclusions.

8.2 Origins and development of CGE modelling

An individual market is in equilibrium when the quantity of the particular good demanded is equal to the quantity supplied. General equilibrium analysis deals explicitly with the interrelationships between different markets and different sectors of an economy. If there are c commodity markets and f factor markets there will be $c + f = n$ markets and $n - 1$ equilibrium prices to be determined if all markets are to be in equilibrium; when they are all in equilibrium the economy will be in a state of general equilibrium. Walras' Law states that for a given set of prices the sum of the excess demands over all markets must be equal to zero. In other words, if one market has positive excess demand, some others must have excess supply; and if all but one are in balance, so is that one. If all economic agents are satisfying their budget constraints and n $-$ 1 markets are in equilibrium, then the n^{th} market will also be cleared. These concepts about a Walrasian general equilibrium system were formalised and elaborated on in the 1950s by economists such as Arrow and Debreu (1954). In the Arrow–Debreu model[1] there is a specified number of consumers, each of which has an initial endowment of commodities and a given set of preferences. Thus there are market demand functions for each commodity, which are the sum of each individual's demand. These market demands for commodities are determined by all prices; the functions are well-behaved and satisfy Walras' Law, that is the total value of consumers' expenditures equals consumer incomes. On the production side constant returns to scale and profit-maximisation are assumed in order to generate the competitive solution. Given these model characteristics it is relative, not absolute, prices that are of significance. General equilibrium is characterised by a set of (relative) prices and pattern of production that clears the market for each commodity.

Two-sector general equilibrium models were popularised and applied to a range of analytical issues during the 1950s and 1960s. In international trade theory, work was pioneered for example by Meade and Johnson on the effect of policy distortions (for example tariffs) to trade. Most of the subsequent applied models are the numerical counterparts of those earlier theoretical models, though it must be recognised that the subsequent

computational models also extend Leontief's work on Walrasian models based on fixed input–output coefficients. By including substitution possibilities in both production and consumption the later work was likely to be more useful in analysing medium- to long-term resource allocation issues. Examples of some of this early applied work are Johansen (1960), who formulated a multi-sector model to analyse resource allocation and policy issues in Norway, and Harberger (1962) who investigated tax policy issues with a two-sector general equilibrium model.

Numerical calculations of the effects of trade policy were rather limited while these early developments in general equilibrium trade theory and in applied general equilibrium modelling were taking place. A number of numerical studies of the effects of European integration were undertaken in the later 1950s (for example Scitovsky, 1958 and Johnson, 1958). But, despite calls for such work from trade theorists, these attempts at numerical trade modelling did not induce similar activity on a wider scale. It was not until the work by Scarf (1967) and Scarf and Hansen (1973) – which provided an ingenuous computation approach to the determination of equilibrium in a Walrasian system – that applied work of this nature on trade was widely undertaken. Miller and Spencer (1971 and subsequently published in 1977) for instance applied Scarf's computational methods to an assessment of the impact of UK entry into the EC. Subsequent CGE trade models have applied further algorithms for numerical solution and have developed the capacity to investigate a wide range of trade policy issues – from unilateral trade policy interventions (tariffs, quotas, and so on) to multilateral trade negotiations.

CGE models have been used extensively since the early 1980s to analyse a range of medium- to long-term policy issues in developing countries. Foreign exchange has considerable scarcity value in most developing countries, and as a result trade policy has occupied a central role in the majority of these applications. The extent to which the scarcity value of foreign exchange is influenced by policy change cannot be easily estimated with partial equilibrium tools of analysis. But even if the purpose of a developing country CGE model is not specifically to model trade policy impacts, the way that the foreign trade sector is modelled is likely to be important. The sensitivity of domestic resource allocation in highly open developing countries again means that general rather than partial equilibrium analysis is required to capture this interdependency.

8.3 General equilibrium models: some basic principles

Before turning to the examination of how general equilibrium models have been applied to the analysis of trade policy in general and to trade policy in developing countries in particular, we need to set out some of the basic principles involved.

The closed economy

Let us first consider a possible general equilibrium system for a simple, two-sector economy. The general equilibrium model must specify the demand and supply relations and the equilibrium condition for each market and must also specify the income or budget constraint on each agent in the economy. Here we assume two single-product (produced in quantities Q_A and Q_B) firms, each using only homogenous capital (K) and labour (L) of fixed or given endowments to the economy, the two products being owned by a single household. In this model therefore there are three economic agents: two firms and one consumer.

The consumer is assumed to maximise utility from the consumption of the two goods (C_A and C_B), subject to the constraint that total expenditure ($P_AC_A + P_BC_B$) equals the consumer's income (Y) (where P_i is the price of good i). If the utility function is well behaved, then the solution to the constrained optimisation problem produces the following demand or expenditure relationships:

$$C_A = C_A\,(P_A, P_B, Y) \tag{8.1}$$

$$C_B = C_B\,(P_A, P_B, Y) \tag{8.2}$$

The production side of the model is based on a two-stage optimisation procedure. Given a production function in general terms for each good or firm (i), that is $Q_i = Q_i(K_iL_i)$, the costs of production will be determined by the factor prices (r and w for capital and labour respectively). This is found by identifying the least-cost means of producing each (given) output level, subject to the technological or production function constraint. The firms' short-run supply functions are then determined by the second stage of the optimisation procedure, namely profit maximisation by each firm where the firm's revenue is a function of price (P_i) and costs are a function of factor prices (r and w). In general terms therefore:

$$Q_A = Q_A\,(P_A, w, r) \tag{8.3}$$

$$Q_B = Q_B\,(P_B, w, r) \tag{8.4}$$

For equilibrium in the product markets for A and B we must add the market clearing conditions:

$$C_A = Q_A \tag{8.5}$$

$$C_B = Q_B \tag{8.6}$$

Next we need to consider the factor markets. Given the profit-maximising

levels of output, each firm will seek to employ the corresponding cost-minimising factor levels. Therefore the factor demand functions are:

$$K_A = K_A\,(Q_A, w, r) \tag{8.7}$$

$$K_B = K_B\,(Q_B, w, r) \tag{8.8}$$

$$L_A = L_A\,(Q_A, w, r) \tag{8.9}$$

$$L_B = L_B\,(Q_B, w, r) \tag{8.10}$$

For simplicity let us assume that factor supplies are exogenously given ($\bar{K}$, $\bar{L}$) rather than endogenously determined. Therefore the market clearing conditions for the factor markets are:

$$K_A + K_B = \bar{K} \tag{8.11}$$

$$L_A + L_B = \bar{L} \tag{8.12}$$

In order to complete the general equilibrium system we need to incorporate the household and firm income equations. For the firms their income or profits (π) is the difference between sales revenue and factor payments, that is:

$$\pi_A = P_A Q_A - wL_A - rK_A \tag{8.13}$$

$$\pi_B = P_B Q_B - wL_B - rK_B \tag{8.14}$$

Given that in this simple economy the single household supplies all factor services, then all income (Y) accrues to it, namely:

$$Y = w(L_A + L_B) + r(K_A + K_B) + \pi_A + \pi_B \tag{8.15}$$

The general equilibrium model for this simple closed economy is complete: there are 15 equations, 15 endogenous variables (Y, π_A, π_B, w, r, P_A, P_B, L_A, L_B, K_A, K_B, Q_A, Q_B, C_A, C_B) and two exogenous variables ($\bar{K}$, $\bar{L}$). Given appropriate functional forms for the (product and factor) demand and supply functions, it is possible to solve for all the equilibrium quantities produced and consumed in the product and factor markets and for relative product (P_A/P_B) and factor (w/r) prices. Similarly it can be solved for changes in the value of an exogenous variable. Herein lies the benefits of a general equilibrium methodology, since it allows the all-important interrelationships between markets to be traced through. If the labour endowment ($\bar{L}$) for example increases it directly alters the labour market equilibrium price ($\overset{*}{w}$). But a new value for $\overset{*}{w}$ will affect other relationships

in the system: factor demands, output levels of the two goods, and consumer incomes and therefore expenditures on the two goods. Thus equilibrium relative prices will have to adjust to reflect the new patterns of demand and supply.

Note that we establish the structure of relative, not absolute, prices from a general equilibrium model, since real relationships in the model are affected by relative prices (that is if all prices increase in the same proportion relative prices are unaltered, as are the structure of incentives to produce and consume particular commodities). Solving the model to identify the structure of equilibrium relative prices requires therefore that one price is arbitrarily set equal to unity; the commodity with a unitary price is the 'numeraire' of the system against which the prices of all other commodities are defined.

The open economy

The scope for international trade provides additional choices for consumers and producers: imports (M) are an alternative source of supply for the home consumer and exports (X) are an additional source of demand for the domestic producer. Compare Figure 8.1a with Figure 8.1b: the general equilibrium solution for a closed economy with that for an open economy. PP is the transformation curve, that is the alternative mixes of maximum levels of production of each good given the economy's factor endowments. In the absence of trade, consumption is constrained by these production possibilities. Maximisation of consumer's utility, represented by indifference curve (U_1) is at E_1, where the marginal rates of transformation and consumer substitution equal the domestic relative price ratio P_A/P_B (shown by the slope of the line dd). With the opening of trade the country has the option of purchasing and selling goods at world relative prices rather than (pre-trade) domestic prices. In Figure 8.1b we represent the (relative) world prices by the slope of (terms of trade) line TT. Since $dd \neq TT$ the domestic consumer has the ability to gain from trade; as P_A/P_B in this case rises then the consumer switches demand for good B from home towards foreign-produced goods, that is $M = C_B - Q_B$, and domestic resources are switched towards producing relatively more of good A (as the production equilibrium shifts from E_1 to F) and selling some of this production abroad, that is $X = Q_A - C_A$ (as the consumption equilibrium shifts from E_1 to a higher utility level [U_2] at E_2). The marginal rates of transformation and substitution, which previously reflected the domestic pre-trade price ratio, now reflect the world price ratio.

The above analysis implicitly incorporates the 'small country' assumption, namely that the country is a price-taker that does not effect world (w) prices through its trading activities. Thus we can treat world prices (Pw_A and Pw_B) as exogenous variables and (assuming no distortions) link world

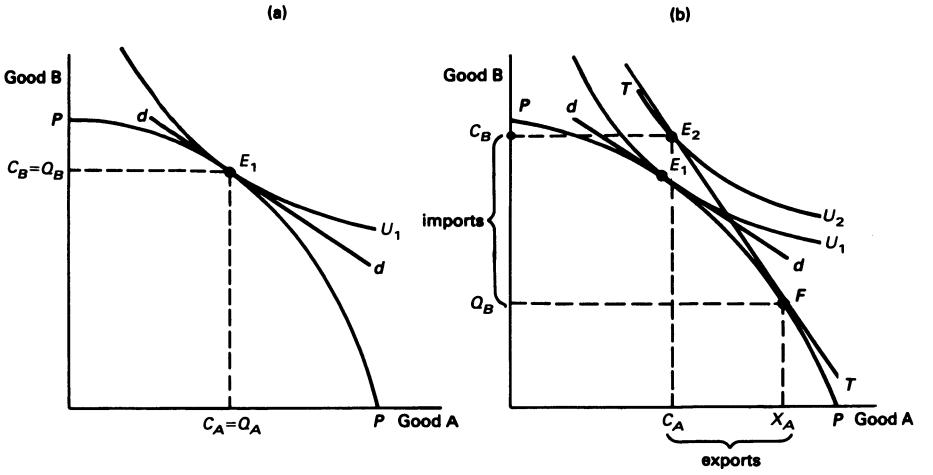


Figure 8.1 Two-sector general equilibrium with and without trade

and domestic prices directly through the exchange rate (e), for example $P_i = e\bar{P}_{wi}$. But e is an endogenous variable, that is the price of one unit of foreign purchasing power in terms of some numeraire, such as a good or factor price. Alternatively e can be normalised at unity and domestic prices are set at the price of traded goods. Besides the revised market-clearing conditions for the now-traded products and these revised price equations (which need to be incorporated with the type of closed economy relationships discussed above), it is also necessary to incorporate an overall balance of payments or foreign exchange constraint for the economy. If capital flows are excluded this requires that total expenditure on imports (Pw_BM) equals total export earnings (Pw_AX).

A two-sector open economy, general equilibrium model is illustrated in Table 8.1. Note that it embodies a constant returns to scale assumption. This means that the supply equations (Equations 8.3 and 8.4) have to be replaced by unit price equations (Equations 3 and 4 in the table, where k_i and l_i are the factor requirements per unit of output). Note also the assumptions of constant returns and given world prices ($\bar{P}w_i$) mean that this is a fixed- not flexi-price model. By normalising the exchange rate to unity, the domestic prices (P_A, P_B) are fixed by Equations 18 and 19. This in turn means that the factor prices are also fixed (Equations 3 and 4 in Table 8.1). Thus market clearing (product and factor) in this model will only come about through quantity, rather than price, adjustment. The general equilibrium needs to be numerically solved by identifying the conditions for factor market clearing. Fulfilment of these conditions will then determine the full employment output levels (Q_A, Q_B); general equilibrium being when these output levels are equal to total (domestic and foreign) demand for these final goods. Given the specific examples of

Table 8.1 A two-sector open economy, general equilibrium model

Description		*The model*	*Numerical example*
Commodity	(1)	$C_A = C_A(P_A, P_B, Y)$	$C_A = Y(2P_A)^{-1}$
Expenditures	(2)	$C_B = C_B(P_A, P_B, Y)$	$C_B = Y(2P_B)^{-1}$
Commodity	(3)	$P_A = rk_A + wl_A$	
Unit prices	(4)	$P_B = rk_B + wl_B$	
Product market	(5)	$X = Q_A - C_A$	
Clearing conditions	(6)	$M = C_B - Q_B$	
	(7)	$k_A = k_A(r, w)$	$k_A = (w/3r)^{3/4}$
	(8)	$K_A = k_A Q_A$	
	(9)	$k_B = k_B(r, w)$	$k_B = (w/r)^{1/2}$
Factor	(10)	$K_B = k_B Q_B$	
Demands	(11)	$l_A = l_A(r, w)$	$l_A = (3r/w)^{1/4}$
	(12)	$L_A = l_A Q_A$	
	(13)	$l_B = l(r, w)$	$l_B = (r/w)^{1/2}$
	(14)	$L_B = l_B Q_B$	
Factor market	(15)	$K_A + K_B = \bar{K}$	
Clearing conditions	(16)	$L_A + L_B = \bar{L}$	
Consumer's income	(17)	$Y = r\bar{K} + w\bar{L}$	
Price equations	(18)	$P_A = e\bar{P}w_A$	
	(19)	$P_B = e\bar{P}w_B$	
Foreign exchange	(20)	$P_{wA}X - P_{wB}M = 0$	

20 Endogenous variables are: C_A, C_B, Q_A, Q_B, X, M, K_A, K_B, L_A, L_B, k_A, k_B, l_A, l_B, P_A, P_B, w, r, e, Y

4 Exogenous variables are: $\bar{K}$, $\bar{L}$, $\bar{P}_{wA}$, $\bar{P}_{wB}$

Source: Dinwiddy and Teal (1988), Tables 5.1 and 5.2.

Cobb–Douglas functions (utility and production) represented in the demand or expenditure, and factor demand equations in the example in Table 8.1, it is possible to write a programme to solve the model (for particular values for world prices). (For details of the structure of the programme and an illustrative solution to the model in Table 8.1 see Dinwiddy and Teal, 1988, pp. 74–5.)

8.4 Applying general equilibrium analysis

A range of problems are encountered in designing and using CGE models. What type of model structure is required for the particular purpose? For that general structure, how are functional forms and parameter values to be chosen? How is the model to be solved? How is the calibrated model to be used to evaluate policy change? Let us consider these questions in turn.[2]

Model selection

The selection of a CGE model for trade policy analysis should be fashioned by the precise purpose of the model. The dimensions, that is the levels of aggregation and the degree of elaboration of particular market relationships and interrelationships, must inevitably involve judgement on the part of the modeller, since the model is an abstraction not an exact representation of reality. If the purpose is to examine current resource pulls between and within sectors associated with trade policies, then the model specification may well differ from one that is required to focus on the aggregate growth effects of trade policy change. Similarly model specification will vary according to the type of economy involved; for instance the degree of competition, the degree of input and factor substitutability, or the degree of substitutability in demand between imported and locally-produced goods will vary between economies as their production structures and development stages vary. The absence of a unique model form is of course a strength of CGE analysis: the ability to blend theory with actual market and policy conditions. However there is a danger, well recognised by most modellers, that model selection may to a large extent predetermine the (qualitative) conclusions of the analysis. But this is an inevitable danger resulting from the need for judgement. As with all good applied economic analysis, the robustness of the results/conclusions needs to be challenged by examining critically the assumptions underpinning the model.

We will return to some specific issues of model selection shortly. It is worth pointing out however that most of the models that have been developed so far have a similar form: static, two factors (capital and labour with sometimes some disaggregation of labour by skill) and a limited number of goods, with interindustry transactions incorporated through fixed (sometimes flexible) input–output matrices. There are a number of reasons for this similarity. Data availability is an important factor. For instance national accounts typically identify wages and profits (or operating surpluses). This encourages the use of a model with labour and capital inputs. Computational convenience is also a consideration. In the case of the choice of production technologies for instance, the specification could involve constant or increasing returns to scale. Some form of decreasing costs may seem appropriate for large ranges of industrial and manufacturing activity. But it has to be recognised that a constant returns assumption tends to make it easier to find an equilibrium concept upon which to base the analysis. Finally, it must also be recognised that many of the applied policy issues investigated quantitatively with CGE models are ones that have been examined qualitatively on previous occasions within a theoretical general equilibrium framework. Thus the legacy from trade theory of the two-sector–two-factor model is one that has had a strong influence on applied work.

An important issue in model specification is the treatment in the external sector. The traditional theoretical model of the dependent developing economy is one in which foreign prices are given, and as a result the terms of trade are treated as given, and domestically produced, tradeable goods are perfect substitutes for foreign goods. This assumption is applied in some CGE models for the external sector as a whole, or at least for primary products that are likely to be highly homogeneous. The implication of this specification is that changes in foreign prices, or changes in the domestic currency price of foreign goods induced by exchange rate or trade policy changes, are fully passed through to the prices of competing domestic goods. The realism of this assumption is increasingly questioned, and many CGE models now incorporate the alternative assumption that foreign and competing domestic goods are imperfect substitutes in use. This is consistent with empirical evidence at this disaggregated level that 'pass through' of exchange rate changes to domestic price is small.[3] It is consistent with the observed importance of simultaneous importing and exporting of similar goods by the same country; this being observed at the disaggregated commodity level and in the trade of developing countries. A common way of accommodating this specification of intercountry substitutability is to use the so-called Armington formulation, which treats similar products produced in different countries as different goods. Note that this specification can also be used on both the import and export side (with domestically produced goods for export sale being less than perfectly substitutable for domestically produced goods for sale on the domestic market) if heterogeneity is an appropriate assumption. Use of this formulation has the added advantage of allowing us to characterise sectors in terms of the degree of tradeability of the goods they produce. The elasticity (μ) of the prices of domestically produced goods with respect to change in the domestic currency price of imports (μ_m) and export (μ_x) will depend upon the model specification, as follows:

$$\mu = f(\theta, \Omega, \sigma, \varepsilon) \tag{8.16}$$

where θ is the share of traded goods in total production, Ω is the elasticity of transformation, ε is the elasticity of supply and σ is the elasticity of substitution.

When σ and Ω tend towards infinity then the domestic price system loses its independence from foreign prices and we have the traditional price-taker model (that is $\mu_m = \mu_x = 1$ and there is full 'pass-through'). Where $\mu < 1$ that is there is imperfect substitutability, then sectors can be classified in terms of tradeability as follows:

- Nontradeables have low import (θ_m) and export shares.
- Exportables have low import and high export shares.
- Importables have high import and low export shares, and are complementary where ($\sigma < \varepsilon$) and substitutes where ($\sigma > \varepsilon$).

Although the imperfect substitution assumption increases the parameter requirements, it does increase substantially the potential richness and realism of any policy simulations. Furthermore the approach is capable of dealing empirically with the theoretical conflicts that exist in the development literature between 'neo-classicists', who represent developing countries as having high elasticities, and 'structuralists', who maintain that they are characterised by low elasticities.

Some of the other issues in model selection that merit mention are the net savings–capital stock relationships and the treatment of investment. Investment is usually represented as reflecting household and corporate saving decisions, which are based on constant expenditure shares in static models or on intertemporal utility maximisation in genuine dynamic formulations. As a 'quasi-dynamic' approach, static equilibrium models are sometimes sequenced or linked through time to reflect changes in any economy's capital due to net savings (even if the constant expenditure share assumption is used to determine net savings at each point in time), that is a series of single period/static equilibria are linked through savings decisions that change the capital stock through time. Such a treatment of investment, like other aspects of the growth process (for example technical change which tends to be ignored or treated as an exogenous variable), is crude. This is unfortunate since a significant element of the effects of trade and trade policy may well be about how they affect investment and the pace of technical change. Here is an example of an area where computational difficulties are compounded by limited theoretical elaboration and consensus.

Choice of functional form

The choice of utility function (from which demand relationships derive) and of production functions in applied general equilibrium analysis is fashioned by the need to be theoretically consistent and analytically tractable. On the one hand the functions need to satisfy the restrictions required of a general equilibrium model, for example market clearing and zero abnormal profits in all markets. On the other hand the functions need to generate expenditure and production patterns that can be evaluated easily by any set of prices that are judged as a potential equilibrium set. Convenience, in particular in incorporating key parameters such as income and price elasticities, rather than appropriateness tends therefore to dominate the choice of functional form. 'Convenient' functional forms such as the Cobb–Douglas or constant elasticity of substitution (CES) tended to be used.

This dilemma facing the applied modeller can be illustrated for the demand side of a model. A Cobb–Douglas utility function (of the general form for the two-good case $U = C_1^{\alpha} C_2^{\beta}$) generates demand functions which

impose the restrictions of zero cross-price elasticities and unit income and (uncompensated) own-price elasticities. The model is tractable but these restrictions are implausible. With the CES utility function (of the general form $U = [a_1C_1^{-\beta} + a_2C_2^{-\beta}]^{-1/\beta}$ where $\sigma = 1/[1 + \beta]$) unit own-price elasticities no longer apply, but all commodities now have the same (compensated) own-price elasticities (if the expenditure shares are small). Increasing the plausibility or acceptability of the model will be at the expense of greater complexity in the structure of the model.

CES functions tend also to be used on the production side. This allows for substitution between primary factors (usually capital and labour). The intermediate input relationships can be modelled with either fixed or flexible coefficients. One specification employed sometimes is to use fixed coefficients in terms of composite goods, but to allow substitution between the elements of the composite good. Thus a fixed cloth requirement per garment may be required for example, but a CES function can be used to allow substitution between imported and domestically produced cloth.

Benchmark data and construction of a SAM

The first step towards constructing a numerical model (see Chart 8.1) involves the construction of a benchmark data set from national income and other major data sources on the technological and trade characteristics of the economy. Typically data for a single and representative year is employed, but averaging over a period is a possibility. Frequently the information from different official sources is not consistent – for example household income from employment does not match the payments to labour by firms. The accuracy of some data is accepted and other data is adjusted in order to produce a consistent benchmark data set compatible with the equilibrium conditions the model is seeking to represent. This benchmark data set is often referred to as the (consistent) social accounting matrix (SAM). An illustration (one sector version) of a SAM for Turkey used in the CGE model constructed by Grais, de Melo and Urata (1986) is set out in Table 8.2. This SAM has 24 accounts; factors of production (accounts of rows 1–3), current accounts of institutions (4–9), capital account (10), rest of the world (11), production activities (12–13) and commodities (14–24). It indicates that the representative household receives payments from factors of production and from the rest of the world (in the form of workers' remittances), and it uses its income on consumption, savings and income taxes. Household consumption is split into committed and discretionary components. Note that government tax revenues (row 8) come from the taxation (that is tariffs) on imports (columns 18, 21 and 24) and on households (column 4) and production (column 13). (The SAM indicates the composition of imports in the base year, classifying imports by end use.) It should be evident to the reader that this SAM for

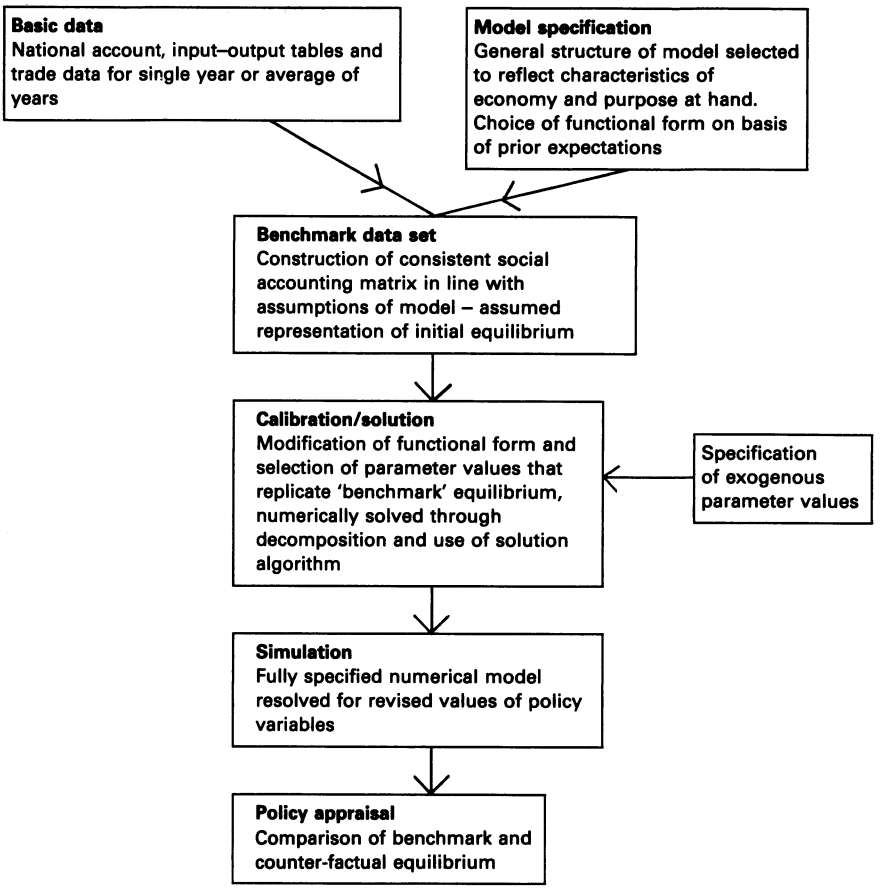


Chart 8.1 Calibration and simulation procedures with CGE models

Turkey, like all consistent ones, has the same number of rows and columns, respectively representing receipts and expenditures associated with each type of account. Row totals have to equal corresponding column totals in line with accounting requirements. But the construction of a SAM will also reflect the features, that is assumptions, of the model selected for the particular economy and circumstances. Thus in this particular example the SAM is also constructed according to the transactions value approach; only transactions with the same valuation appear in a given row. This allows the modeller(s) to incorporate his/her judgement about different assumptions regarding such considerations as factor mobility or the nature of policy influences. For example, in Table 8.2 labour is assumed to be perfectly mobile across all sectors. One uniform factor price applies therefore and one account only is needed in the SAM. If there were factor immobility resulting from sector specificity of that factor, then one needs as many accounts for that factor as there are separate or distinct factor prices.

Table 8.2 Social accounting matrix for Turkey (mm. th.), 1978

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Factors of production																										
Labour	1												597													597
Capital	2												590													590
Consolidated capital	3		590																							590
Household																										
Revenue	4	597		590								22						7								1216
Total income	5				999																					999
Total expenditure	6					845																				845
Discretionary expenditure	7						419																			419
Government																										
Revenue	8				217									47					8			24			8	304
Expenditure	9								169																	169
Capital account	10					154			135			24														313
Rest of the world	11																		25			71			25	121
Activities																										
Value added	12													1187												1187
Output	13														2053	75										2128
Domestic supply	14																805			733	66			449		2053
Exports	15											75														75
Commodities																										
Consumption																										
Domestic	16						443	362															733			805
Rationed imports	17						–17	57															161			40
Imports	18																	33								33
Intermediates																										
Domestic	19																									733
Rationed imports	20																									161
Imports	21																									95
Composite	22													894							95					894
Others																										
Domestic	23									165	284															449
Imports	24									4	29															33
Total	25	597	590	590	1216	999	845	419	304	169	313	121	1187	2128	2053	75	805	40	33	733	161	95	894	449	33	

Parameter values, calibration and solution

Parameter values for the selected functional forms are invariably crucial in determining the results of simulation exercises with CGE models. These parameter values are either generated 'exogenously' or through 'calibration' of the numerical model.

Calibration involves fitting the model to the benchmark data set. This may involve some modification of functional form, but since no statistical test of model specification is involved it more typically involves choosing and adjusting the parameters of the model 'endogenously' so that (or until) the model can reproduce what is to be taken to be the benchmark equilibrium. Herein lies the potential weakness of such a deterministic approach. The assumption of the equilibrium representation by the benchmark data may not be justified, and given that the stochastic elements of economic processes are excluded confidence in the robustness of policy simulations with the model are thereby reduced. Nevertheless there are strong practical grounds for adopting the 'calibration' approach. Given the dimensions of such models it would be difficult in practice to achieve the richness in specification that econometric estimation would offer. In order to estimate simultaneously all model parameters with time series statistical methods would require long runs of time series of observations for large numbers of variables. This is likely to be severely data-constrained in developing countries. Although partitioning models into blocks of relationships (for example into expenditure and production sub-models) is one way of reducing the number restrictions on identification and therefore on the number of data observations required for econometric estimation on a system basis, the coverage of time series data may still be inadequate and the partitioning is likely to conflict with some of the general equilibrium restrictions that can be satisfied via calibration.

Not all parameter values are necessarily 'endogenously' determined through calibration however. The benchmark data typically do not identify a unique set of parameter values. In any case with some functional forms it is necessary to prespecify certain key parameter values. With the widely employed CES functional form, for instance, exogenously or prespecified substitution elasticities are required; the curvature of indifference curves and isoquants cannot be inferred from the single observation on price and quantity recorded in the benchmark data. Other elasticities that are likely to need to be prespecified are the income elasticity for consumer goods, elasticity of substitution in production between factors and between (domestic and imported) intermediate inputs, and the elasticity of transformation between domestic and exported goods. Values for such elasticities are usually specified on the basis of other research. This could involve original work by the modellers themselves, but more typically they are taken from other models or earlier empirical studies not related to the study at hand. This places considerable reliance upon a careful survey of

the existing literature and upon judgement about which study estimates (or guesstimates) should be 'borrowed' from. Careful judgement is required because elasticity values from different studies may be contradictory; this is not altogether surprising when they come from a range of countries, time periods and levels of aggregation. The transferability of 'exogenous' elasticity estimates, where information is not sparse, to the particular modelling exercise involved is therefore an important issue because it may well be crucial in fashioning the results of subsequent simulations. The modeller must consider carefully the comparability of the 'borrowed' source with the specific conditions being modelled.

Thus final solution of the model – a fully specified numerical model – is the outcome of an iterative procedure. The basic structure of the model (behavioural equations and functional specification) are combined with the information from the SAM. (Any partitioning of the model may be undertaken as necessary or convenient for solution purposes.) A solution algorithm is designed to solve for the particular model.[4] The increasing sophistication in computer software means that it is data availability rather than solution techniques that constrain this type of applied modelling. But judgement of the modeller is required to know whether the failure of the model to converge towards the benchmark equilibrium is a product of the solution method or of the functional forms and specific parameter values adopted. Where it is the latter some recalibration may be required in order to produce convergence towards a final numerical solution.

Policy simulation and appraisal

The numerical model can be used to examine a wide range of policy issues. By specifying new values for each policy instrument separately, or for a range of instruments simultaneously, it is possible to resolve the model to identify a new 'counter-factual equilibrium'. It is possible therefore to evaluate alternative reform packages or to compare specific reforms of alternative magnitudes by comparing the counter-factual and benchmark equilibrium. Comparison of alternative equilibrium outcomes means that the policy appraisal is medium to long term in nature. Although the model structure is not designed to capture the rich detail of dynamic adjustment paths, the fact that the model is solved in an iterative manner allows the nature of the convergence towards the new equilibrium to be plotted.

In the case of trade models of developing countries a CGE model can be used to comment on a wide range of issues of interest to the policy maker. For instance, changes in the use of factors of production across sectors, changes in the levels and composition of imports and exports, and changes in trade and other tax revenue (if unconstrained by the model) are likely to be important in policy evaluation. This type of positive information will be a direct 'output' of each, new numerical solution. Its richness (that is

degree of disaggregation) will depend on the dimensions of the basic model structure.

In order to make normative assessments of policy, that is to comment on the desirability or ranking of alternative equilibria associated with alternative policy values, it is necessary to measure economic welfare. The most commonly-used measures are the Hicksian compensating (CV) or equivalent variations (EV); the former starts from the new equilibrium and asks how much income needs to be added or subtracted to return consumers to their original utility level; the latter starts from the original equilibrium and measures the change required to reach the new utility level. (For a welfare-raising change CV is negative and EV is positive.) Where the model provides detailed information on CVs or EVs (that is gainers and losers in utility terms), then the policy analyst may be interested in distributional effects, and it may not be necessary to aggregate individual welfare effects. Where net evaluations are required it is usual to aggregate CVs (or EVs) across households. There are obvious theoretical difficulties in interpreting the resulting net measure as an indicator of social welfare. Of course problems of distribution and aggregation are often abstracted from in applied trade models by assuming only one representative household or consumer. In this case aggregate efficiency and welfare effects of trade policy change are directly observable.

Having overviewed in general terms the nature of the process and problems involved in numerically applying general equilibrium analysis, let us now turn to an illustration of this in practice. We illustrate in the next section a CGE model that was developed to analyse foreign trade restrictions in a developing economy (Turkey for the year 1978).

8.5 A CGE model to analyse foreign trade restrictions illustrated

A tariff-quantitative restriction (TQR) model calibrated to 1978 Turkish data (see Table 8.2 discussed in Section 8.4 for the relevant social accounting matrix [SAM]) has been constructed by Grais, de Melo and Urata (1986). A brief overview of the model is provided in this section. (A full specification of the equations of the TQR model is contained in Appendix 8.1 of this chapter.)

The model

The broad features of the TQR model are summarised in Table 8.3. A number of the features of the model merit particular note.

First, distributional implications are minimised in a number of ways. The

model assumes a single, representative consumer as the indicator of national welfare. Government expenditure is also fixed in real terms.

Second, given the emphasis on static (rather than dynamic) resource and welfare implications of trade restrictions, investment behaviour is modelled in a rudimentary manner; investment demand by sectors is in fixed proportions and capital inflows (in foreign currency) is fixed. However the adjustment to a new equilibrium (following policy adjustment) can be simulated where both capital specificity and capital mobility is assumed.

Third, the model allows for different demand behaviour by differing types of 'demanders'. For private consumption a demand system (a linear expenditure system) is specified; this allows for non-unitary income elasticities and cross-price substitution between imported and similar domestic goods. In contrast government and investment demand for different goods are assumed to be in fixed proportions (that is a Leontief-type assumption).

Fourth, the model retains the price-taker/small country assumption – infinite supply elasticities for unrestricted imports and infinite demand elasticities for exports – which is appropriate for a developing country. It does however allow for product differentiation, and does so for both imports and exports. In the case of the importables sector, imports and domestically produced goods are imperfect substitutes in end use. Domestic production is supplied for the domestic market and export sales according to a constant elasticity of transformation function (this is shown in the appendix by Equations 4(h) and 4(i) for the specification of composite prices and Equation 3a and 3b of the supply functions).

Fifth, a range of substitution possibilities in production are represented by Equations 1 and 2 of the appendix. There is no scope for substitution between primary and intermediate inputs in the aggregate production function. Value added is however a CES function of capital and labour. In the case of substitution between intermediate inputs there are mixed possibilities. There is a fixed intermediate input requirement across sectors, but from within a sector it is possible to substitute (via a CES function) between domestic and imported inputs.

Sixth, the representation of trade policy distortions is based on the simplifying assumption that imports can be clearly separated into those imports that are:

- Subject to tariffs only (assumed to be investment and government goods).
- Subject to tariffs and quantitative restrictions QRs, but not to rent-seeking activity (assumed to be consumer goods).
- Subject to tariffs, QRs and rent-seeking (assumed to be intermediate goods).

QRs are modelled (see Equation 6a in the appendix) by deriving the

'virtual prices' (pv) for a rationed import, that is the price that would induce an unconstrained consumer to behave in the same way as when faced with quantitative constraints. Thus the benefit to the consumer of a marginal relaxation of a quantitative import restriction is given by the difference between pv and the prevailing market price (pm). In turn the rents (R) associated with QRs are equal to ($pv - pm$) times the volume of rationed imports.

Seventh, given that producers in Turkey in 1978 (typically) directly received licenses to import specified commodities for intermediate uses, rent-seeking activity is introduced such that producers are induced to divert resources away from productive activities into acquiring import licenses for intermediates (that is directly unproductive activities – DUP) and the rents associated with them. The model assumes that the entire value of the rents is spent on the production of rent-seeking activity (assumed to be by the same technology as 'productive' activity). Thus the effect of rent seeking is to raise the price of intermediate inputs to the final user and to reduce the output of 'productive' activities, but not to generate utility since output from DUP activities is not an element in final demand.[5]

Calibration and solution

The construction of a consistent SAM was discussed in Section 8.4 and illustrated for one sector for this particular model of Turkey in Table 8.2. The exogenous parameters adopted by the modellers for the eight-sector disaggregation involved are set out in Table 8.4. Note that it is assumed that the income elasticities are lower for primary sector goods (agricultural and mining) than for non-primary sector goods and for domestically produced goods than for imported goods (compare rows 1 and 3). The higher income and (own) price elasticities for imported goods is consistent with the imperfect substitution assumption and with the view that import restrictions are likely to give rise to a pent-up demand for imports.

Numerical calibration of the model to the base year data set also required that rates of the premia associated with import QRs had to be estimated. Again the considerable data requirements of CGE modelling is demonstrated. Given crude estimates of the degree of quantitative restriction taken for earlier work it was only possible to approximate the premia using the following formula:

$$\frac{pv - pm}{pm} = \frac{1}{\eta} \frac{\Delta M}{(M_0 + \Delta M)} \tag{8.17}$$

where pv is the 'virtual' price of imports, pm is the actual price of imports, M_0 is the actual quantity of imports at pm, ΔM is the estimated level of

Table 8.3 Main features of the TQR model

1. Model dimensions	Eight sectors (one non-traded: construction); one consumer; two primary factors labour and capital with labour mobile and capital mobile or immobile across sectors.
2. Production	Cost-minimising producers using CES functions for value added; intermediate requirements involve fixed coefficients across intermediates in different sectors but allow for substitution between domestic and foreign intermediates within a sector.
3. Foreign trade	Imports and domestically produced goods are imperfect substitutes with different marginal rates of substitution by end use; capital inflows fixed in terms of foreign currency; the real exchange rate, defined as the relative price of foreign produced goods in terms of the numeraire, clears the market for domestically produced goods. Domestic production is supplied for domestic market and for export sales according to a CET transformation function. Small country assumption for import supplies and foreign export demand.
4. Final demand	Linear expenditure system for single household. Fixed coefficient investment demand by origin. Fixed coefficient demand by the government. Fixed real government consumption. Government savings determined residually.

Table 8.4 Parameter specifications for the TQR model

Parameter/Sector	*Agri-culture*	*Mining*	*Food Pro-cessing*	*Textiles*	*Inter-mediates*	*Machinery*	*Construc-tion*	*Services*
Domestic (D) final goods:								
1. Income elasticity	0.6	0.6	0.8	1.1	1.1	1.1	–	1.1
2. Own price elasticity	−0.2	−0.3	−0.4	−0.5	−0.5	−0.5	–	−0.3
Imported (M) final goods:								
3. Income elasticity	2.5	2.5	2.5	2.9	2.9	2.9	–	2.9
4. Own price elasticity	−1.2	−1.2	−1.2	−1.4	−1.4	−1.4	–	−1.4
Intermediate goods:								
5. Price elasticity (D)	–	−0.5	–	–	−0.1	−0.1	–	−0.1
6. Price elasticity (M)	–	−1.0	–	–	−0.3	−0.3	–	−0.8
Elasticity of substitution:								
7. Capital/labour	1.2	0.8	0.4	0.4	0.4	0.4	0.4	0.4
8. Domestic/imported goods	–	1.5	–	–	0.4	0.4	–	0.8
Elasticity of transformation:								
9. Domestic/exported goods	1.5	1.5	1.5	0.5	0.5	0.5	–	0.5
Import quota premia:								
10. Consumption goods	23.9%	32.0%	32.0%	13.7%	20.7%	21.0%	–	13.7%
11. Intermediate goods	–	40.0%	–	–	94.6%	101.4%	–	25.4%

Source: Grais, de Melo and Urata (1986), Tables 4, 5 and 6.

restricted imports and η is the assumed price elasticity of demand for imports.

The guesstimated premia rates by sector are reported in the last two rows of Table 8.4. Note the higher rates for intermediate than final consumption goods, which result not from higher rationing rates for intermediates but from lower demand elasticities (compare rows 4 and 6). (The estimated premia are used to compute the rents – R – accruing from rent-seeking activities.)

Simulation

More detailed consideration of the way in which a CGE model such as the TQR model can be used for policy appraisal purposes is provided in Chapter 9. At this stage we need to illustrate briefly the idea of simulation of policy experiments. Grais, de Melo and Urata (1986) report on the macroeconomic implications of a number of experiments (E). We consider only the following:

- E1: QRs on imports of intermediates eliminated *without* sectoral capital mobility.
- E2: QRs on imports of intermediates eliminated *with* sectoral capital mobility.
- E3: E1 plus removal of QRs on imported consumer goods.
- E4: E2 plus removal of QRs on imported consumer goods.

The impact of these simulated policy changes on imports, exports and GDP are reported in Table 8.5.

Clearly a wide range of other policy changes could be considered, as could the impact on other economic variables in the model (investment, consumption and so on). The context and focus of policy reform can vary. The danger is of course that the ease of experimentation could induce an unjustified confidence in the results, both qualitatively and quantitatively. It is easy to forget that the structure of the model embodies assumptions (which reflect beliefs or prejudices rather than reality) and that the data and the adopted elasticity values may be deficient. Nonetheless the importance of certain assumptions can themselves be tested through experimentation. In the case of the TQR model we can compare for example the implications of assuming intersectoral capital mobility rather than capital specificity – compare E1 with E2 and E3 with E4. In this case the magnitude of the results is not very sensitive to what is assumed about capital. Such a result is at odds, however, with the impact of capital specificity in models where perfect substitution between domestic and imported goods is assumed.[6] We need to consider clearly therefore what feature(s) of the model (in this case substitutability) produces a different result for the present model, and be assured that we are confident about the robustness of the relevant assumption.

Table 8.5 Results of some policy simulations with TQR model

	Import[1] *volumes*				*Export volume*	*Real GDP*
	Consumer	*Inter-mediate*	*Other*	*Total*		
Base values[2]	25.0	71.0	25.0	121.0	75.0	1281.0
Experiments[3]						
E1	25.0	70.6	27.1	122.7	76.8	1339.9
E2	25.0	73.5	27.5	126.0	79.9	1347.6
E3	31.8	69.5	27.1	128.4	81.5	1342.5
E4	31.7	72.3	27.4	131.4	84.5	1350.2

Source: Grais, de Melo and Urata (1986), adapted from Table 7.

Notes:
1. Exclusive of tariffs.
2. Millions of Turkish lira.
3. Defined in the text.

It is also possible to consider the sensitivity of the results to the composition of or level of simulated policy change. In the case of those simulations reported in Table 8.5 it is possible to compare the implications of QR liberalisation of intermediates only with that of consumer goods also included. In this case it turns out that the *incremental* effects of removing QRs on consumer goods are not very large. This reflects their lower share in imports and the lower rationing rate on this category of imports. Clearly considerable richness can be given to the appraisal of policy and the formulation of reforms by this type of sensitivity analysis. Even though complete QR liberalisation maximises the increase in real GDP (and presumably welfare), there are likely to be constraints (foreign exchange and political economy) on governments' abilities to reform completely and immediately. The information from policy experiments with GCE models can therefore be used to consider not only the nature of policy reform qualitatively and quantitatively, but also the timing and sequencing of reforms.

8.6 Concluding comments

This chapter has traced the development of general equilibrium analysis from its theoretical origins to the recent rapid growth of computable or numerical models supported by the computational convenience offered by modern computers and software. The structure and properties of the models typically developed in trade analysis have been investigated and illustrated, as has the process of model construction and of model use for

policy simulation purposes. The advantages and limitations of CGE models should be clear to the reader from the discussion of their theoretical properties and of the calibration/solution methods. The additional insights of general equilibrium over partial equilibrium methodologies, the reduced data requirements relative to time-series econometric models and the ease of undertaking policy experiments are obvious strengths of the models. However it is also evident that there is room for improvement, in particular in the area of parameter estimation and of testing for model validity. This is true for all CGE models, be they single or multi-country ones applied to developed or developing countries. Given the special data problems likely to be experienced in developing countries, it does mean that CGE modelling should be viewed as a complementary technique and not one that replaces those discussed earlier in this volume. With these points in mind we turn to a more detailed consideration and illustration of the application of CGE models to trade policy issues in developing countries.

Appendix 8.1 The equations of the TQR model

This appendix presents the complete set of equations describing the model. Exogenous variables and parameters are denoted by Latin letters with an overbar or Greek letters; superscripts are used to distinguish commodities by end use and subscripts refer to sectors. The first list gives the sets of equations in the model, and the second list defines commodity prices in the model.

1. Factor markets

(a) $L_i^d = \alpha_i^{\sigma_i}(\mathrm{PN}_i/W)^{\sigma_i}\mathrm{X}_i$	Labour (L) demand (σ is the elasticity of substitution between capital (K) and labour).
(b) $\sum_i L_i^d = \bar{L}$	Equilibrium condition for the labour market.
(c) $K_i^d = (1 - \alpha_i)^{\sigma_i}(\mathrm{PN}_i/r)^{\sigma_i}\mathrm{X}_i$	Demand for capital services.
(d) $\sum K_i^d = \bar{K}$	Equilibrium condition for capital services (capital mobile across sectors). If capital is fixed, rental rates, r_i, are determined residually.

2. Demands for intermediate inputs (V)

(a) $V_i^c = \sum_j a_{ij}\,\mathrm{X}_j$	Demands for composite intermediates, where X_j is total output.
(b) $V_j^d = \zeta_j^{n_j}(\mathrm{pc}_j^i/pd_j^i)^{n_j}V_j^c$	Notional demands for domestic intermediates, $n_j > 0$, $0 < \zeta_j < 1$.
(c) $V_j^m = (1 - \zeta_j)^{n_j}\,(pc_j^i/pv_j^i)^{n_j}V_j^c$	Notional demands for imported intermediates, $n_i > 0$, $0 < \zeta_j < 1$.

3. Supplies to domestic (S^d) and foreign (S^e) markets

(a) $S_j^d = \beta_j^{\theta_i} (PD_j/PD_j^d)^{\theta_j} X_j$	Supplies to domestic markets, $\theta_j < 0$, where X_j is total output.
(b) $S_j^e = (1 - \beta_j)^{\theta_i} (PD_j/PD_j^e)^{\theta_j} X_j$	Supplies to foreign markets, $\theta_j < 0$, where X_j is total output.

4. Relations between prices (variables starting with τ refer to corresponding ad valorem tax rates)

(a) $pd_j^c = (1 + \tau c_j^d)\ PD_j^d$	Market prices (*pd*) of domestic consumer goods (*c*)
(b) $pd_j^i = (1 + \tau i_j^d)\ PD_j^d$	Market prices of domestic intermediates.
(c) $pd_j^o = (1 + \tau o_j^d)\ PD_j^d$	Market prices of other domestic goods.
(d) $pd_j^e = (1 + \tau e_j)\ PD_j^e$	Export prices inclusive of taxes or subsidies with $pd_j^e = \overline{\pi e}_j\ ER$.
(e) $pm_j^c = (1 + \tau c_j^m)\ \overline{\pi c}_j^m\ ER$	Landed prices of consumer imports (pm).
(f) $pm_j^i = (1 + \tau i_j^m)\ \overline{\pi i}_j^m\ ER$	Landed prices of intermediate goods.
(g) $pm_j^o = (1 + \tau o_j^m)\ \overline{\pi o}_j^m\ ER$	Landed prices of other imports.
(h) $pc_j^i = (\zeta_j^{n_j}\ [pd_j^i]^{1-n_j} + [1 - \zeta_j]^{n_j}\ [pv_j^i]^{1-n_j})^{1/1-n_j}$	Composite prices of intermediates (pc)
(i) $PD_j = (\beta_j^{\theta_j}[PD_j^d]^{1-\theta_j} + [1 - \beta_j]^{\theta_j}[PD_j^e]^{1-\theta})^{1/1-\theta_j}$	Marginal revenues.
(j) $PD_j = \sum_i a_{ij}\ (pc_i^i) + a_{va,j} PN_j$	Gross output prices, marginal costs of gross output.
(k) $PN_j = (\alpha_j^{\sigma_j}\ w^{1-\sigma_i} + [1 - \alpha_j]^{\sigma_i} r_j^{1-\sigma_j})^{1/1-\sigma_j}$	Net prices/marginal costs of primary factors.

5. Market-clearing conditions

(a) $C_j^d + G_j^d + I_j^d + V_j^d = S_j^d$	Domestic goods.
(b) $C_j^m = \bar{C}_j^m$	Rationed consumer imports.
(c) $V_j^m = \bar{V}_j^m$	Rationed intermediate imports.
(d) Perfectly elastic supplies	Other imports.
(e) Perfectly elastic demands	Exports.
(f) $\sum_j \overline{\pi c}_j^m + \sum_j \overline{\pi i}_j^m\ V_j^m + \sum_j \pi o_j^m (G_j^m + I_j^m) - \sum_j \overline{\pi e}_j\ S_j^e = \overline{FS}$	Balance of payments.

6. Definition of rents

(a) $CR = \sum_j (pv_j^c - pm_j^c)\bar{C}_j^m$ — Rents to consumers (CR).

(b) $PR = \sum_j (pv_j^i - pm_j^i)\bar{V}_j^m$ — Rents to producers (PR).

7. Government revenues, expenditures, and savings

(a) $GREV = DTAX + NIT$ — Government revenue (GREV).

(b) $GEXP = \overline{TG}$ — Government expenditures (GEXP)

(c) $\left.\begin{aligned} G_j^d &= \delta_i^d \overline{TG} \\ G_i^m &= \delta_i^m \overline{TG} \end{aligned}\right\} \sum (\delta_i^d + \delta_i^m) = 1$ — Government demand (G) for domestic goods. Government demand for imported goods.

(d) $GSAV = GREV - GEXP$ — Government savings (GSAV)

(e) $NIT = \sum_j[\tau c_j^d C_j^d + \tau i_j^d V_j^d + \tau o_j^d (G_j^d + I_j^d)]PD_j^d + (\sum_j \tau c_j^m \overline{\pi c}_j^m C_j^m + \sum_j \tau i_j^m \pi i_j^m [V_j^m] + \sum_j \tau o_j^m \overline{\pi o}_j^m [G_j^m + I_j^m])\, ER$ — Net indirect taxes (NIT)

8. Savings and investment

(a) $SAV = HS + GSAV + ER \cdot \overline{FS}$ — Total savings ($\overline{FS}$ is foreign capital inflow).

(b) $TINV = SAV$ — Total investments.

(c) $I_i^d = \gamma_i^d(TINV/PI)$ — Demands for domestic capital goods ($\sum (\gamma_i^d + \gamma_i^m) = 1$).

(d) $I_i^m = \gamma_i^m(TINV/PI)$ — Demands for imported capital goods ($\sum (\gamma_i^d + \gamma_i^m) = 1$).

9. National income and Its allocation

(a) $Y = \sum_i wL_i^d + \sum_i r_i K_i^d + ER\, \overline{FS} + CR$ — GNP at factor cost; CR is the total rent generated by the rationing of consumer imports.

(b) $HDI = (1 - t)\, Y$ — Disposable income (HDI)

(c) $DTAX = tY$ — Direct taxes (DTAX)

(d) $\overline{TC} = \mu HDI$ — Private consumption (TC) ($0 < \mu < 1$).

(e) $HS = (1 - \mu)HDI$ — Private savings (HS) ($0 < \mu < 1$).

(f) $C_i^d = \gamma_j^d + (b_i^d/pd_i^c)\,(\overline{TC} - \sum_j \gamma_j^d [pd_j^c] - \sum_j \gamma_j^m [pv_j^c])$ — Notional private demands for domestic goods.

(g) $C_i^m = \gamma_i^m + (b_i^m/pv_i^c)\,(\overline{TC} - \sum_j \gamma_j^d\,[pd_j^c] - \sum \gamma_j^m\,[pv_j^c])$	Notional private demands of import goods.

Prices in the TQR model:

PN_j, $j = 1, 2, \ldots, N$	Net prices.
PD_j, $j = 1, 2, \ldots, N$	Gross output prices, inclusive of production taxes.
PD_j^d, $j = 1, 2, \ldots, N$	Supply prices of domestic goods to domestic markets exclusive of commodity taxes or subsidies.
PD_j^e, $j = 1, 2, \ldots, N$	Supply prices of domestic goods to export markets exclusive of commodity taxes or subsidies.
pd_j^k, $j = 1, 2, \ldots, N$ k = c, i, o, e	Prices of domestic goods inclusive of commodity taxes or subsidies, where c, i, o, e refer to consumer, intermediate, other goods, and exports.
pm_j^k, $j = 1, 2, \ldots, N$ k = c, i, o	Tariff-inclusive landed prices of imports.
pv_j^k, $j = 1, 2, \ldots, N$ k = c, i	Virtual prices of consumer and intermediate imports.
pc_j^i, $j = 1, 2, \ldots, N$	Composite prices of intermediates.
$\left.\begin{matrix}\overline{\pi c}_j \\ \overline{\pi i}_j^m \\ \overline{\pi o}_j^m\end{matrix}\right\}$ $j = 1, 2, \ldots, N$	World prices of imports.
$\overline{\pi e}_j$	World prices of exports.
w	Wage rate.
r_i, $i = 1, 2, \ldots, N$	Sectoral rates of returns; $r_i = r_j$, where capital is mobile.
P	Consumer price index (numeraire).
PI	Investment price index.
PG	Government price index.
ER	Exchange rate.

CHAPTER 9

Applied CGE Analysis of Trade Policy

9.1 Introduction

In the previous chapter the focus of attention was with the principles and technique of CGE modelling. We turn now to illustrating the potential applications of CGE models in the case of medium- to long-term trade policy analysis in developing countries. There are of course policy applications beyond trade policy – taxation, income distribution, resource depletion, location, employment policies and so on – to which CGE analysis can and has been applied (see for example Devarajan, 1988). Our focus here is by necessity narrower, though it is the case that trade policy has been a central issue in the case of many applications to developing countries. Further, the way in which the foreign trade sector is modelled crucially influences policy simulations outside the foreign trade sector.

The aim of this chapter is to provide a focus on trade policy issues and to illustrate the modelling of them, rather than to provide a comprehensive review of what is now a very large literature. The remainder of the chapter is as follows. Section 9.2 considers the measurement of protection and resource pulls in a general equilibrium framework. In Section 9.3 the use of CGE modelling to analyse the welfare effects of protection and rent seeking is illustrated. The costs of trade interventions in the context of the non-competitive market structures that may often be a feature of small developing economies are investigated within a general equilibrium framework in Section 9.4. In Section 9.5 attention shifts to the issue of raising government revenue at minimum distortion through the use of trade taxes. The last application is the use of CGE simulation analysis of the growth implications of alternative trade strategies, and this is con-

sidered in Section 9.6. Finally some concluding comments are provided in Section 9.7.

9.2 Effective protection and resource pulls

The concept of effective protection was introduced in Chapter 5. There a partial equilibrium approach was adopted, and the problems of drawing inferences from this approach about general equilibrium adjustments (production effects and resource pulls) was that, although the lack of consideration of factor-price effects and input substitution possibilities introduces potential errors in the estimation of effective rates of protection in a partial equilibrium framework, the estimated effective rates may be used to provide a sensible indication of the effects of protective measures on resource allocation. This is supported by empirical work that has investigated the theoretical work (Bhagwati and Srinivasan, 1973) about how well effective rates of protection estimated in a partial framework will predict resource flows.

Taylor and Black (1974) have compared the output changes predicted by partial equilibrium effective rates with output changes estimated in a 35-sector general equilibrium model of the Chilean economy for 1962. They conclude that the specification of the way in which intermediate inputs enter into the production function is numerically important in determining output responses to, for example, tariff changes. But rank correlation between partial and general equilibrium estimates is not very sensitive to the specification, and is high. If intermediate input coefficients are assumed to be constant the rank correlation coefficient between the two sets of estimates is 0.885. If instead a unitary elasticity of substitution between primary and intermediate inputs is assumed, there are larger absolute differences between the estimates than in the first case but the rank correlation remains high (0.851).

Taylor and Black (1974) assume that capital is immobile between industries and that labour is the only mobile factor. This is clearly a restrictive assumption and one that is inconsistent with a long-run, general equilibrium theory of protection. De Melo (1978) investigates the sensitivity of the Taylor–Black results to this assumption. The model distinguishes between land, labour and capital (with substitutability between primary factors and fixed intermediate input coefficients) in a 15-sector general equilibrium model for Columbia. With capital mobile he found a rank correlation coefficient of 0.864 between partial equilibrium effective rates and resource pulls; lower but not substantially lower than the 0.955 rank correlation between comparable general equilibrium estimates and resource pulls. Similar results have been obtained by de Melo (1980) for a model which splits labour into skilled and unskilled groups. Interestingly, in the later study de Melo obtains a closer correspondence between partial

equilibrium estimates and resource pulls for a more disaggregated model of the traded goods sector. We can therefore identify a possible complementarity between partial and general equilibrium analyses, since data is likely to constrain general equilibrium modelling to higher levels of aggregation than is possible for estimation of partial equilibrium effective rates.

The closer correspondence between resource pulls and partial equilibrium effective rate estimates may well be explained by the fact that the effects of protection on product prices are more important in determining resource pulls within sectors (with similar factor input requirements) than are the effects of protection on factor prices. As factor intensities vary between traded good sectors then the factor price effects of protection can be expected to have a greater influence on incentives to produce and therefore resource pulls. It should be noted that general equilibrium estimates of effective protection may not correlate perfectly with resource pulls, since a given protection-induced change in value added in a particular process can be brought about by alternative 'mixes' of product price and factor price changes (de Melo, 1978, finds an 0.95 rank correlation between resource pulls and general equilibrium effective rates). Indeed it is conceivable that a process with a lower effective rate of protection (or smaller policy-induced increase in value added) will receive a greater incentive to increase output than an activity with higher effective protection (or greater policy-induced increase in value added) if factor intensity differences are sufficient to cause factor price effects of protection to offset the product price effects of protection. Thus the essential purpose of CGE modelling is not to generate alternative, that is general equilibrium estimates of effective protection, but rather to comment upon the broad intersectoral resource pulls associated with policy interventions or policy reforms.

We can illustrate the long-run structural effects of trade policy from work by Chenery *et al.* (1986). They construct a dynamic CGE model in two parts. First there is a static CGE model which is solved for a one year equilibrium, based on data for South Korea for 1963. (Korea had completed a period of development based on import substitution up to 1963, and was poised for a shift towards a more outward-orientated strategy.) Table 9.1(a) summarises the main features of the static model and the dynamic features, that is the intertemporal linkage equations which update on exogenous variables and parameters that are influenced by policy decisions. (See Section 9.6 below for further discussion of the dynamic features of the model.) The authors use the model to simulate the effects of alternative trade strategies. We concentrate here on the effects of export promotion through the lowering of average tariffs (from 17 per cent to 9 per cent over a 20 year period) and the necessary devaluation of the real exchange rate to clear the foreign exchange market. This policy reform alters the structure of relative prices and factor allocation in turn responds

Table 9.1(a) Outline of the static and dynamic CGE model (Chenery et al, 1986)

Economic relations	*Static model*		*Dynamic model: cumulative processes*
	Principal relations	*Structural features*	
Factor markets:			
Labour	Labour demand equations	Segmented rural–urban labour markets	Labour force growth
Capital	Marginal product equations	Fixed sectoral capital stocks	Capital stock growth
Product markets:			
Production	Production functions	—	Productivity growth
Demand	Expenditure functions	—	Composition changes
Foreign trade:			
Exports	Export supply functions	Segmented domestic and export markets	World market trends
Imports	Trade aggregation functions	Imperfect substitutability	Induced import substitution
Trade balance	Exchange rate or premium rate	Foreign exchange rationing, exogenous inflow	Sequence of capital inflows
Macroeconomic balance:			
Savings–investment	Domestic savings rates	—	Trends in savings rates
External capital	Endogenous foreign capital inflows	Fixed exchange rate	—

Table 9.1(b) Simulated growth and structural changes of trade liberalisation/export promotion (Chenery et al. model)

Strategy and sector	*Output growth*	*Share of output change*	*Percentage contribution*			
			Domestic demand	*Exports*	*Import substitution*	*Change in input–output coefficients*
Agriculture	3.2	9.0	103.4	31.2	−4.6	−30.2
Food processing	7.3	9.1	79.4	23.4	−0.7	−2.1
Consumer goods	9.4	24.9	64.4	38.1	0.2	−2.6
Intermediate goods	12.4	23.0	51.0	30.9	1.7	16.4
Machinery	12.6	8.9	70.1	16.4	−1.5	14.9
Services	6.6	25.1	89.5	14.9	0.1	−4.5
Total	7.5	100.0	73.0	26.7	−0.2	0.4

Source: Chenery *et al.*, 1986, Tables 11.1 and 11.8.

to these changes in price incentives. Table 9.1(b) summarises the sectoral output growth effects over the whole period, the sectoral shares of output change and the decomposition of sectoral output growth. Note the significant contribution of export expansion (26.7 per cent) to the total growth of output as the incentive to produce for export rather than for domestic market increases. Note also the significant intersectoral differences in the contribution to the total change in output – ranging from 8.9 per cent in the case of machinery to 24.9 per cent from production of consumer goods. This confirms the possibility of trade reforms having long-term effects on the structure of the economy and on the allocation of resources.

The above model is not designed to explore the short-run resource reallocation effects associated with the transitional period of trade reforms or of change of development strategy. 'Structural adjustment' issues may be better addressed with an annual or 'static' model where the structure and detail of the model can be fashioned so as to concentrate on adjustment problems (see for example Robinson and Tyson, 1985). Some of the models examined in subsequent sections of this chapter could be used for this type of purpose. We focus however on other issues of interest to the policy analyst or policy maker.

9.3 Costs of protection and rent seeking

Developing countries have typically used quantitative restrictions on imports, as well as tariffs, to protect domestic producers and ration foreign exchange.

The (TQR) model of Grais, de Melo and Urata (1986) has been used to analyse the effects of quantitative imports restrictions (QRs) in Turkey in 1978. The characteristics of the model are outlined in Section 8.5. We consider here how that model can be used to estimate the welfare costs of this protection and of the extensive rent-seeking activity by industrialists that was induced by the use of QRs by Turkey.

The regulation of imports in the late 1970s in Turkey involved the classification of imports as follows: an unrestricted list of non-competing imports of raw materials and parts; a restricted list of competing intermediate and final goods imports for which an import license was required; and a quota list (with quotas for specific commodities) of allocations between producers and importers.[1] It is evident that the producers' response to this rationing of imports was to indulge in rent-seeking activity.

The modelling of a trade regime like this is of course extremely difficult. The restrictiveness of the regime, and therefore the effects of any liberalisation, will depend upon the extent to which the QRs alone or QRs and tariffs combined have a binding, pre-policy change effect on the volume of imports. It is difficult to estimate with precision what the effects of the lowering of either policy instruments will be on import volumes, in particu-

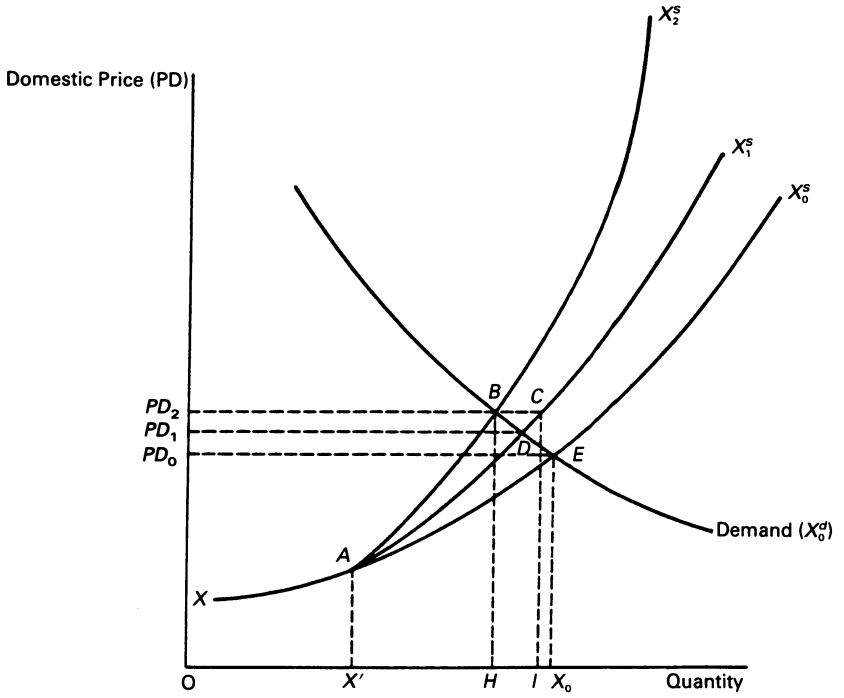


Figure 9.1 Welfare cost of rationing and rent seeking

lar of new products. This difficulty is compounded when, as might be expected, import restrictions induce smuggling and other illegal means of circumventing the controls. Thus, in order to simplify the model and the analysis, the model sharply divides imports into the three categories described on page 153. The authors estimate the welfare costs of quantity rationing and rent-seeking; rationing of consumers in their purchase of imports of final goods and rationing and rent-seeking by producers whose purchases of intermediate imports are restricted. (Again the modelling procedure to capture rent-seeking is described on page 154.)

The costs resulting from rationing and rent seeking can be illustrated by Figure 9.1 for a single sector. In the absence of rationing the domestic price is PD_0, which corresponds with the intersection of the initial domestic demand (X_0^d) and supply to the domestic market (X_0^s). Thus the 'traditional' output level (without rent-seeking activity) would be X_0. The rationing of intermediates causes the marginal costs of production to rise, and the supply schedule beyond X' (the level at which import rationing is binding) shifts to the left from X_0^s to X_1^s. At the resulting higher domestic price (PD_1) and reduced output of 'traditional' output associated with point D, there is a deadweight loss which can be represented by the area ADE. The effect of rent seeking is to push the supply curve further to the left, that is to X_2^s, as output is diverted from 'traditional' to rent-seeking activity.

Relative to the numeraire, this raises the domestic price to PD_2 and the deadweight loss by the area ABD. Thus the total deadweight loss associated with the restriction of output (ABE) can be broken down into a cost of rationing (ADE) and cost of rent seeking (ABD). At the final (distorted) domestic price (PD_2) producers would be willing to supply quantity OI, but only produce 0H quantity of 'traditional' output because of rent-seeking production. HI 'production' of rent-seeking activity at price PD_2 values these rents at a level represented by the area $HBCI$.

The welfare effects of trade liberalisation in Turkey in 1978 using the eight-sector TQR model are reported in summary in Table 9.2. The gains of liberalisation (or if the signs are reversed the costs of rationing and rent seeking) are expressed as percentage increases over the base values. Overall gains in real GDP are estimated to be over 5 per cent. Interestingly the bulk of the potential gains (or costs) arise out of the rationing of imports of intermediate goods; eliminating QRs on consumer goods and then lowering tariffs across the board raise the total estimated gains by only 0.2 per cent and 0.1 per cent respectively. Clearly these results are sensitive to model specification (including the modelling of rent-seeking activity) and to the price-raising effects of QRs incorporated into the calibrated solution for the base case. Nonetheless the results are at least indicative and offer a richness that is unlikely to be available from partial equilibrium estimation techniques. The simulations will throw out new equilibrium values for all the endogenous variables in the model. In this case, for example, we are also able to comment on the costs of QRs in terms of foresaken consumption and the reduced productive potential associated with lower investment levels.

9.4 Trade regimes and market structure

The analysis of the costs of protection (whether it be deadweight consumption or rent-seeking costs) is traditionally conducted in the context of competitive markets. In the case of many developing countries the size of the domestic market may well not support more than a few firms. This tendency to concentration may be reinforced by industrial policies (licensing procedures and investment incentives) that deter entry. As a result the costs of a restrictive trade regime (especially where quantitative import restrictions eliminate foreign competition at the margin) may induce greater costs in the presence of oligopolistic market structures than the standard welfare costs that we would identify in the face of competitive behaviour.

Pioneering work in the area of general equilibrium assessment of trade liberalisation in a developing country context in the presence of economies of scale and imperfect competition has been undertaken by Condon and de Melo (1986) and Rodrik (1987). It has extended work by Harris (1985) and

Table 9.2 Welfare gains from trade liberalisation[1] in Turkey (% increase relative to base values in 1978)

	Real GDP	*Real consumption*	*Real investment*
Removal of QRs on intermediate goods	+5.2	+3.8	+11.2
Removal of QRs on intermediate and consumer goods	+5.4	+4.2	+11.0
Removal of all QRs and a 50% cut in tariffs across the board	+5.5	+5.7	+7.1

Source: Grais, de Melo and Urata (1986), Table 7.

Note:
1. Assuming capital mobility across sectors.

empirical analysis for Canada by Cox and Harris (1985) to the structural characteristics of a typical semi-industrial economy.

The standard costs of import rationing need to be modified first to capture the effect of protection on the scale of production and therefore on per unit costs, and its effect on the price as a result of the departure from average cost pricing implied by non-competitive behaviour. We can show this formally, as in Rodrik (1987). If the expenditure (E) function for the single representative consumer is as follows,

$$E = E(p_1 \ldots p_n, W) \tag{9.1}$$

where p_i is the price of good i, W is the welfare index and sectoral production (X_i) takes place in n identical firms (that is $X_i = nx_i$) with unit cost (C_i) functions as follows,

$$C_i = C_i(f, X_i) \tag{9.2}$$

where f is the vector of factor prices, then the welfare effect for a given sector ($E_n dW$) of a change in trade policy can be expressed as:

$$E_n dW = \sum_i (p_i - p_i^w) dC_i + \sum_i (c_i - p_i^w) dX_i + n_i c_i (1 - 1/\pi_i) dX_i \tag{9.3}$$

where p_i^w is the world price of good i and Π_i is the ratio of average to marginal cost or scale elasticity.

The three terms on the right-hand side of Equation 9.3 relate to the consumption, competition and scale economy effects respectively. As domestic price (p_i) exceeds world price (p_i^w) following the application of an import restriction, then welfare falls for the normal good as consumption of good i contracts. The first term, therefore, is the traditional cost associ-

Table 9.3 Welfare costs of import rationing for alternative market structures and returns to scale

	Welfare costs[1] *(% of base*[2] *national income)*	
	20% import rationing[3]	*50% import rationing*
Policy Experiments:[4]		
E(1)	1.7	13.0
E(2)	6.1	16.0
E(3)	6.5	16.7
E(4)	6.5	17.1

Source: Condon and de Melo (1986) Table 5.

Notes:
1. Hicksian-compensated variation from indirect utility function in linear expenditure system.
2. The base was taken as the free trade situation.
3. Rationing of consumer and intermediate goods.
4. The nature of the policy experiments are described in the text.

ated with the policy-induced distortion. There are, in contrast to the traditional production cost of protection, two elements to the production distortion. The second term captures the effect of imperfect competition on production; the greater the degree of market concentration and the more that price exceeds unit cost ($p_i > c_i$) because of monopoly power, then the greater the degree of contraction of output and the more that unit cost will rise above the world price ($c_i > p_i^w$). Finally, the third term captures the effect of trade policy on the degree to which scale economies are exploited. Thus the greater the expansion of production and the greater the scale elasticity or fall in costs as output increases, the greater the increase in welfare.

Condon and de Melo (1986) investigate the trade-off between the scale and anticompetitive effects of import restrictions in the context of a stylised three-sector model. In their model the primary and non-traded goods sectors are characterised by constant returns and competitive conditions, while the manufacturing sector is represented as being subject to increasing returns and non-competitive behaviour. The results of their simulations of the effects of import rationing are summarised in Table 9.3. Four policy simulation experiments are reported on:

- E(1): constant returns to scale, no firm entry, and no collusive behaviour.
- E(2): increasing returns to scale, no firm entry, and no collusive behaviour.

- E(3): increasing returns to scale, firm entry and no collusive behaviour.
- E(4): increasing returns to scale, no firm entry and collusive behaviour.

Of course the results in Table 9.3 can only be viewed as indicative of the potential implications for trade policy analysis in the context of scale effects and non-competitive behaviour. The scale elasticities were based on evidence from the manufacturing sector in Canada, while the policy-induced changes in price–cost margin and firm numbers were set in line with the experience after trade liberalisation of the Chilean manufacturing sector. The results are for a hypothetical rather than an actual developing economy. Nonetheless they suggest that the costs of import restriction (or the gains of trade liberalisation) can be considerably greater in the imperfect competition/increasing returns context than in the traditional competition/constant returns framework. Compare the results of experiments E(1) and E(2), but note also the advantages of being able to simulate within a general equilibrium framework. One might have anticipated that the freedom of firm entry would have reduced the costs of import rationing by restricting the degree of production distortion resulting from monopoly or market concentration. But by incorporating the assumption that the number of firms in a sector is an increasing function of the rents available from rationing, then there is the possibility of excessive entry which increases the extent to which each firm underexploits available scale economies. (There is evidence from developing countries of 'excessive entry', that is too many firms behind protective barriers, where the restrictiveness on industrial licensing is not too great.)[2] Of course experiment E(4) shows that this is not the only danger in the case of imperfectly competitive markets. In this experiment the possibility of the 'excessive entry problem' is eliminated, but now rationing provides an opportunity for greater departures from average cost pricing in the domestic market as a result of collusive behaviour by firms. The welfare costs of policy experiment E(4) are no lower than for E(3) and increase above those of E(3) as the degree of import rationing and opportunity for collusion increases.

The potential complexity of the links between trade policy, scope for scale economies and industrial organisation or market structure has meant that the robustness of the postulates of trade policy in the context of the traditional (constant returns/perfect competition) framework has been challenged. The costs of import restriction are always positive for the small, undistorted economy in the traditional model. There is a possibility of welfare-raising interventions in the context of an increasing returns/imperfect competition world. But the discussion in this section has identified two important features of the recent work on trade policy. First, we have been able to show the value of using general equilibrium analysis when seeking to capture the complex interactions between trade policy and market structure. And second, although welfare-raising intervention is a possibility in this second-best world, the evidence from recent empirical

works suggests that the costs of restricting trade (or gains from liberalising trade) in these circumstances can be considerably greater than they are in a traditional, neo-classical framework.

9.5 Trade taxation and government revenue

In the earlier sections of this chapter we have been able to demonstrate how CGE modelling can be used to focus on the allocation effects and misallocation costs of trade policy interventions. But trade taxes are not always used for protective purposes alone. In many developing countries there is a fairly high fiscal dependence on trade taxes. Greenaway and Milner (1991a) show that the average share of trade taxes in total government revenue is 17 per cent for a sample of non-oil developing countries. There is however a wide dispersion around this mean, and the trade tax share is considerably higher than this in many cases (62 per cent in the case of Gambia for example). Indeed for 31 countries in the sample fiscal dependence of over 20 per cent was identified. On efficiency and equity grounds trade taxes are not 'first best' means of raising revenue. If we ignore lump-sum taxes, then the optimal taxation literature (for example, Dixit, 1985; Stern, 1987) establishes that commodity consumption taxation should be used to raise revenue. However the choice of taxes may be severely constrained in low-income developing countries. Some subsistence sectors (rural agriculture) cannot be taxed, and in some sectors administrative costs and pervasive tax evasion (for example of income taxes) forces the authorities to rely on trade and producer taxes as major sources of revenue. Thus the willingness of developing countries to undertake trade policy reform will not only be fashioned by consideration of efficiency and growth gains or by adjustment and income redistribution considerations, it will also be influenced by the impact of border taxation changes on trade and non-trade tax revenue.[3] Herein lies the benefits of a general equilibrium framework since a CGE model can be used to simulate simultaneously the effects of trade policy change on the output and structure of an economy and the effects on tax revenue – directly from trade taxes and indirectly from non-trade taxes. (The ability of general, as opposed to partial, equilibrium analysis to capture indirect effects also should be noted.)

The CGE framework can be used as a positive tool, that is to identify actual revenue effects of non-optimal trade policy reforms. It can of course also be employed as a normative tool to identify how to raise a given amount of revenue at minimum distortionary cost, given the constraint that distortionary taxes (such as production and trade taxes) have to be used to raise the revenue. It is this latter type of work on 'optimal' tariff structure that has been tackled by Mitra (1986) and Dahl, Devarajan and van Wijnbergen (1986), the former for India and the latter for Cameroon.

Interesting results have come out of this type of analysis, and these contrast with the traditional public finance and trade analysis. The traditional and more pragmatic approach emphasises the benefits of more uniform taxation and protection. More uniform tariffs across final goods and between intermediate and final goods is seen as a means of simplifying the complexity of the system, reducing resource misallocation and the spread of effective protection rates and therefore resource misallocation and the opportunities for rent-seeking activity. Indeed this orthodoxy has fashioned the form of the trade policy reform components of most SAL programmes (see Chapters 12 and 13). It has been possible to design programmes that achieved greater uniformity and which could also be revenue-neutral or enhancing. The replacement of quantitative import restrictions by tariffs or the reduction of tariff exemptions on intermediate inputs are obvious sources of direct revenue-enhancement, which can be achieved with greater uniformity as well. These reforms have often been defended on *a priori* grounds, but CGE modelling has also been used to quantify and compare the revenue effects of alternative reform packages and alternative tariff rates.

But the orthodox approach tends to presume that related reforms of the tax system will take place, and with it the dependence on distortionary trade taxes will decline over time. If, in contrast, we adopt the position that the fiscal systems of the lowest income developing countries will remain inherently weak for some considerable time and that the present distortionary taxes are not removable, then the recent CGE analysis of 'optimal' tariffs shows that the recommendations for uniform (nominal and effective) tariffs may not be robust. The work has identified a number of rules analogous to those derived by the optimal tax analysis. Only if price elasticities of import demand are uniform across goods (ignoring cross-price effects) and if the substitutability of production between the domestic and export market is identical, would an 'optimal' tariff structure involve uniform tariff rates. *Ceteris paribus* the 'optimal' tariff should be higher the more inelastic the import demand and the lower the substitutability between import and export goods; the higher tariff induces a lower consumption and/or production distortion and a lower 'tax' on exports than would apply if the same tariff rate were applied when import demand is elastic and imports are closer substitutes for exports.

This has been illustrated by Dahl, Devarajan and van Wijnbergen (1986) in an eight-sector model of Cameroon that captured the above influences on the optimal tariff structure. The model was calibrated to data for Cameroon for the year 1979/80 and assumed the structure of indirect taxes and import tariffs that actually applied at that time. Very high export demand elasticities (uniformly -20, in line with Cameroon's minimal world market power) are also assumed. This implies that the optimal export tax will be positive in an undistorted economy. The model is used to simulate the structure of 'optimal' tariffs that generate the same level of

Table 9.4 'Optimal' revenue-constrained tariff rates

	Base rates		*Optimal revenue-constrained rates*		
			with zero export taxes		*with optimal export taxes*
	Ind. tax[1] *rates*	*Tariff rates*	*Existing ind. taxes*	*Ind. tax = 0*	*Ind. tax = 0*
Food crops	0.02	0.22	−0.06	0.09	0.15
Cash crops	0.19	0.23	−0.28	0.13	0.14
Forestry	0.06	0.28	9.31[2]	0.12	0.14
Food processing	0.04	0.35	0.27	0.11	0.15
Consumer goods	0.10	0.38	0.28	0.11	0.14
Intermediate goods	0.03	0.18	0.22	0.15	0.14
Services	0.00	0.00	0.04	0.19	0.14
Uniform rate			**0.16**	**0.15**	**0.14**

Source: Dahl, Devarajan and van Wijnbergen (1986) Table 2.

Notes:
1. Indirect production tax rates.
2. This very high 'optimal' rate is due to the fact that imports of this commodity are miniscule.

revenue as was collected in 1979; 'optimal' being those tariff rates that maximise the utility of the representative consumer. (Given that investment goods play no role in the consumer's single period utility function, then the tariff on investment goods was constrained to prevailing levels to avoid the shifting of the bulk of the tax burden to this sector.) 'Optimal' tariffs are identified for: the existing structure of domestic indirect taxes and with them eliminated; for export taxes at zero and with them set optimally; and when tariffs are constrained to be uniform – in all cases generating the same amount of revenue. Table 9.4 summarises the results of these alternative policy experiments.

The distinctive feature of these results is the sensitivity of the 'optimal' tariff structure to the degree of policy distortion assumed to remain. With optimal export taxes and indirect production taxes set at zero, the optimal structure is highly uniform (at 14 per cent or 15 per cent). (The variability of the 'optimal' rate is of course dependent in part on the degree of disaggregation possible in the model.) However as we move into a second-best world where distortions due to both non-optimal export and production taxes are present, then the 'optimal' tariff rates vary widely across

sectors (from plus 28 per cent to minus 28 per cent if we ignore the exceptional figure for forestry). The negative rates in the area of food and cash crops is particularly interesting. Much of the output of these sectors was exported in 1979, so that production tax (which is sizeable in the case of cash crops) acts like an export tax. The negative optimal tariff therefore attempts to dampen the effects of this tax.

One message from this analysis is that uniform protection is not necessarily optimal (though it may be welfare-raising relative to existing non-optimal patterns of protection) if fiscal or other constraints are present. Whether or not one should recommend greater uniformity is not the purpose of the current discussion. Some authors would advocate greater uniformity of protection, irrespective of whether related reforms were going to reduce the other policy-induced constraints. They would recommend greater simplicity in anticipation of future reforms. A preference for 'long-term' optimisation does rule out the use of CGE modelling of the type we are examining here. The policy experiments allow us to identify the 'second-best' optimal tariff rates, and to identify the potential benefits of lowering other policy constraints through complementary policy reform. Therein lies the motivation for a general equilibrium approach to policy modelling, and for the avoidance of piecemeal reform based on partial analysis.

9.6 Growth and trade strategy simulation

The final application of CGE simulation we shall illustrate is that of examining the long-term growth implications of alternative foreign trade strategies. This is clearly of central interest to policy makers in developing countries who are considering trade policy reform: sufficient long-term growth advantages are likely to be necessary to encourage policy makers to initiate change which induces significant adjustment costs and income redistribution.

Modelling the growth process is of course problematic. There has been much controversy surrounding causality issues, the measurement of capital and about the form and role of technical progress. A modelling exercise of this form inevitably has to side-step many of these problems by taking the determinants or sources of growth as exogenous to the model. Even so the results are likely to be sensitive to the nature of the linkages of the model into the exogenous growth sources. We report here on work by Chenery, Lewis, de Melo and Robinson (1986) on the impact of alternative (representative) trade strategies on various macroeconomic variables, including growth. This model was introduced in Section 9.2 above and its broad features are summarised in Table 9.1(a). Disembodied technical progress and labour force growth are exogenously given, but the model also has to capture the response of trade (imports and exports) to relative price

Table 9.5 Trade strategies and macroeconomic performance

Components	*Import substitution (IS)*	*Balanced (B)*	*Export promotion (EP)*
Trade Policy/Trends:			
Sectoral trends (i.e. exogenous variation in trade shares)	Low/falling	Constant	Rising
Macroeconomic policy instruments	Tariffs/import rationing	Real exchange rate adjustment	Real exchange rate adjustment
Productivity growth	Low/intermediate	Intermediate	High
Macroeconomic Indicators:			
Incremental capital–output ratio, terminal year	3.26	3.02	2.95
Export growth rate	7.9	10.3	14.1
Import growth rate	4.5	6.4	9.3
GDP growth rate	5.7	6.2	6.5
Bias of the trade regime in terminal year	2.0	1.0	0.95
Relative price of capital goods in terminal year	1.2	1.05	0.95

Source: Chenery *et al.* (1986) Chapter 4.

changes induced by the selection of alternative trade strategies. Thus further exogenous trends were imposed on the parameters of the import demand and export supply functions. The authors revised the trade share parameters in these functions in line with shifts in relative prices.[4] The trends in trade shares for an import substitution (IS), balanced (B) and export promotion (EP) strategy are shown in Table 9.5.

In addition to differential trends in trade shares, trade strategy is modelled by assuming differential effects on productivity growth, different forms of macroeconomic adjustment and by affecting the cost of capital. The former is potentially controversial since there are differing schools of thought about the role of openness and competition on innovation and technical progress. There is however empirical evidence of a positive link between productivity growth and outward-orientation, which provides a reasonable initial working assumption that can be modified for sensitivity analysis purposes. The differences in macroeconomic adjustment between an IS and EP strategy are also summarised in Table 9.5. In the case of an IS strategy all the adjustment to any excess demand for imports is assumed to come on the import side through import rationing. In contrast any ex-ante excess demand for foreign exchange is eliminated by real exchange rate adjustment, depreciation of the real exchange rate relieving the constraint

by squeezing imports and stimulating exports. Thus in the case of the IS strategy the premium on foreign exchange (that is induced by import rationing) means that the effective exchange rate (EER) for imports (M) is considerably higher than it is for exports (X). This results in a significant trade regime bias (B) against exports (that is $EER_M > EER_X$), which is avoided by other strategies. Table 9.5 shows that $EER_M/EER_X = 2$ in the terminal year in the case of the IS strategy, while the bias index remains around unity for the other strategies. The table also shows that an IS strategy tends to raise the relative price or cost of capital (by 20 per cent compared with a fall of 5 per cent in the case of an EP strategy).

The authors undertook extensive sensitivity analysis of the key parameters of the model, given the obvious elements of subjectivity embodied in the model. The significance of particular assumptions can thereby be brought to the attention of the policy maker, and the reasons why the choice of development/trade strategy may affect growth can be identified. The simulations reported in Table 9.5 provide a rough guide to the bounds of influence of trade strategy on growth. The growth rate differences do not appear to be particularly large: the GDP annual growth rate ranging from 5.7 per cent for the IS strategy to 6.5 per cent for the EP strategy. Growth depends on many factors besides trade policy, but an (approximate) one percentage point differential in the average growth rate over a 20-year period will result in a substantial GDP differential over the period as a whole – a differential which certainly suggests that governments should be concerned with the impact of the choice of trade strategy on growth and development.

9.7 Concluding comments

This chapter has reviewed[5] a number of the recent applications (from what is a burgeoning literature) of CGE modelling to the analysis of trade policy in developing countries. Space constrained any description of the detailed structure of the models, but the broad features (and their potential strengths and weaknesses) have been outlined. Some of the more detailed issues were considered in the previous chapter, but the reader interested in the detailed properties of a specific model will need to refer to the original study. The aim here was rather to illustrate the range of trade policy issues (cost, structural and growth effects) that could be investigated within a CGE modelling framework. Some of the numerical results of specific policy exercises have been provided in order to show the reader how simulation and sensitivity analysis can be used as a tool to guide policy makers and policy formulation.

It is evident from the results reported and the discussion of the model's characteristics that the absolute values of the numerical results often need to be viewed with some scepticism, especially in a developing country

context where data deficiencies (rather than model limitations) may be particularly serious. But orders of magnitude and the qualitative content of the results are also often instructive. It is generally advisable to avoid excessive confidence in the precision of empirical economic analysis. This is particularly true of applied CGE analysis, but it is also true that this is an area of analysis that is undergoing rapid 'technical progress'. As software developments continue to reduce the computational task of model calibration and solution, so attention will no doubt increasingly shift to improving parameter estimation (and reduce dependence on the use of 'borrowed' values) and improving the formal methods of testing for model validity.

It must be recognised however that the advance of computing technology and the ability of modellers to build models that are more realistic (in the case of developing countries capturing 'structuralist' rigidities and macro-imbalances which imply a departure from the strict Walrasian/neo-classical framework) may lead to methodological problems and problems of interpretation.[6] There is a danger of ad hoc addition of model features that are not rooted in adequate theory. But ability to accommodate both neo-classical and structuralist perspectives is also a potential strength. Theoretical progress needs to keep pace with applied work.

PART IV

EVALUATING COMPARATIVE ADVANTAGE

CHAPTER 10

Revealed Comparative Advantage

10.1 Introduction

Most models of international trade explain the commodity composition and direction of trade in terms of the law of comparative advantage: countries tend to export those goods which have the lowest relative costs (and therefore prices) under autarky. Different models focus on particular commodity characteristics and/or country characteristics to determine the pattern of relative autarkic costs; for instance technological factors in the case of the Ricardian model and factor intensity/endowment differences in the case of the Heckscher–Ohlin model. Indeed the concept of comparative advantage can be regarded as one of the triumphs of economic thought. It is logically irrefutable and widely accepted. It is also however a concept that is difficult to quantify and test directly: relative prices under autarky are not observable for countries that have long engaged in international trade, and even if they were the law does not imply a simple, deterministic relationship between comparative advantage and the volume of trade.

Despite these difficulties and given the central nature of the concept of comparative advantage to both theoretical and policy discussions, economists have persisted in their attempts to apply it to real-world circumstances. These involve indirect methods which use information derived or revealed from post-trade situations and assumptions about the relationship between observable and unobservable variables. Such indirect approaches are often concerned with explaining trade patterns in terms of a particular model, that is of a particular set of trade determinants, rather than with the explicit assessment of comparative advantage. It is on the attempts to assess the latter, that is to 'measure' revealed comparative advantage in the context of developing countries, that we report in this chapter. The chapter is organised as follows. In Section 10.2 we consider the conceptual issues and

problems involved in testing and measuring comparative advantage. This is followed by review of the principles and empirical evidence relating to the use of revealed trade performance (Section 10.3) and price-based measures of revealed comparative advantage (Section 10.4) as indicators of comparative advantage. Section 10.5 provides some conclusions.

10.2 Conceptual issues and problems

Most trade models are designed to answer the very specific question: what goods do countries trade and why? As argued in the previous section, most models provide an answer to this question in terms of comparative advantage; comparative advantage (or the structure of autarkic relative prices) being the proximate or immediate determinant of the commodity trade pattern. The empirical researcher does not have information however on autarkic prices because countries are already engaged in international trade. We therefore cannot construct direct estimates of comparative advantage. Clearly that may be a considerable frustration to the policy maker anxious to promote selectively activities of comparative advantage (or to protect selectively activities of comparative disadvantage). But can the economic analyst infer anything from information derived from the post-trade situation to assist the policy maker?

Certainly we can test the trade models themselves without a direct measure or test of comparative advantage. The models explain comparative advantage in terms of factors which are themselves observable. If the model is constructed such that the vector of an economy's relative autarky prices ($\bar{p}$) is linearly related to product characteristics (captured by matrix X and relative country characteristics (contained in vector a):

$$\bar{p} = X.a \tag{10.1}$$

then we can derive a relationship between trade and the characteristics of X and a, independent of the relationship between trade and $\bar{p}$. Thus in the context of the Heckscher–Ohlin model autarkic prices will be relatively low for those goods whose production is (relatively) intensive in the country's (relatively) abundant factor; the country will tend to export these goods of comparative advantage. Testing the H–O theorem therefore requires data on trade, factor intensities and factor endowments but no direct measure of comparative advantage. Given that each trade model implies a (derivable) relationship between the observable determinants of trade and the resulting (and also observable) post-trade pattern of trade, production and consumption, is it also legitimate to use revealed patterns of trade and production (for example trade performance) to assess or measure comparative advantage?

The key difficulty is that there is not a simple/deterministic relationship

between trade and autarkic relative prices ($\tilde{p}$) or comparative advantage. It would be convenient if it could be established that the volume of trade by commodity was linearly related to $\tilde{p}$. In the Ricardian model for example we can show that with *free and costless* trade the direction of trade in a particular commodity does depend upon autarkic prices, but the volume of trade does not; this depends on the foreign demand for and the domestic capacity to produce the good. The story is further complicated by the inclusion of trade barriers and transport costs, and by higher dimensionality issues (multi-product and multi-factor conditions) in the case of the Heckscher–Ohlin model. In the simplest H–O model – with only two countries, two products and two factors – it is easier to derive a deterministic relationship between comparative advantage and revealed trade performance. But the real world does not look like the textbook H–O model and a deterministic link no longer holds (Drabicki and Takayama, 1979). Such problems are often conveniently forgotten in empirical work on trade, where a continuous, rather than binary, dependent variable is used in regressions of the volume of trade against the hypothesised determinants of comparative advantage.[1]

Where does this leave us? Is it possible to identify comparative advantage and test the theory of comparative advantage? It is possible to be pessimistic, even nihilistic in the light of the preceding discussion. However there is a large body of evidence using regression analysis that is consistent with the existence of a fairly systematic relationship between trade and its proposed determinants, and this gives encouragement to explore the relationship further. In this regard we can draw some support from the theoretical work that has been done on weaker forms of the trade – comparative advantage relationship. Deardorff (1980) for example, using a fairly general model, has shown that autarkic prices and (net) exports (T) are negatively correlated, that is

$$\tilde{p}' \; T = a' \; X' \; T < 0 \tag{10.2}$$

Since relative country characteristics (a), relative product characteristics (X) and (net) exports (T) can all be observed, the above correlation (Equation 10.2) means that there are testable propositions that can be derived from any trade model that relies on the law of comparative advantage. The issue remains however about the extent to which the pattern of trade will diverge from a deterministic relationship between trade and its determinants. In Section 10.3 we presume that the deterministic relationship is sufficiently plausible to justify the cautious use of trade performance indices as a way of 'revealing' comparative advantage.[2] As an alternative to reliance on the deterministic specification and direct measurement of comparative advantage, we consider in Section 10.4 how price-based measures of revealed comparative advantage can be used to draw inferences about the pattern of comparative advantage.

10.3 Trade performance and 'revealed' comparative advantage

In this section we adopt a 'second-best' position; accepting the fundamental criticism[3] that the use of any revealed comparative advantage (RCA) statistic may not be a consistent measure of 'true' comparative advantage. We consider the issues of how an RCA statistic might be constructed, how cross-sectional information on RCA may be interpreted, and review some empirical results based on this type of methodology.

Alternative measures

The literature offers a variety of measures or proxies for RCA based upon:

- The use of production, consumption and trade statistics.
- The use of actual trade statistics only.
- Deviations between actual and expected production and consumption values.

The first class of measures does permit some 'normalisation' for country size. By relating exports to domestic production (X/P) for instance, it may be possible to improve the comparison between a 'large' and 'small' country. Table 10.1 illustrates this point for the case of the steel industries of Brazil and South Korea. The higher export or net trade to production ratios (rows 7 and 8) suggest that Korea has a greater comparative advantage in steel than Brazil. The table however also demonstrates the problem of using observed data for X, M, P and C. In terms of the share of imports in total consumption (M/C in row 9) Brazil is revealed to have a greater advantage than South Korea.

Before considering whether this ambiguity can be eliminated by concentrating on trade data only, it should be noted that any measure of RCA can be distorted by aggregation and policy effects. By choosing to measure RCA in Table 10.1 at the level of aggregation of all steel exports and imports, there is a risk that the selection of this particular level of aggregation is obscuring the true pattern of comparative advantage. A country may specialise for instance in the production of high-quality finished steel in which it has a comparative advantage, and import crude and semi-processed steel in order to meet the input requirements of the higher stage of processing. Measurement of an RCA index at the industry level may not capture this effect if total imports of steel are relatively high. Applied researchers must give careful thought to the level of aggregation at which RCA indices are constructed. There is a tendency in fact to calculate the indices for as narrowly-defined product lines as data and resources will permit. But that may aggravate the problems caused by policy distortions were tariffs, non-tariff barriers and subsidies are product-specific and non-

Table 10.1 Some alternative trade performance indicators: Brazilian and South Korean steel industries, 1979–80

	Brazil	*South Korea*
1. Production (*P*) ($US mill.)	7144	4403
2. Imports (*M*) ($US mill.)	551	1073
3. Exports (*X*) ($US mill.)	834	1473
4. Consumption (*C*) ($US mill.)	6861	4003
5. Net trade ($X - M$)	283	400
6. Gross trade ($X + M$)	1385	2546
7. Export/production ratio (X/P)	0.117	0.334
8. Net trade/production ratio (X-M)/P	0.040	0.091
9. Import/consumption ratio (M/C)	0.080	0.268
10. Net: gross trade ratio $\left(\frac{X - M}{X + M}\right)$	0.204	0.157

Source: Ballance (1988) Table 2.1.

uniform within industries. Products within a given industry may be revealed to have both a comparative advantage and disadvantage, not because the factor intensities vary significantly within the industry but because of policy distortions. At higher aggregation there may be less bias in the measured RCA because there are offsetting errors. Of course at any level of aggregation non-uniform or distortionary policy may remain. It is for this reason that some analysts (for example Balassa, 1977) have chosen to exclude imports from their calculations on the ground that import restrictions are more pervasive than export interventions. Of course exports will be affected by the import restrictions of other countries, but the more important criticism of the exclusion of information about imports is that it runs the risk of dismissing intraindustry or 'two-way' trade as aggregation bias rather than the outcome of *within-industry* specialisation forces that are compatible with broader *between-industry* specialisation influences. It is for this reason that many analysts prefer to construct RCA indices based on net trade flows.

The preceding discussion would suggest that there is a need to strike a careful balance in avoiding both excessive aggregation and disaggregation when calculating RCA indices. But the choice may be data-constrained. This is particularly the case where different classifications are employed for production and trade data, and the process of concordance forces the researcher into using the level of aggregation dictated by the least finely disaggregated classification. It is for this reason, and the potential ambiguity associated with composite indices such as the X/P, $(X - M)/P$ and M/C ratios, that RCA indices are derived often from trade data only.

There are several variants of the 'trade-only' measure. Let us illustrate two of these variants in order to capture the key issues involved in index construction:

$$\text{RCA}_1 = \frac{X_{ij}}{X_{wj}} \div \frac{\sum_j X_{ij}}{\sum_j X_{wj}} \tag{10.3}$$

$$\text{RCA}_2 = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \tag{10.4}$$

where i is the country, j is the commodity and w is the world.

RCA_1 is the original formulation used by Balassa (1965b) and retained in his subsequent work (Balassa, 1977, 1979a). If country i's share of 'world' exports of j (X_{ij}/X_{wj}) is greater than country's i's share of world exports (of all goods or all goods of a certain type for example manufactured goods, $\Sigma X_{ij}/\Sigma X_{wj}$) then $\text{RCA}_1 > 1$ and a comparative advantage is revealed. As argued above, this index may be distorted by the omission of imports, and this omission may be particularly important where there is a country-size effect. In the case of many small developing countries the denominator of RCA_1 (Equation 10.3) is likely to be negligible. In contrast its exports may well be concentrated on a few traditional exports where its share of world trade is significant. Thus RCA_1 may reveal very high 'levels' of comparative advantage for a few traditional export commodities, and low levels (that is comparative disadvantage) for most other non-traditional goods. This calls for careful selection of the range of goods (j) over which we aggregate $\left(\sum_j\right)$ when formulating the denominator in Equation 10.3.

The alternative index (RCA_2) set out in Equation 10.4 makes reference to the 'own' country trade performance only, and recognises the possibility of simultaneous exporting and importing within a particular product category. The most recent work on measuring revealed comparative advantage appears to reflect the theoretical preference for a focus on some form of net export ratio. In the case of the simple ratio in Equation 10.4 the ratio ranges from -1 ($X_{ij} = 0$ and revealed comparative disadvantage) to $+1$ ($M_j = 0$ and revealed comparative advantage). Around zero values for RCA_2 there is ambiguity. Indeed the limitations of this particular index are evident when we consider that any specific value of the index is consistent with any volume of trade. It is for this reason that a number of studies (Donges and Riedel, 1977; and UNIDO, 1986) have sought to normalise for the relative importance of a particular (net) trade flow in world trade.

The final set of RCA measures adopts a probabilistic approach; RCA is expressed in terms of deviations between actual and expected levels of trade, production and consumption. This requires that a 'norm' is formulated to represent conditions under autarky. The principle underpinning this approach is of course appealing since it recognises that it is the interaction between production and consumption that fashions revealed comparative advantage. The approach gives rise to ambiguities since alternative forms of the pre-trade world can be hypothesised. If prefer-

ences are assumed, as in the standard H–O model, to be identical across countries pre-trade (Kunimoto, 1977) or identical and homothetic (Bowen, 1983), then the comparison of expected and actual trade flows may be very misleading if the assumptions about preferences do not approximately hold in reality.[4]

Given that there is a range of RCA indices that have been proposed and employed to measure comparative advantage then we may anticipate that there will be some inconsistency in the results obtained by each index. This sensitivity of results to proxy choice is empirically confirmed by Ballance, Forstner and Murray (1986). They show the inconsistency to be greatest when the indices are interpreted cardinally rather than in an ordinal or dichotomous fashion. The policy maker should be encouraged therefore to interpret RCA indices with caution, and as a means of discriminating between activities with a greater or lower probability of revealing a comparative advantage or disadvantage.

Some evidence for developing countries

UNIDO (1982) is one of the most comprehensive studies. It used several of the RCA indices discussed above and had a coverage of 47 countries and 129 industries. The results showed that in general developing countries' comparative advantage was limited to the production of manufactures involving simple processing, often linked to agriculture or other resource-intensive primary activities. In line with the ladder of development principle embodied in the stages approach to comparative advantage (see Balassa, 1979b and Section 11.2), more advanced developing countries were found to be less dependent on natural resource-based manufacturing activity; they revealed clear comparative advantage in labour-intensive goods or stages of processing involving standardised technologies. This can be seen from an examination of Table 10.2. All 'classes' of developing countries show a much greater tendency to reveal comparative advantage in labour-intensive/standardised than capital intensive/standardised goods (compare rows 1 and 2), and there is a much greater incidence throughout of comparative advantage in standardised than non-standardised products. This pattern of revealed trade performance is consistent with a factor endowments explanation of trade; relative to the industrialised countries the developing countries have large amounts of unskilled labour and little technological expertise. Note however that the results are consistent with the ladder of development view of comparative advantage; the NICs are less dependent on natural resource-based activities than other developing countries and the recently developed countries show greater evidence of breaking into capital-intensive and less standardised product ranges.

Depending on our confidence in our ability to measure comparative advantage and the factor intensity of goods, and in the H–O and stages

Table 10.2 Share of manufactured exports with a strongly revealed comparative advantage[1] in different types of developing countries (percentages)

Product type[2]	*Recently[3] developed*	*Newly[4] industrialising (NIC)*	*Other LDCs*
Standardised:			
Labour-intensive	22.3	34.6	20.3
Capital-intensive	3.1	0.7	1.5
Unstandardised:			
Labour-intensive	2.9	3.2	2.9
Capital-intensive	5.2	1.2	0.6

Source: Adapted from Ballance (1988) Table 2.3.

Notes:
1. RCA index exceeded a normalised level of 100 by at least 50 per cent.
2. Products were distinguished by the rate of product development, with standardisation involving low product development.
3. Countries such as Greece, Israel, Portugal, Spain and Yugoslavia.
4. Includes Argentina, Brazil, Hong Kong, Mexico, Singapore, South Korea and Turkey.

model, then we will place differing degrees of confidence in these results. Certainly the NICs and other newly exporting developing countries have been able to compete in world markets for mature manufactured goods, and it is tempting to interpret this revealed trade performance as evidence of where comparative advantage lies.

10.4 A price-based measure of revealed comparative advantage

Using revealed trade performance to indicate comparative advantage has one obvious drawback – actual trade flows are affected by policy-induced barriers to trade. Indeed trade barriers may affect both the volume and direction of trade. Consider Figure 10.1 below. If two varieties (u, v) of final good (j) can be produced (S^u_{Dj} and S^v_{Dj}) by country D using the same amount of a common intermediate input (i) available at world price (P_{wi}), then supply of each variety is a function of net price which may be influenced by import duties on final and intermediate goods. Without border interventions then there would be AB quantity of imports of variety u and BC amount of exports of variety v. Consider now the effect of an import tariff on the intermediate input; the effective supply schedule to domestic users shifts to S'_{wi}. At each gross price for the final goods involved

domestic producers are willing to supply less; the supply schedules for the final good are now S^{u}_{Dj} and S^{v}_{Dj}. In the absence of output 'subsidisation' from output tariffs (in domestic sales) or export subsidies, then the volume of imports of variety u increases from AB to EB while variety v ceases to be exported and is now imported (volume DB).

The use of the post-policy intervention trade volumes to comment on revealed comparative advantage in this example would be very misleading. Clearly this is a potentially serious problem when conducting single-country studies of revealed trade performance for developing countries where policy-induced trade barriers are extensive and substantial. In fact, as the discussion of effective protection analysis (Chapter 5) showed, low tariffs or duty-exemptions on intermediate goods means that effective rates of protection of exportables are typically (absolutely) small. Import protection of final goods means that the trade distortions are greater in the importables sector. Thus RCA indices based on gross exports (X) rather than net trade ($X - M$) are likely to be subject to less distortion. Nevertheless the possibility of eliminating the effects of protection should not be ignored.

In principle it is possible to calculate the percentage changes in (net) price, that is the rates of (effective) protection, and therefore use specific supply elasticities to calculate the domestic production distortion. The non-distorted trade flows would equal the revealed or actual trade flows less the production distortions. The protection effects are capable of estimation (see Chapter 5), but data is likely to constrain calculation on an across-the-board basis and with much disaggregation in the absence (as is likely to be the case) of an input–output table with large dimensions. Similarly (net) price supply elasticities are not likely to be available or calculable with broad coverage. Thus we could focus instead on the implicit (relative) prices that would define tradeability or determine trade patterns in the absence of trade policy distortions.

'Implicit' revealed comparative advantage (IRCA)

The basis of the IRCA measure is the calculation of a notional price for each commodity or activity, that is the price that would apply in the absence of policy distortions in intermediate and final goods markets. The total value of the (per unit) output of each activity can be adjusted (P^{i}_{j}) in order to:

- Remove the effect of net (direct) subsidies (s_j).
- Revalue tradeable inputs (1. . . n) at 'world prices'.
- Revalue non-tradeable inputs to the value that apply if all tradeable inputs used in the production of each non-tradeable (1. . . m) were set at 'world prices'.

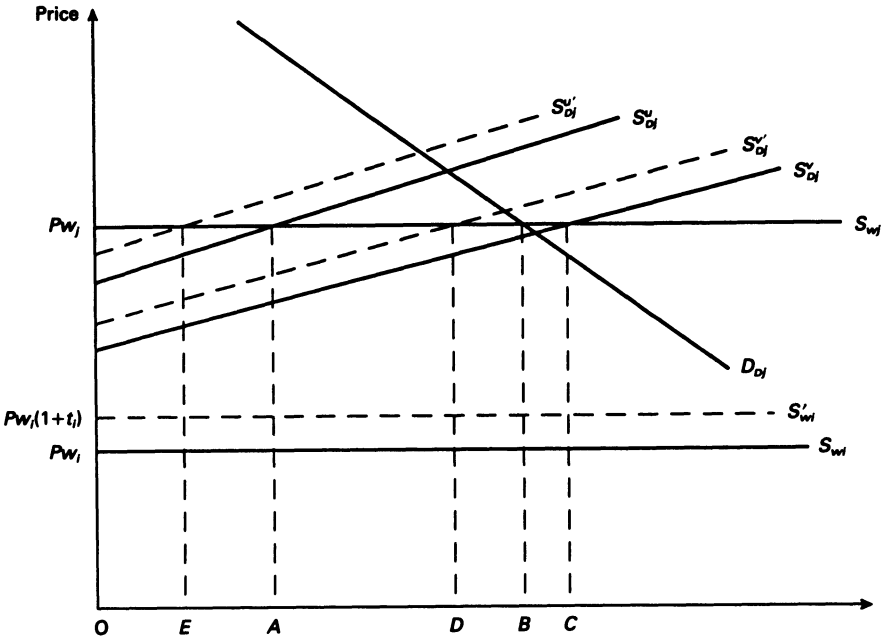


Figure 10.1 Policy-induced distortions of revealed trade

Thus the adjusted value (P') is given by:

$$P'_j = VA_j + s_j + \sum_{i=1}^{n} (a_{ij}p_{iw}) + \sum_{n=1}^{m} (a_{nj}p'_n) \qquad (10.5)$$

where VA_j is the value-added at current factor prices, S_j net subsidies, a_{ij} is the amount of tradeable input i in producing one unit of j, a_{nj} is the amount of non-tradeable input n in producing one unit of j and p'_n is the notional price of non-traded input n calculated as in Equation (10.5)

The notional price can be constructed from input–output relationships and evidence on the price-changing effects of subsidies and border taxes, using the fixed technological assumptions and the type of information that is used in effective protection calculations (see Chapter 5). Note that the effect of factor market distortions on comparative advantage are not investigated by the IRCA measure. Further adjustments for such distortions are investigated in the context of domestic resource cost analysis (see Chapters 6 and 11).

The adjusted or notional price can be expressed as a notional domestic relative price by expressing it relative to a trade (export)-weighted average of the notional prices ($\bar{P}'$) of each commodity. This provides an estimate of, or hypothetical relative price of, commodity j that would apply in the absence of product market interventions. In order to construct a measure of implicit revealed comparative advantage (expressed in terms of devia-

tions from unity) we can express the domestic relative price (P_j') relative to the world relative price of j (P_w):

$$\text{IRCA} = \left(\frac{P_w}{P_j'}\right) - 1 \tag{10.6}$$

where $P_w = P_j/\bar{P}$ and $P_j' = P_j'/\bar{P}'$ (with identical trade weights used to estimate $\bar{P}$ and $\bar{P}'$).

In theory this measure is positively correlated with the unobservable set of autarkic relative prices and with net exports under Deardorff's 'natural trade' concept (Deardorff, 1979). Thus a country is expected to have a comparative advantage for those commodities where the (adjusted) domestic (relative) price (P_j') is lower than the world (relative) price (P_w). In terms of the formula in Equation 10.6 this means that a comparative advantage is indicated where the IRCA measure is positive and a disadvantage where it is negative.

The information requirements of IRCA are very similar to those of effective protection analysis – information on the price effects of policy interventions and input–output relationships. The methodological and data issues are dealt with in detail in the chapters on nominal and effective protection. It should be evident however that the data requirements are considerably greater than the revealed trade peformance indicators of comparative advantage. Indeed there is only limited published information on input–output relationships for many developing countries. Input–output tables may not exist, or may exist only for a specific year which is now some time ago, or they may be constructed at a very high degree of aggregation. In such cases it will be necessary to conduct large-scale enterprise surveys in order to apply the technique. There is as a result little evidence to report on. Webster (1991) has calculated IRCA indices for the UK using 80 categories of tradeable goods from the 1979 published input–output table. Otherwise the technique has been applied in large-scale consultancy studies on specific countries where large-scale enterprise surveying has been funded by agencies such as the World Bank, for example Maxwell Stamp (1991) on Trinidad and Tobago.

Table 10.3 lists those industries that were identified by the IRCA analysis in the above studies as having a comparative advantage. In the case of the UK results it is interesting that the areas revealing strongest advantage were relatively technologically-sophisticated manufactures, chemicals and chemical-based activities and machinery and equipment. Although not reported in the table, the activities 'revealing' comparative disadvantage tended to involve relatively unsophisticated and traditional manufactures: food processing, leather goods, textiles, clothing and footwear. We would have expected this if trade- and price-based indicators of RCA produced reasonably consistent results, and it is again consistent with the picture that emerged from trade-based measures: direct links between the degree of

Table 10.3 Industries with (implicit) revealed comparative advantage: UK and Trinidad and Tobago compared

UK (1979)[1]	*Trinidad and Tobago (1990)*
Structural clay products	Rubber products
Cement, lime, plaster	Electrical appliances
Asbestos and abrasives	Transport equipment
Inorganic chemicals	Wood products
Organic chemicals	Printing and publishing
Synthetic resins, plastics	Textiles
Paints, dyes etc.	Pharmaceuticals
Industrial chemicals	Metal building materials
Pharmaceuticals	Petroleum
Soaps and toiletries	Beverages
Man-made fibres	Footwear
Metal castings, forgings etc.	
Other metal goods	
Engineer's small tools	
Process machinery	
Power transmission equipment	
Insulated wire and cable	
Industrial electrical equipment	
Telecommunications equipment	
Electric lighting equipment	
Other vehicles	
Grain milling	
Bread, biscuits etc.	
Alcoholic drink	

Source: Webster (1991) for the UK and Maxwell Stamp (1991) for Trinidad and Tobago.

Note:
1. Both revealed by trade performance indicators (RCA) and the price-based indicator (IRCA) of comparative advantage.

technological sophistication and the pattern of export performance. There is support for this link in the activities of comparative advantage listed for Trinidad in Table 10.3. Resource-based activities are evident (petroleum, pharmaceuticals and wood products) as are some of the labour-intensive activities that do not appear on the UK's list, such as textiles and footwear. Interestingly in the case of Trinidad there are some items on the list that would not be there if a trade-based measure of RCA is used. Apparel and chemicals for instance would look to have immediate potential on the basis of trade performance, but the IRCA analysis provides a cautionary note about the possible influence of policy on transitory trade performance. Chemicals, as indicated by the UK results, require a level of technological sophistication that has not yet been reached by Trinidad. Wages levels are also such that it is difficult to envisage sustained competition against

clothing exports from low-wage economies in Asia and South-east Asia in particular. Therein lies the benefit of avoiding an excessively mechanistic approach to the interpretation of a single indicator of comparative advantage.

10.5 Concluding comments

Despite the obvious difficulties of bridging the gap between the theoretical concept of comparative advantage and an operational measure, it is evident that empirical estimates of revealed comparative advantage can, if used judicially and in an ordinal manner, add to our understanding of the international differences in sources of relative efficiency, competitiveness and international patterns of specialisation and trade. They also allow us to understand, in part at least, how these sources of trade change over time. The principle that relative rather than absolute costs largely determine trade patterns is a theoretically robust principle, and there is, as this chapter shows, a large amount of empirical evidence that is consistent with the orthodox view of the broad determinants of comparative advantage. Developing countries do reveal a comparative advantage in those products which are *apparently* relatively intensive in the factors with which they are *assumed* to be relatively well endowed. Policy makers in developing countries should not ignore the principle or the evidence. Indeed they should consider this when formulating the broad trade strategy and trade policy environment. They may also use evidence about revealed comparative advantage when seeking to lower policy or market distortions that restrict changes in relative factor endowments. However to assume that RCA indices can serve as a basis for specific policy decisions about which activities to promote, and which not to promote, would be wholly unjustifiable. Policy makers generally, and in developing countries in particular, already have a regrettable propensity for trying to 'pick winners' on the basis of subjectivity. They should not be encouraged to believe that there are objective indicators that they can use with confidence!

CHAPTER 11

Potential Comparative Advantage

11.1 Introduction

There is a considerable amount of evidence of developing countries either wishing or being encouraged to promote particular activities; promotion which increases exports of existing products and/or diversifies exports into non-traditional manufacturing activities. As we argued in Chapter 10, governments should be cautious about trying to select or identify specific activities for either the domestic or the export market. There are many examples of the failure of governments to identify appropriate activities. Indeed a primacy needs to be placed on demonstrating the responsibility of governments to create an environment conducive to facilitating efficient resource allocation. For example the encouragement of exports may require reductions of anti-export bias in incentive structures induced by existing policies (see for example Greenaway and Milner, 1986b, 1987a). The creation of more neutral incentive structures is likely to be a major element in export promotion.

There is nonetheless likely to be a legitimate interest by governments of developing countries to identify appropriate activities to promote or encourage. In the case of export promotion for example, measures of import protection are unlikely to be totally eliminated and some anti-export bias is likely to remain. If there is a budget constraint on the provision of compensatory fiscal and financial incentives for export promotion, then selective promotion may be necessary. Indeed where the government itself, directly or indirectly through quasi-official agencies, is involved in the allocation of investment funds, information on export potential may be of immediate value, especially if market signals are deficient. Even if the government and the public sector are not major actors in investment decisions, then the identification of export potential may still be of value in the making of decisions about the provision of infrastructure support.

Developing countries should be encouraged, of course, to employ appropriate investment appraisal techniques, once specific/individual investment proposals have been identified. But there are also economy-wide appraisal techniques, such as domestic resource cost analysis, that can be employed. But before the (specific) project appraisal stage is reached there may be a need to select or filter out a finite number of projects from a nearly infinite number of possibilities. Revealed comparative advantage, that is past performance, is of course a possible starting point. But in looking to the future we need to consider how an economy's resource endowments, and therefore its comparative advantage and competitiveness, may change.

The rest of this chapter is organised as follows. Section 11.2 examines how comparative advantage and the factor content of trade evolve over time with the process of development. Section 11.3 shows how information on the trade performance of similar economies might be used as a guide to export potential. Section 11.4 considers how information on domestic resource cost indices might be used as further information about how comparative advantage may change with policy reform. Finally Section 11.5 offers some summary conclusions.

11.2 Factor content and the stages approach

The empirical analysis of trade flows and revealed comparative advantage shows that trade is about much more than the processing of local raw materials into final goods for consumption. Some countries produce and export raw materials to others where they are processed into intermediate goods that are then exported for further processing. The complexity of this process depends upon the location of raw materials, the nature of the product and factor input requirements of each stage of processing. Consider the case of textiles and clothing. The developing countries tend to be net importers of textile fibres, to have a more competitive position in intermediate processing (yarns and fabrics), and to enjoy a clear comparative advantage in the final stage of labour-intensive production of clothing for the mass market. But this is only a generalisation. Countries such as Hong Kong and Mauritius are large net importers of yarns and textiles and exporters of finished clothing, while other NICs and industrialising countries are highly specialised in specific processing operations, importing cotton and man-made fibres from elsewhere. This is not a permanent pattern. There are dynamic aspects to comparative advantage which mean that the pattern of international specialisation shifts and relative resource endowments change as technologies and market needs change. Thus in the case of clothing there is now some tendency for the location of cutting, matching and finishing of clothing to shift back to the industrialised countries. Computer-controlled processes ensure reliability and quick response to market needs.

Such variations in competitiveness at different stages of production and changes in them over time are typical of many manufacturing activities. There are systematic links between the factor endowments of countries and the factor intensities or contents of production processes. There also appears to be systematic patterns of change in countries' factor endowments, and therefore their comparative advantage, that provide us with some guidance as to how we might anticipate comparative advantage to change.

Stages approach to comparative advantage

Balassa (1979b) argues that a country's comparative advantage will systematically change as a result of the accumulation of physical and human capital and increasing technological sophistication in production. Thus with the passage of time the competitive advantage of the more advanced developing countries will be lost in those processes that require a relative abundance of cheap, unskilled labour, and will shift instead to those processes and products which require more capital and skill input and are technologically more sophisticated. The developing countries can expect, in this model, to move along a ladder of comparative advantage as development proceeds. Certainly the post-war experience of Japan and other Asian NICs would appear to be in general accord with this interpretation of the dynamic aspects of comparative advantage.

There is also wider cross-country evidence (Leamer, 1984) on the sources of comparative advantage that show the industrialising countries losing their revealed comparative advantage first in labour- and then in capital-intensive activities as newly industrialising countries displaced them in these areas. But the support for a smooth, systematic transition appears to exist only for very broad aggregates of goods/activities. Using data for 79 industries in 28 countries during the mid-1960s and mid-1970s, Ballance, Ansari and Singer (1982) were unable to find support for a sequential evolution of comparative advantage. This is probably not surprising given the problems of measuring revealed comparative advantage and of testing the 'stages' hypothesis. It does indicate however that developing countries should be cautious about using this approach in a prescriptive manner. It does not provide a rationale for governments of countries that have had export successes in some labour-intensive products to believe that they should promote further export growth and diversification through the general promotion/subsidisation of capital- and technologically-intensive activities. It is in any case necessary to know first what the factor content of existing exports are. Armed with this information, it may be appropriate to implement policies that induce the socially-optimal rate of physical and human capital accumulation.

Factor content analysis

The effects of a country's existing factor endowments on its comparative advantage can be inferred from the factor content of its current trade, to the extent that the H–O–S model of trade applies. Factor content analysis seeks to convert trade in goods (and services) into the implied trade in services (direct and indirect) of factors of production embodied in that trade, on the assumption that:

$$F.T = E_k - E.w_k \tag{11.1}$$

where F is the matrix of coefficients of direct or direct and indirect quantities of each factor per unit of gross output, T is the vector of net exports, E is the vector of world endowments of factors, E_k is country k's vector of factor endowments and w_k are the scales indicating country k's share of world factor endowments.

Calculation of $F.T$ is equivalent to measuring the net export of country k's endowment of factor services, if trade is balanced. If trade is imbalanced it is necessary to measure the factor content of net trade relative to that of domestic consumption. Thus factor j will be a source of comparative advantage for the country if its net exports require more j per unit than its consumption.

There are a number of practical difficulties in applying factor content analysis to developing countries. First, the F matrix (the technological coefficients or the Leontief-inverse matrix depending on whether direct only or gross inputs are measured) can only be identified if there is an input–output table available that is reasonably reliable, up-to-date and sufficiently disaggregated to match our definition of net exports by 'industries' in vector T. Second, even if an appropriate input–output table is available there may be difficulties in applying the table for the present purpose if the economy is small and/or highly distorted. If there is no domestic production of many imported goods, it will not be possible to measure the factor content of net exports. Alternatively if the technological relationships in the economy are severely distorted by import substitution policies we would be measuring the effect of policy rather than that of free trade on the use of factors. Estimating undistorted from distorted technological coefficients is difficult and requires a considerable amount of information on the nature and extent of the policy distortions. Third, measures of factor inputs or content may not be available or may not be sufficiently disaggregated or reliable.

For these reasons factor content analysis has tended to focus on the trade of developed economies, in particular the US. Even here much of the work has been involved with low dimension versions of the H–O–S model, and with the verification or otherwise of the 'Leontief paradox' (for a summary

of this type of work see Deardorff, 1984). Certainly in order to comment on potential comparative advantage much higher dimensions are required, with a meaningful breakdown of each type of factor input (for example breakdown of labour inputs into skill types). More recently there has been some factor content analysis work which is of a much richer form than the investigations of the 2 × 2 × 2 H–O–S model, but it relates to developed countries. Work with relevance to the developing countries is much less sophisticated and partial in nature.[1] It often relates to developing countries' bilateral trade with a particular industrial country and for data limitation reasons looks at the factor content of their imports.[2]

Clearly there is a need for much more systematic factor-content work on the trade of developing countries, as production and input–output data becomes more comprehensive and reliable. In the meantime there is some scope for basing analysis on the assumption that technologies are internationally invariant. Thus detailed (and probably more comprehensive) input–output information from an industrialised country (such as the US or UK) where policy distortions are limited could be used to proxy 'world' production techniques. A developing country's net exports (for which information is more likely to be available) could then be applied to this technological information to measure the factor content of the developing country's trade, as if 'world' production techniques were operative. Empirical work of this kind on Trinidad and Tobago for example (Maxwell Stamp, 1991) has produced results that are consistent with the country's factor endowments, and the information content of which is valuable for policy purposes. Much more work of this kind is needed if we are to understand the complex interactions between the characteristics of economies and of products or processes that determine international competitiveness.

11.3 Export similarity and comparative trade performance

As was shown in Chapter 10 trade performance measures have in fact been widely employed to comment on comparative advantage on a cross-country basis. We saw in Section 11.2 how comparative advantage may systematically change with progress up the ladder of development. Thus we may be able to employ trade performance information from an appropriate comparator country to identify export potential.

There are three analytically separate but interrelated aspects of the process of identifying comparative advantage and export potential: the identification of similar or comparator economies, the identification of products with export potential and the identification of potential export markets. For each of the goods produced or producable by a developing country, we can ask the following question: may we expect this country to compete with similar goods from other countries in third market(s)?

Identification of similar economies

A central feature of this approach is the prior identification of comparator countries; countries which, due to their local resource endowments, stage of industrial development and/or revealed export performance, are likely to be guides to export possibilities. These countries may have, or once had, similar resource endowments and therefore compete for inward investment; they may export similar but not identical products. These dissimilarities can therefore become a source of information for the country concerned on export potential. They may export similar products but to different markets; the comparison again offers information on potential for market diversification. The possible method of identifying potential competing countries in export markets has two stages: initial selection of a number of countries based on qualitative judgements and subsequent discrimination between the selected countries based on export similarity indices.

Following the qualitative selection of potential comparator countries, it is possible to measure the revealed similarity between the home country's actual exports and those of the selected countries. An export similarity index (ES) is defined as a measure of the similarity of the exports of any two countries to the world market in general or to a specific third market:

$$ES = \sum \min (xj[ac], xj[bc]) \cdot 100 \qquad (11.2)$$

where a is the home country, b is the selected comparator country, c is the world (or specific) market and xj is the share of industry j's exports in the country's total exports.

If the industry distribution of country a and b's exports to market c are identical (that is $xj(ac) = xj(bc)$ for all j), there is total (scaled) similarity and the index will take on a value of 100. If there is total dissimilarity in the product or industry pattern of a and b's exports (that is $xj(ac)$ or $xj(bc)$ equal 0 for all j), the index will take on a value of 0. Note that the exports of each country are scaled relative to total exports and as a result the index compares only patterns of trade across product categories and not absolute levels. This is a useful characteristic which makes possible a comparison between countries of different size and stage of development. (An export similarity index was first articulated by Finger and Kreinin, 1979, and has been employed fairly widely in trade analysis.)[3]

Although the index utilises actual export data, it is capable of application in a way that may indicate potential competitors and as a consequence potential export products and markets. For instance, where there is a 'high' degree of measured (scaled) export similarity between two countries (with perceived similar resource endowments) at the industry level of aggregation, then:

- Differences in the absolute level of the competitor country's exports can be identified. Such information may be indicative of the scope for export growth through the displacement of existing suppliers.
- Differences in the detailed product breakdown of each industry's exports may indicate scope for product diversification of exports, that is for intraindustry diversification of exports.
- Differences in the geographical composition, that is direction of exports, may indicate the opportunities for export expansion through diversification.

Thus a range of issues may be judicially tackled with the aid of export similarity indices. The attractiveness of such an index is that it requires only international trade data. Indices can be calculated for total exports (to the world or specific markets) and for exports excluding significant primary products, at for example the third digit level or a more detailed product level.[4]

Product identification

In addition to the information on export similarity indices, which can indicate on disaggregation sources of unfulfilled export potential, complementary analysis entails the identification of revealed comparative advantage (RCA). The sources of revealed advantage can then be compared with those for competitor countries. Thus if other similar economies (in terms of prior expectations about resource endowments and in terms of recorded export similarity) have a comparative advantage in certain industries/product ranges that the country of focus has not so far revealed, again we have an indicator to potential product development for that country. This may identify potential for export diversification of an inter-, as opposed to intraindustry nature. (RCA indicators are defined and discussed in Chapter 10.)

Market identification

The final stage of the methodology is to identify potential markets for these products. There are two features of market identification which are relevant to the question of export promotion: one is the identification of new markets for the current or similar export product range; the other is the identification of market potential for new export products. It was mentioned earlier that export similarity and revealed comparative advantage indices could be used to identify competing exporters and how the geographical pattern of exports of similar economies might identify currently untapped markets for the home country's current exports.

An illustration of the methodology: Cameroon

(1) IDENTIFICATION OF COMPARATORS

The Cameroon is a small economy rich in natural resources. It is a 'price-taker' in world markets and relatively distant from the main high income/industrial markets. It is classified by the World Bank as a lower–middle income developing country. It has benefited significantly since 1979 from oil-producer status, and its natural resource endowments have facilitated near-self-sufficiency in food. It has a range of agricultural exportables (fruit, vegetables, coffee, cocoa, cotton) and there is obvious specialisation in forestry products (wood, rubber and palm oil). The more recent diversification into industrial production has been in the areas of agro-industries, construction materials (aluminium products and cement) and textiles.

We will take Nigeria, Kenya, the Ivory Coast, Indonesia, Malaysia, Ecuador and Venezuela as an illustrative group of potential comparator countries. Clearly the larger the number of countries in the initial selection the smaller the possibility of random errors and distortions undermining the robustness of the later analysis. Some prior criteria for selection of countries (for example relating to size, development and structural characteristics) could also be used. In this case there are countries at similar (Nigeria, the Ivory Coast) and higher (Malaysia and Venezuela) stages of income and industrial development. It includes other countries with relatively abundant (underdeveloped) natural resources (Ecuador and Indonesia). In terms of per capita incomes, Nigeria, the Ivory Coast and Ecuador are very similar to Cameroon. Venezuela, with its high level of dependence on fuel and mineral exports and its subsequent diversification of exports, may offer some guidelines for Cameroon. Alternatively Malaysia's industrial and export growth, despite its relative smallness in terms of population, may be informative.

The scaled exports for Cameroon at the 3rd digit of the SITC and for the six countries (where their exports matched those of Cameroon) for 1982 are set out in Table 11.1. These export shares can be applied to Equation 11.2 to calculate export similarity indices. The resulting indices are as follows:

	% degree of similarity	*% accounted for by crude oil*
Cameroon/Ecuador	59.4	46.8
Cameroon/Indonesia	54.2	46.8
Cameroon/Ivory Coast	46.1	2.4
Cameroon/Venezuela	49.3	46.8
Cameroon/Kenya	18.1	0.0
Cameroon/Malaysia	38.0	27.4

Table 11.1 Scaled exports of Cameroon and potential competitor countries, 1982 (in matched categories)

SITC* Digit 3 R2 (R1)	Cameroon	Ecuador	Indonesia	Ivory Coast	Venezuela	Kenya	Malaysia
030	.0015	.0768	.0104	.0209	–	–	.0097
057	.0025	.0938	–	.0274	–	.0126	–
061	.0022	–	–	.0099	–	.0076	–
071	.1558	.0684	.0154	.2218	.0002	.2544	–
072	.1416	.0384	–	.2667	.0012	–	.0087
073	.0005	.0136	–	.0047	–	–	–
112	.0047	–	–	–	–	.0009	–
121	.0029	–	–	–	–	–	–
232 (231)	.0069	–	.0272	.0094	–	–	.0945
247 (242)	.0440	–	.0147	.0928	–	–	.1203
248 (243)	.0154	.0044	.0099	.0278	–	–	.0414
263	.0359	–	–	.0242	–	.0000	–
292	.0047	–	.0042	.0029	–	.0278	–
333 (331)	.4683	.6425	.6648	.0243	.7875	–	.2737
424 (422)	.0058	–	.0161	.0185	–	–	.1094
553	.0044	–	–	–	–	–	–
554	.0070	–	–	.0025	–	.0097	–
634 (631)	.0165	.0101	.0142	.0094	–	–	.0129
652	.0180	–	–	.0176	–	–	.0033
684	.1630	–	.0010	–	.0233	–	–
690 (691)	.0036	–	–	.0061	–	.0067	.0042
890 (899)	.0044	–	–	–	–	.0085	.0057

* Standard International Trade Classification, Revision 2 (R2) (or Revision 1 (R1) in brackets).

In terms of total exports (including crude petroleum) therefore, the structure of Cameroon's exports appears to be closer to those of Ecuador, Indonesia and Venezuela. In all these cases, however, the similarity is substantially accounted for by the shared importance of crude oil exports – the export shares in 1982 for the four countries being Cameroon 46.8 per cent, Ecuador 64.3 per cent, Indonesia 66.5 per cent and Venezuela 78.8 per cent. In contrast the index for overall similarity with the Ivory Coast is 46.1 per cent, but only 2.4 per cent of the Ivory Coast's exports in 1982 were crude oil. For this reason Ecuador, Indonesia and the Ivory Coast were selected as the reference or comparator countries for the subsequent analysis of export potential.

(2) PRODUCT IDENTIFICATION

For the three-digit categories identified in Table 11.1 as significant exports by Cameroon, revealed comparative advantage indices greater than unity

(that is comparative advantage is revealed) are reported in Table 11.2. Thus comparative advantage is revealed for Cameroon in SITC (Revision 2) as:

057	(fruit and nuts)	262	(cotton)
071	(coffee)	333	(crude petroleum)
072	(cocoa)	553	(perfumery, cosmetics)
121	(tobacco)	554	(soap)
232	(natural rubber)	634	(veneer, plywood)
247	(wood: rough)	652	(cotton fabrics)
248	(wood shaped, supply worked)	684	(aluminium)

By implication all the other categories listed in Table 11.2 have indices below unity. These results are not at all unexpected given Cameroon's resource endowments. Natural resource-intensive products predominate in the exports of this relatively natural resource-abundant economy.

The comparative information on revealed comparative advantage (at the third digit) set out in Table 11.2 can be used to identify possibilities for both intra- and inter-industry export promotion. (For illustrative purposes the subsequent discussion will concentrate on manufactured goods, that is SITC sections 5–8.)

(3) Intra-industry export potential

Cameroon reveals comparative advantage in manufacturing activities at the third-digit level in SITC (R2) categories 553 (perfumery, cosmetics), 554 (soap), 634 (veneers, plywoods) and 652 (cotton fabrics). In each case a detailed analysis of the product composition and market direction of exports by the comparator countries (in particular the regional comparator, the Ivory Coast) in each of the three-digit categories could be undertaken. To the extent that the competitor countries are exporting related but different products, or are exporting identical products to different markets, this is valuable information for existing export industries.

(4) Interindustry export diversification

The comparator countries are also shown in Table 11.2 as having revealed comparative advantage for three-digit categories for which the Cameroon does not have at present. Given the similarity achieved in other categories, it is possible that similarity may be achievable in these areas if resource endowments are indeed sufficiently similar (and any technological and policy constraints can be overcome). Thus we have a basis for investigating the scope for export diversification. The activities of revealed advantage in

Table 11.2 A comparison of revealed comparative advantage[1] for Cameroon and similar economies,[2] 1982

SITC (Revision 2)	Cameroon	Ecuador	Indonesia	Ivory Coast
030		9.93	1.18	
037		12.97		
057	3.83	22.11		8.59
058				4.27
061				3.94
071	63.69	24.23	5.46	78.47
072	154.87	42.01		291.46
073		11.89		4.12
074			4.36	
075			7.53	
081		2.53		
098				1.70
121	3.99			
122				3.65
232	1.77		5.37	1.85
247	12.64		5.95	37.53
248	1.49		1.66	4.64
263	11.05			7.93
265		21.61		
292			1.32	
333	11.03	53.54		
424			1.69	6.94
553	2.21			
554	2.61			1.33
634	4.25	3.34	4.67	3.09
652	2.85			4.06
661				2.62
684	8.16			
687			14.81	
775		1.05		
842				1.01

Notes:
1. Revealed comparative advantage indices greater than unity.
2. Ignoring refined petroleum products.

the similar countries which *might* for example achieve comparative advantage in Cameroon are 661 (lime, cement and building products), 775 (household equipment) and 842 (men's outerwear, not knitted).

To the extent that aggregate or overall 'similarity' between countries (possibly on different steps of the development ladder) is accounted for by the similarity of relative factor endowments, more detailed comparisons of the revealed trade performance of these similar economies may provide a useful initial guide to potential for export growth and diversification. Where comparator economies reveal mutual activities of comparative

advantage at a specific level of aggregation or industry-proxy, evidence of dissimilarity in the composition and direction of exports at a higher level of disaggregation may indicate potential for product and market diversification. Similarly, revealed comparative advantage in competitor countries that is not matched in the reference country might indicate future scope for new export industries.

Of course there are dangers in using this approach. Revealed similarity does not ensure that there is actual similarity of resource endowment and market opportunities. The actual trade flows of 'similar' and 'dissimilar' economies are likely to be subject to the influence of distortions, in particular policy ones in both the exporting and importing countries. But it is not always obvious which distortions should be taken as given. In this case basing analysis on revealed evidence is not necessarily unsatisfactory – the methodology only seeks to identify possibilities for export potential. It offers a search methodology, and export potential can only be expected to turn into actual exports if appropriate resource allocation criteria are applied and if an appropriate policy environment is created. This 'health-warning' needs to be attached to any such procedure. The proposed approach – one which places an emphasis on resource and market constraints on export opportunities – is preferable to one in which non-economic and administrative influences predominate. International comparisons serve to focus attention on some of the critical issues: the nature of techniques of production and costs, and the nature of incentives to inward investment in comparator countries, for example.

The case study for Cameroon does in fact provide results that conform with prior expectations about the importance of relative resource endowments. The scope for expansion and diversification of manufactured exports appears to be constrained in the shorter term. Recognition of the constraints on industrial export growth in a country like Cameroon should not necessarily be viewed with pessimism however. Natural resource-intensive and traditional exports should not be discouraged for the sake of non-traditional exports if this is not consistent with prevailing relative resource endowments. Acceptance of the 'ladder of development' principle is not an argument for the continuation of the status quo, but rather a recognition of the need for specific steps or stages of development to be fulfilled.

11.4 Policy reform and cost competitiveness

A crucial aspect of export promotion and diversification is likely to be policy reform itself. We have seen in earlier chapters how import protection acts as a relative disincentive to produce for export markets. The direct manifestation of the cost of this anti-export bias is resource misallocation (higher resource costs associated with production distortions)

and higher prices to consumers (consumption distortions). But the policy-induced distortions may well mean also that an economy's true factor endowments, and therefore its genuine comparative advantage, are not reflected in the revealed trade performance or the factor content of its trade. Thus use of information that is subject to policy distortions may provide a very misleading foundation upon which to base an analysis of potential comparative advantage. The analyst needs to be able to comment upon relative costs and competitiveness in the absence of policy distortions. By doing so he is able to comment also on how market-enhancing policy reform might be expected to alter the pattern of production and trade.

Domestic resource costs and comparative advantage

The domestic resource cost (DRC) concept and its measurement were discussed in detail in Chapter 6. Since the DRC ratio seeks to measure the true opportunity cost of domestic resources used in a particular activity, it was indicated there that the DRC ratio could be viewed in two ways: either as a measure of the actual (true) resource costs of existing policy distortions (that is as a cost of protection measure) or as an indicator of potential comparative advantage. It is this latter interpretation of the DRC ratio that is relevant to the present discussion. Since the ratio can be thought of as a measure of the true resource costs of saving foreign exchange (through import substitution) or acquiring foreign exchange (through exporting), then the lower the ratio for a particular activity, the lower the marginal cost of acquiring or saving foreign exchange.[5] Where the ratio is less than unity (see equation 6.1) there are potential 'cost' savings or net resource benefits associated with local production. In a static setting, activities with DRC ratios less than unity are ones of potential comparative advantage, towards which resources might be drawn if 'cost' savings can be sustained over a significant range of production increase. In a dynamic setting where efficiency gains from 'learning by doing' or increased scale might be reaped, then the rank order rather than absolute value of DRC ratios may be of more interest to the policy maker. Expansion of activities with relatively low DRC ratios, and the corresponding contraction of activities of DRC ratios well above unity, is indicated on efficiency grounds.

Note that in order to obtain measures of domestic resource cost we are identifying what the true resource cost of producing goods is in the absence of policy-induced distortions in both final product markets and all factor markets. In other words in the two-factor, capital (K) and labour (L) case:

$$\mathrm{DRC}_j = \frac{S_L + S_K}{V_j} = \frac{S_L + S_K}{V_j'\left(\dfrac{1}{1 \times e_j}\right)} \tag{11.3}$$

where S_L are the labour costs at shadow prices, S_K are the capital costs at shadow prices, V_j is the value added in j at world prices, V_j' is the value added in j at distorted output and intermediate input prices and e_j is the effective rate of protection of activity j.

Product market distortions are eliminated in the numerator of Equation 11.3 by estimating what value added would be without tariffs and non-tarriff barriers on competing imports of product j and without tariffs on importable intermediate inputs, while factor market distortions can be separately or jointly eliminated in the denominator.

The reader should of course be reminded that there are methodological and measurement problems associated with the estimation of DRC ratios as a form of policy analysis: it is demanding in information terms, and sampling and proxying problems are likely to result in measurement error and incomplete coverage in the case of most developing countries. These issues are discussed in some detail in Chapter 6 and the reader is advised to refer back to that discussion. Suffice it to say at this point that the value of DRC ratios in commenting on potential comparative advantage is information-constrained.

Table 11.3 reports upon some estimated DRC ratios for a sample of activities in Cameroon; domestic factor inputs are revalued at estimated shadow values and international value added is estimated from border prices. Individual DRC estimates for identical local activities may sometimes be available, but given that sample evidence only is likely to be available and that we may be concerned with the potential for activities

Table 11.3 Estimates of domestic resource cost ratios by sector, Cameroon, 1986

	Range of DRC ratios
Forestry	0.29–0.90
Agriculture and fisheries	0.66–0.71
Agro-industrial	0.36–1.50
Metal products	0.70–2.05
Wood and paper products	1.16–4.41
Leather and rubber products	1.28–3.47
Textiles	1.79–4.11
Chemicals and pharmaceuticals	1.75–160.60
Engineering	potentially ∞[1]
Construction goods	potentially ∞[1]

Source: Maxwell Stamp, 1987.

Note:

1. All activities in these sectors had estimated negative value added at world or border prices. DRC ratios cannot, strictly speaking, be identified but this can also be interpreted as evidence of potentially infinitely high domestic resource cost.

without currently-revealed comparative advantage then it is the DRC ratio (average or range of values) for the relevant sector (that is for activities with similar technological characteristics or factor intensities) that are likely to be of particular interest in this case.

The results shown are in fact consistent with traditional factor-endowment explanations of comparative advantage. Existing primary sector activities at this stage of Cameroon's development are shown to be 'resource' efficient; DRC ratios less than unity consistently apply in the case of forestry and agriculture and fisheries. The DRC ratios rise however as the relative importance of natural resources and local factor inputs decrease. Thus engineering and construction goods are shown to be highly resource-inefficient. The fact also that the intermediately ranked sectors tends to have ratios in excess of unity suggests that the scope for 'efficient' industrialisation is currently limited, and in turn therefore that there is limited potential for manufactured exports. But there are some instances even in manufacturing of DRC ratios below unity (agro-industrial and metal products) and of relatively low DRC ratios which may fall at higher scale and capacity utilisation (for example wood and paper products and leather and rubber products). Note that these activities tend to be higher-stage ones based on local/primary sector inputs.

11.5 Concluding comments

'Picking winners' is a dangerous exercise. There are good grounds for believing that the 'market' is in general likely to be more efficient than the policy maker in this regard. The policy maker's primary concern should be with identifying and remedying sources of market failure and with reducing policy-induced distortions or impediments to efficient resource allocation. But for both positive reasons (such as the need to provide appropriate institutional and infrastructure support) and negative reasons (such as avoiding inappropriate investments) policy makers are likely to continue to be interested in identifying where an economy's future comparative advantage lies. This chapter has illustrated how the factor content of trade, the revealed trade behaviour of comparator or 'similar' economies, and domestic resource cost analysis might be used to guide policy makers. Such filtering devices could be used judicially to identify activities that merit more detailed and formal project appraisal.

PART V

THE MODELLING AND REFORMULATION OF POLICY

CHAPTER 12

Structural Adjustment Lending: Rationale and Trade Policy Aspects

12.1 Introduction

In Part I of this volume the role of trade policy in the process of economic development was emphasised. Parts II and III focused on empirical aspects of trade policy – the techniques of policy appraisal and their potential use in policy evaluation. In this part we take the analysis a stage further and examine how the techniques of policy appraisal have been used in the process of policy reform in LDCs. In recent years a major new source of conditional finance has emerged from The World Bank. As we shall see this has opened a window for substantial resources which can quickly be disbursed to LDCs. The disbursements are however conditional upon policy reforms being agreed and implemented. Many of the required policy reforms revolve around changes in trade policy.

In this chapter we will focus upon the role of trade policy in the adjustment process, both from an ex-ante and an ex-post standpoint. Prior to any loan agreement a package of reforms has to be proposed. Often evaluations of the effects of trade policy, using the techniques discussed earlier, forms an input to this process. Even when agreement is reached on a reform package, actual outcomes may differ from intended outcomes due for instance, to exogenous shocks or problems with government commitment. The lessons to be learned from individual country experiences thus far will be appraised in Chapter 13.

Trade policy is just one element (albeit a very important one) in structural adjustment programmes; other areas of policy are also included. Thus

we begin this chapter with an analysis of the characteristics of SALs. Section 12.3 narrows the focus by looking at trade policy in SALs, whilst Section 12.4 considers how policy appraisal can form an important input to the SAL process. Finally Section 12.5 offers some concluding comments.

12.2 Structural adjustment lending: origins and structure

The World Bank is the largest multilateral lending agency in the world, both in terms of the range of its lending operations and its country involvement. Traditionally World Bank lending activities have concentrated on specific investment loans, sector-specific loans, and to a lesser extent technical assistance loans. In 1980 a new programme of structural adjustment lending was initiated. Since that date SALs and SECALs (mini SALs which pertain to specific sectors) have grown in importance and now account for around 20 per cent of total World Bank lending, about $4.0 billion in 1990 (Figure 12.1). To put this in perspective, it is equivalent to about 20 per cent of official overseas development assistance to non-oil developing countries. It is therefore an extremely important source of finance. This growing importance of SALs is documented in Table 12.1. As can be seen, both the number of SALs and the funds disbursed therein grew dramatically in the 1980s.

According to a recent World Bank appraisal, the SAL programme was initiated in response to fundamental disequilibrium in developing countries – disequilibrium which resulted from the second oil shock and domestic policy weakness (World Bank, 1988). Whilst these were undoubtedly important factors, as Mosley and Toye (1988) argue, a third factor was also influential, namely the desire of officials at the World Bank to secure a seat at the 'high table' of policy making alongside the IMF, whose stabilisation loans are also subject to conditionality. In this respect the SAL programme can be thought of as a political track, as opposed to the administrative track in project lending. Conditions are negotiated and administered at an altogether higher level.

The Operational Manual of the World Bank defines SALs as:

> non-project lending to support programmes of policy and institutional change necessary to modify the structure of the economy so that it can maintain both its growth rate and the viability of its balance of payments in the medium term.

As can be seen from this definition there are several important characteristics which set them apart from IMF stabilisation loans. First, they are medium term rather than short term in outlook. Second, they involve programmes of policy reform. Third, in emphasising institutional change and the structure of the economy their thrust is oriented primarily to

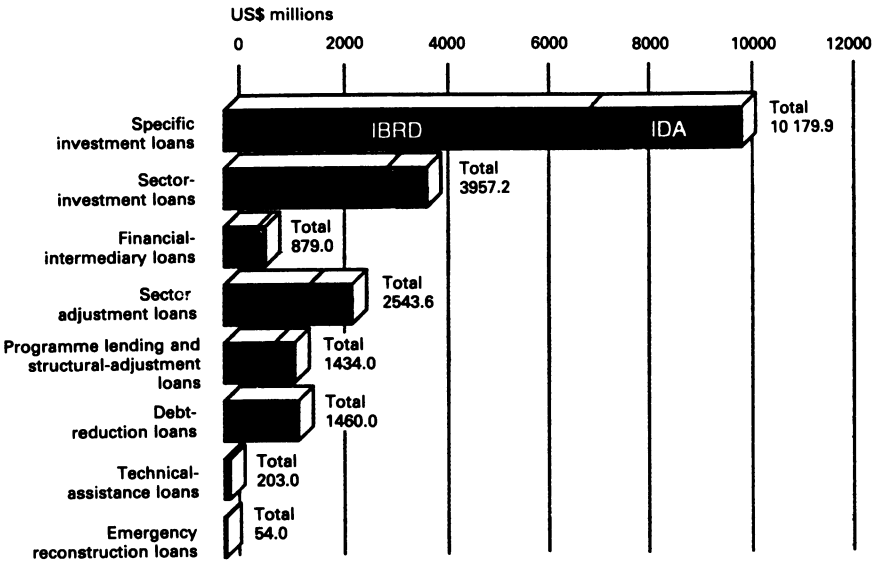


Figure 12.1 IBRD and IDA lending, by lending instrument, fiscal year 1990

supply-side reforms rather than the management of aggregate demand. In simple microeconomic terms, the objective of SAL programmes is to encourage an evolution of the economy from point a in Figure 12.2, through point b to point c. In other words, relative prices are adjusted in a way which facilitates a more efficient use of existing resources (a → b). In time the mobilisation and investment of new resources results in economic growth (b → c). To achieve these objectives the broad policy focus is directed at altering relative incentives in the economy and facilitating the more efficient mobilisation of resources. As we shall see, the former is directed at changing the price of tradeables relative to non-tradeables and/or agricultural relative to non-agricultural products, as well as exportables relative to importables. More effective mobilisation of domestic resources may be facilitated by budget deficit reduction, financial sector reforms, reforming public sector management structures and so on.

In the context of development finance the operation of SALs is quite unique. The process begins with policy appraisal. Past policies are evaluated and current problems diagnosed. On the basis of this appraisal the bank and host government enter into a dialogue about policy reform. Ultimately recommendations are made for reforms and disbursement of SAL funds is conditional upon the acceptance of these reform proposals. The process can be thought of as a stick and carrot mechanism. The carrot comes in several forms: quickly disbursed finance; often a great deal of latitude over the way in which the finance can be utilised; finance which is

Table 12.1 Adjustment loans and lending commitments by the World Bank, 1980–9[1]

	1980–2[3]	*1983–5*[3]	*1986*	*1987*	*1988*	*1989*	*Total 1980–9*[4]
Africa[2] ($ millions)	190	468	1497	754	1472	1235	6933
(% total AL)	24	21	35	17	31	20	24
(no. of loans)	3	8	16	11	13	14	85
Asia ($ millions)	200	383	0	840	600	1130	4320
(% total AL)	25	18	0	19	13	19	15
(no. of loans)	1	2	0	4	2	6	20
EMENA[5] ($ millions)	357	657	803	990	1150	1064	7047
(% total AL)	44	30	19	22	24	17	25
(no. of loans)	2	3	5	4	5	6	34
LAC[5] ($ millions)	62	675	2005	1840	1485	2665	10 206
(% total AL)	8	31	47	42	32	44	36
(no. of loans)	1	4	7	10	7	7	48
HICs[5] ($ millions)	171	1095	2607	1840	2135	3166	13 545
(% total AL)	21	50	61	42	45	52	48
(no. of loans)	2	6	8	10	8	6	55
Total ($ millions)	809	2183	4305	4424	4707	6094	28 506
(no. of loans)	7	17	28	29	27	33	187

Source: *Report on Adjustment Lending II: Policies for the Recovery of Growth*, World Bank, 1990.

Notes:
1. All figures are based on Calendar Year.
2. Africa includes Special Facility for Africa (for dollar amounts but not number of operations).
3. Per year, average of three years.
4. Total sum of CY 1980–9.
5. EMENA = Eastern Mediterranean and North Africa; LAC = Latin American countries; HICs = highly indebted countries.

often provided on concessional terms. The stick takes the form of a commitment to policy reform by the recipient government. Commitment to policy reform is a prerequisite to disbursement. Often loans are tranched, that is, disbursed in slices. This provides the opportunity for periodic appraisal of the extent to which loan conditions are being met. In the event of non-compliance the bank tightens the conditions associated with further disbursements – or it could even suspend the loan and has on occasions done so.

Tables 12.2 and 12.3 provide details of the policy areas where conditionality is most frequently applied in connection with SALs and SECALs. Table 12.2 shows the content of conditionality broken down by supply-side growth-oriented reforms, absorption reduction policies and

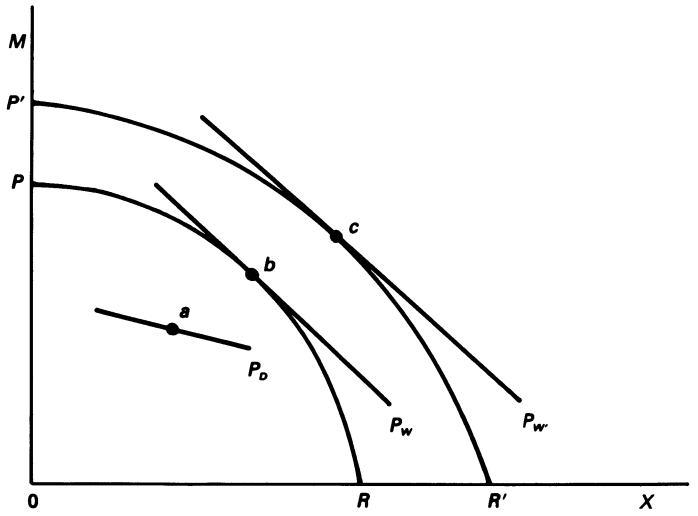


Figure 12.2 Structural adjustment loans and economic growth

switching policies. These are also cross-classified by country type. Table 12.3 then breaks down lending operations by loan agreement conditions in various policy areas. The most striking feature of Table 12.2 is the overwhelming importance of supply-side policies compared to absorption and switching policies – the proportion of conditions by policy areas being 84 per cent, 11 per cent and 5 per cent respectively. This reflects two factors: first the emphasis on medium-term policy reform to which we have already alluded; second the fact that demand-side conditionality, which focuses on absorption and switching policies, is much more the preserve of the IMF. Insofar as conditions apply in these areas in World Bank lending, they are generally subject to 'cross-conditionality' with the IMF.

Turning to the detail of policy reform, from Table 12.3 we can see that the area most frequently subject to conditionality is trade policy. Almost 80 per cent of all loans have trade policy reform conditions attached. This is by far the most important area of conditional lending. The specific details of these reform programmes will be examined in the next section. Other important areas of conditionality are public sector reform (fiscal policy, budgetary expenditures and public enterprises), agricultural policy and financial sector reform. A little less important are industrial policy and energy policy. The broad thrust of these conditions is directed at industrial restructuring (such as divestiture of assets in parastatals), more effective mobilisation of resources (such as reform of indirect taxes) and changing relative incentives through changing relative prices (for example reducing export taxes on agricultural products).

Table 12.2 Content of conditionality in World Bank lending

	Distribution of loan-agreement conditions by policy area and country type (per cent)											*Distribution of all actions in Presidents' Reports*[3]
	All countries	*HICs*	*SSA*[4]	*SAL*	*SECAL*	*Hybrid-loans*[1]	*EIAL countries*[2]			*Other AL countries*		
							79–85	*86–8*	*89*	*79–85*	*86–9*	*(per cent)*
1. *Supply-side, growth-oriented polices*:	85	89	82	77	91	90	88	88	88	87	80	84
Trade policies	16	22	14	15	17	4	26	17	11	10	13	16
Sectoral policies	28	23	26	18	35	62	36	21	44	53	23	28
Industry	4	4	4	3	4	5	6	4	7	4	2	5
Energy	6	3	2	3	7	31	5	4	24	2	4	5
Agricultural	17	16	19	12	20	19	25	13	12	47	14	17
Financial sector	10	12	7	10	9	1	3	14	18	9	7	10
Rationalisation of gov't finance & administration	7	7	6	11	4	0	8	6	5	3	8	9
Public enterprise reforms	16	18	19	15	17	7	14	21	6	6	18	14
Social policy reforms	4	5	5	2	5	14	0	8	0	2	5	3
Others	4	2	5	4	3	1	1	2	2	3	7	5
2. *Absorption reduction policies*:	12	9	13	18	8	8	11	10	9	9	15	11
Fiscal policy	9	7	12	16	6	7	9	9	7	8	11	8
Monetary policy [money supply targets]	2	2	2	2	2	0	1	1	3	2	4	3
3. *Switching policies*:	3	2	4	5	2	2	1	2	3	4	5	5
Exchange rate	2	2	2	2	1	0	1	2	2	2	2	3
Wage policy	2	0	3	3	1	2	0	1	1	3	3	2
Total	100	100	100	100	100	100	100	100	100	100	100	100

Source: World Bank (1990), based on an analysis of 183 SALs and SECALs to 61 developing countries. A total of 7723 actions were considered in all.

Notes:
1. Based on a subset of 10 hybrid SECALs.
2. EIAL – early intensive adjustment lending. Years refer to fiscal year of Board approval.
3. All actions in all countries, including conditions in loan agreements.
4. SSA – Sub-Sahara Africa.

Table 12.3 Content of lending operations of World Bank

	Share of loans with loan-agreement conditions in various policy areas (per cent)[1]											
							EIAL countries			*Other AL countries*		*Share of loans with actions in various policy areas*[2] *(per cent)*
	All countries (183)	*SSA (84)*	*HICs (64)*	*SAL (73)*	*SECAL (110)*	*Hybrid (10)*	*79–85 (55)*	*86–8 (49)*	*89 (15)*	*79–85 (9)*	*86–9 (55)*	
1. *Supply-side, growth-oriented polices*:												
Trade policies	58	58	67	64	55	30	60	69	33	56	55	79
Sectoral policies												
Industry	22	30	16	25	20	10	24	20	27	22	20	44
Energy	15	12	14	21	11	30	15	14	7	22	16	27
Agricultural	45	62	33	56	37	30	44	35	27	89	53	62
Financial sector	31	26	31	40	25	20	16	35	27	44	40	51
Rationalisation of gov't finance & administration	51	57	50	71	38	10	51	53	40	44	55	72
Public enterprise reforms	44	58	34	49	40	40	31	49	33	33	56	65
Social policy reforms	11	13	9	11	11	10	4	20	0	22	11	24
Other	28	42	17	33	25	10	7	27	20	33	51	49
2. *Absorption reduction polices*:												
Fiscal policy	51	69	41	78	34	30	47	51	53	33	58	67
Monetary policy [Money Supply Targets]	16	14	13	14	16	10	7	16	13	11	24	42
3. *Switching policies*:												
Exchange rate	16	18	20	22	13	0	9	18	20	11	22	45
Wage policy	13	23	5	25	6	20	4	8	7	11	29	22

Source: World Bank (1990), based on an analysis of 183 SALs and SECALs to 61 developing countries.

Notes:
1. Numbers in brackets are total number of loans.
2. All countries. All conditions called for in all loan agreements or other actions called for in all Presidents' Reports.

The range of policy instruments affected by SAL programmes makes them difficult to negotiate and agree for three reasons. First, there are problems of policy interdependence. Policy instruments interact. Thus, for example, tariff reduction may impact on government fiscal constraints, reducing agricultural taxes may also affect government budget constraints, introducing new taxes may distort relative prices and so on. When changes are taking place simultaneously across a range of areas it may be extremely difficult to predict *a priori* quite how these changes will ultimately affect economic activity. Second, the greater the number of policy areas involved in a particular reform package, the greater the number of government agencies involved in the negotiation of the package. As the number of interested parties increases, the potential trade-offs between agencies increases. This can make the process of negotiation very complicated indeed. The third reason is the resistance which host governments often have to liberalisation in a world where they feel they are facing increasing restrictions. One can of course argue about differences in initial levels. The fact remains however that the new protectionism has not helped here.

The potential for policy conflict and the manner in which it interacts with government commitment to a programme are important issues. This is not the place for a full and detailed appraisal of all aspects of the SAL programme and we will return to these issues later. The principal thrust of our analysis is on the trade policy-related aspects of SALs, to which we now turn.

12.3 Trade policy reform in SALs

Trade policy has been the area of policy reform where most SAL conditions have been assigned. As we saw in Tables 12.2 and 12.3, almost 80 per cent of all SALs have a trade policy condition, and some 16 per cent of all SAL conditions are trade policy related. Why has trade policy figured so prominently in the SAL programme? Five considerations are relevant here.

First, as we saw earlier, basic trade theory suggests that the optimal trade policy for a small open economy with no distortions is free trade. Of course if distortions exist, as they often do in developing countries, there may be an economic argument for intervention. However protection will rarely be a first best policy. Thus, there is a presumption in trade theory that reliance upon trade policy should be carefully circumscribed.

Second, a growing body of empirical evidence suggests that protectionist interventions are costly. Moreover a substantial literature indicates a positive association between exports and growth, and a possible association between outward orientation and economic performance (see Greenaway and Nam, 1988). In other words it appears that strongly inward-oriented

economies may have performed less well as a consequence of their protective structures.

Third, trade policy performs a pivotal role. Arguably if trade policy is liberal in orientation the significance of other policy interventions declines. For example, if one has free trade one may not have to worry about domestic monopolies abusing their market power for the simple reason that exposure to international competition keeps the market contestable. Thus getting prices right in the traded goods sector is viewed as being of crucial importance.

Fourth, there is evidence to suggest that protectionist trade regimes, particularly those grounded in direct controls, encourage rent seeking and directly unproductive activity. Reforming trade policy can alter the structure of property rights in a more equitable direction.

Fifth, many of the instruments of trade policy are readily identifiable and compliance/non-compliance with particular conditions relatively easily monitored. For instance it is more straightforward to monitor a condition that all import tariffs be reduced by 25 per cent than one which states that the rate of growth of the money supply should be maintained in a band of 10–15 per cent.

These considerations have interacted in thrusting trade policy to the fore in the SAL process. As we shall see later, this emphasis on trade policy and the justification for it have not been universally accepted. For the time being we will take it as given and examine the reform packages involved.

The detail of reform varies from one programme to another depending upon, *inter alia*, initial protective structures, the prospects for sustainability and political considerations. Most reform packages tend to be guided by a combination of factors that can be readily adduced from the points made earlier – a desire on the part of the World Bank to reduce protection, reduce anti-export bias, simplify protective structures and increase the transparency of policy. Table 12.4 summarises the main components of trade policy reform for a sample of 40 countries subject to SALs. The table breaks down import policy into seven instruments, and export policy into three. Where possible, policy changes are designated as significant, less significant and negligible. These are essentially qualitative indicators (see Halevi, 1988, for definitions). Nevertheless they do provide us with an indication of the relative importance of alternative reform measures.

As can be seen, reforms in overall import policy were regarded as significant in almost half of all cases, and negligible in just a quarter. Recommendations relating to the overall level of protection were significant in one-third of cases. Conditions here pertained more to quantitative restrictions (QRs) than tariffs. Significant reforms on protective QRs and on QRs for non-protective imports were recorded in almost one-third of all cases. This reflects a view that is relatively widely held outside the World Bank, and even more strongly held within it, that quotas are a relatively

Table 12.4 Main components of trade policy reform in 40 AL countries[1]

	Number of countries where reforms were:						
Area of reform	*Significant*	*Less significant*	*Negligible*	*Total*	*Present*	*Not present*	*Total*
Overall import policy	19	10	11	40	–	–	–
QRs on non-competitive imports	12	16	12	40	–	–	–
Protective QRs	12	17	11	40	–	–	–
Tariff level	7	20	13	40	–	–	–
Tariff dispersion	8	22	10	40	–	–	–
Protection level	13	26	1	40	–	–	–
Schedule of future reduction	6	29	5	40	–	–	–
Protection studies	–	–	–	–	28	12	40
Overall export policy[2]	15	14	11	40	–	–	–
Exchange rate[3]	–	–	–	–	38	2	40
Export promotion[4]	–	–	–	–	33	7	40
Imports for exports	17	15	8	40	–	–	–

Source: World Bank (1988) Table 3.1.

Notes:
1. The assessments refer to proposals supported by the World Bank. They do not necessarily refer to policy implementation.
2. Judgment on the significance of the overall reform proposals.
3. Often these were not explicit conditions, but constituted understandings frequently made under the programme.
4. Includes such schemes as export credits, insurance, guarantees and institutional development.

inefficient form of protection and tend to have less acceptable distributional consequences than tariffs. Thus even where a QR is replaced with an equivalent tariff, this in itself would be regarded as an act of liberalisation on the grounds that the tariff is more transparent, maintains competition at the margin and has a desirable impact on government revenues.

Reform provision on tariff levels and tariff dispersion were significant in about 20 per cent of all cases. However they were of negligible significance in only one-third and one-quarter of cases respectively. Clearly tariff reductions ought to be liberalising on a *ceteris paribus* basis. Such changes are regarded as desirable in improving resource allocation. In addition however, tariff liberalisation is viewed as reducing anti-export bias. The rationale behind reducing tariff dispersion is that if one reduces the range of nominal tariffs, reductions in effective tariffs should follow, with potentially beneficial implications for resource allocation. Typically reduction schedules are specified in terms of nominal tariffs, although occasionally they may be specified by reference to effective tariffs (as in the case of the Ivory Coast for instance).

Reforms in overall export policy were significant or less significant in almost three-quarters of cases, negligible in the remaining quarter. A major objective of SALs has been to reduce anti-export bias in developing

countries. Protection is a relative concept. As recent research has shown, if one protects the import-competing sector of an economy, one does so at the expense of other sectors – typically the export sector. Thus, as noted above, liberalisation of import policy may in itself have a beneficial impact on incentives to export. Arguably, complete import liberalisation would obviate the need for any positive export promotion policies, since complete liberalisation will, *ceteris paribus*, result in neutrality in the structure of relative prices.

However in SAL programmes complete liberalisation is not typical, either because reforms are gradually phased in or because a certain 'core' level of protection is conceded. Thus positive export policy is frequently recommended. This sometimes takes the form of understandings on the exchange rate with a view to reducing the extent of exchange rate overvaluation. An overvalued exchange rate distorts the price of tradeables relative to non-tradeables to the disadvantage of the former. Moreover since the costs of, and risks associated with, exporting tend to be greater than those of competing on the home market, it is often argued that an overvalued exchange rate disadvantages the export sector in particular. As we saw earlier however, recommendations on exchange rate policy tend to be in the bailiwick of the IMF rather than the World Bank.

The range of possible recommendations on export promotion is wide. They can include duty drawback schemes, export credit guarantee schemes, institutional reform designed to improve market reseach and market intelligence, and export subsidies. Reforms of export policy have been less pervasive and less marked than those of import policy, in the sense that less conditionality has been applied. This does not reflect a lack of concern with export policy, but rather results from a combination of technical and practical constraints. First, the (non-traditional) manufacturing sector is often relatively small – the emphasis therefore tends not to be in terms of encouraging existing firms in that sector, but in creating conditions which will encourage entry. In turns this relies, at least in part, on dismantling structures of import protection. Second, many areas of reform on the export side rely on institutional change. One does not have obvious 'indicators' here as with tariffs or QRs. Thus rather than explicit conditionality applying, often recommendations refer to feasibility studies and the like. Third, the provision of export subsidies can in the short run represent a drain on fiscal resources, which could discourage their use. Moreover explicit export subsidies can readily run afoul of countervailing duty action in industrialised countries.

Overall then, recommendations on trade policy reform are directed at reducing anti-export bias, increasing transparency in the protective structure and improving the efficiency with which relative price signals are transmitted. We will consider in Chapter 13 how these and other aspects of the SAL programme have operated, and what their impact on economic

performance may have been. In the meantime let us consider the role of policy appraisal as an input to the SAL programme.

12.4 The role of policy appraisal in SALs

As can be seen from Table 12.4, in 28 of the 40 adjustment loans reviewed, studies of protection levels were included in the conditionality package. It is not unusual then to have policy reviews explicitly included as a loan condition. These figures however understate the role of explicit appraisal, since in most cases appraisal of some form will take place *prior* to the loan conditions being negotiated. Thus policy appraisal may be pre-loan or post-loan.

Pre-loan policy appraisal performs a number of important functions. Specifically one can identify an *informative function*, a *simulation function* and a *persuasive function*. Relatively little is known of the economic effects of trade and industrial policy in developing countries. We have at various points confronted the reasons for this situation – data is relatively scarce and frequently 'contaminated'; policy stacking makes it very difficult to disentangle the economic effects of different interventions; the incentive structure within the bureaucracy creates natural resistance to full information, and a tendency to obfuscation. Thus the information function of pre-loan policy appraisal is arguably a very important one. Generating information on effective protection rates, domestic resource cost ratios and cost of protection details is particularly useful in this regard. The information content of these measures is high. Of course, as we have seen, there are difficulties involved with their calculation and often problems with their interpretation. This is not however an argument against generating such information – some information is generally better than none at all. So long as the results of any such exercise are appropriately qualified and carefully interpreted they can be extremely useful. Thus, as we saw in the case of EP analysis, the precise details of given estimates of effective protection are less important than the ranking and range of rates in a given series. Even if we have concerns regarding the precision of particular point estimates, we may have more confidence regarding the probable direction of resource pulls induced by the protective structure. This type of information is clearly important as an input to the process of policy reform. As far as possible reform proposals should be grounded on evidence which supports the need for change.

This last point leads on to the persuasive function of pre-loan policy appraisal. A SAL is provided by a multilateral lending agency to a sovereign government. That sovereign government cannot be forced to adopt particular adjustment measures. Although the willingness of a government to follow a given set of measures will be directly related to the severity of the constraints it perceives itself to be facing, and the perceived

strength of the lobbies it faces, the fact is that it still cannot be forcibly driven down a particular path. Effective and meaningful reform is more likely where government officials can be persuaded that a particular course of action is in their interests. Now whilst appeals to the principle of comparative advantage and the theory of tariffs could be helpful, in themselves they are unlikely to persuade policy makers of the need for reform. Argumentation grounded on 'theory' is likely to be dismissed as an act of faith. The ability to offer empirical evidence to illuminate the effects of current policy is therefore important. This does not mean of course that if one provides a given set of estimates of effective protection (EP) the case is won – far from it. Providing detailed data can create a different set of problems. Skilled negotiators wishing to resist change can deploy selective information very effectively as a delaying tactic. (This point does not incidentally only pertain to developing countries!) Nevertheless the fact remains that this kind of information can perform an important persuasive function. Given the nature of policy formulation, and incrementalism, policy makers and policy administrators rarely have any real feel for the economic effects of a given policy regime. Information on EP, domestic resource costs, cost of protection and incidence analysis all have a potentially valuable role to play, especially when used to enlighten the relative effects of protection. When incidence analysis was discussed we saw that although the information content was less than with EP and DRC, it had the virtue of being a simple, transparent measure which can be readily understood. With regard to the persuasive function, this makes it particularly useful.

The simulation function ties in with both the informative and persuasive functions of pre-loan policy appraisal. If a particular package of reforms is to be adopted and implemented, one ought to attempt to provide some indication of its likely impact, otherwise the reform package might launched on the basis of uncertain impact. Now forecasting is a dangerous business. Sceptics would no doubt describe it as a graveyard, and moreover a graveyard that is not short of tombstones. This is true for industrialised countries where data series are more complete and probably more reliable than in developing countries. Nevertheless forecasting and policy simulation in the context of policy appraisal are not directed at generating point estimates of output, employment, the current account and so on. Rather the process is directed at providing information of a qualitative nature or on *relative* orders of magnitude. This is where computable general equilibrium (CGE) modelling is useful. As we saw earlier, there are a great many pitfalls with CGE modelling in developing countries. In many cases the technology is just too sophisticated for the data base it relies upon. The technique must therefore be used with great caution. However when used with appropriate caution it can provide some enlightenment on alternative policy scenarios. In particular it can be helpful in comparing a base case, simulating the continuation of present policies, with projected outcomes of

a range of reform possibilities. Although CGE modelling may exhaust its usefulness more quickly than other policy appraisal techniques it can perform a useful role.

Before proceeding further, one final point should be made. Although we have distinguished between the informative, persuasive and simulation functions we need to acknowledge that in practice they may be interdependent. A political scientist might argue that pre-loan appraisal is geared towards involving outside experts in the process. According to this view, simulation is then no more than a means of generating the types of information an expert political outsider must have in order to be persuasive. In the context of the bargaining that takes place between governments and the lending agencies, this view has some legitimacy. Notwithstanding this, it is still helpful to try to disentangle the three functions in order to highlight the role of economist cum technician, as opposed to the adviser cum persuader.

So much for pre-loan policy appraisal, what about post-loan appraisal? This process too can perform several functions. Again the *informative function* may be important. In addition the process performs a *monitoring function*. Finally we can identify a *bargaining function*. In the light of our comments above the information function is largely self-explanatory. Some time after the loan conditions have been agreed and implemented it is useful to recalculate EP or DRC rates. As well as providing basic information on changes in the protective structure this facilitates monitoring of actual effects. As we saw earlier a particular reform package may have certain expected effects. As a matter of good practise one should subsequently evaluate whether these particular effects materialised and if not, why not. This is arguably an important process with regard to any episode of policy reform. It is especially important in the context of SALs as this programme is still relatively young. As we shall see later, there is evidence to suggest that some early SALs were over-ambitious in terms of the conditionality they required. This clearly compromised their prospect of success. In order to improve the design and implementation of SALs it is important that learning take place. Post-loan appraisal has an obvious role to play in this regard.

From a political economy standpoint, post-loan appraisal has a third function, namely a bargaining role. SAL programmes generally encompass more than one single loan and/or tranching within a given loan programme. Thus in the countries covered by Tables 12.1–12.4, many received three or more loans. As Mosley (1987) has stressed, the bargaining process that occurs within and between loans has a vital bearing on actual conditionality. Both parties have an interest in underpinning their position with evidence on the economic effects of prior programmes. Where the World Bank is concerned this can be viewed as the analogue of the persuasive function discussed in connection with pre-loan appraisal. Information is required in order to reinforce the case for continuing with a

particular programme, or to support the case for readopting a suspended programme.

Thus policy appraisal, using the techniques discussed earlier, has a very important role to play in the context of the SAL programme. This role is multi-faceted. The range of tools available allows the applied economist/policy analyst the opportunity to provide the raw material to facilitate informed debate. Of course the information generated may ultimately do little to alter entrenched positions. That is however a problem for negotiators rather than economists, and it is not a convincing argument against using the techniques available to enlighten and inform. As with all techniques of applied economics they have to be used with caution and care – one wants to avoid at all costs being confronted with Turvey's famous dictum 'if you torture the data long enough, it will confess'!

12.5 Concluding comments

The SAL programme is an important one from the standpoint of developing countries: it provides substantial resources. These are quick to disburse and there is considerable flexibility in their usage. SALs are conditional lending programmes that emphasise supply-side reforms. A crucial element in the reform package is trade policy reform. SALs agreed thus far have resulted in changes in a number of instruments of trade policy. In deciding upon which instruments to change, as well as the general thrust of policy reform, policy appraisal using the techniques we have discussed has been an important input. Policy appraisal has figured in both pre-loan and post-loan bargaining about the detail of conditionality, and has probably made for more informed debate that would otherwise have been the case. This does not of course mean that the 'right' policies have always been adopted, nor that they have always been implemented in the 'right' order. That is another issue. It simply means that the tools of policy appraisal can have an important operational function to play in the context of trade policy reform. The issue of actual outcomes will be addressed in Chapter 13. Having evaluated the rationale behind SALs, and assessed the trade policy components, it is now time to consider in more detail actual adjustment experience and economic performance under SALs.

CHAPTER 13

Structural Adjustment Lending: Timing, Sequencing and Economic Effects

13.1 Introduction

As we saw in Chapter 12, SALs have rapidly become an important source of finance to developing countries. These quick to disburse loans now account for the equivalent of one-quarter of all official development assistance to non-oil developing countries. As we also saw, trade policy is the most important area of conditionality in these lending programmes. In turn policy appraisal forms an important element in the negotiation of conditionality.

Having examined the main thrust of SAL reforms, we come now to an assessment of the economic effects of those reforms. Of necessity this must focus primarily on the SAL programmes overall. Where possible however the economic effects of trade policy aspects will be highlighted. In the course of this assessment we will draw out the interaction of trade policy with other areas of policy reform. In turn this will permit us to emphasise the importance of timing and sequencing.

The remainder of this chapter is organised as follows. Section 13.2 looks at the detail of adjustment experience and economic performance and Section 13.3 concentrates on issues of timing, sequencing and other constraints to reform. Section 13.4 examines the factors affecting sustainability. Section 13.5 considers whether policy appraisal has any role to play with respect to timing and sequencing. Finally, Section 13.6 offers some concluding comments.

13.2 Adjustment experience and economic performance

How does one evaluate the SAL programme? This is an extremely important question. However it is also a difficult question to answer. In principle there are two quite separate approaches we could use. First, we could evaluate actual outcomes relative to SAL objectives. Second, we could attempt to compare economic performance under SALs with economic performance in their absence.

Compliance with conditionality

Assessing compliance with conditionality is a relatively simple exercise. We take the information on conditionality and assess the degree to which this conditionality was adhered to. Any such assessment would be necessarily qualitative. One would have to make judgements as to when a condition was 'fully implemented', and when 'substantial progress' towards implementation had been made. World Bank (1988) makes such an assessment. This is summarised in Table 13.1. As one can see, for the 40 countries studied 60 per cent of all conditions were assessed as fully implemented in the period concerned. When those conditions where 'substantial progress' was made are also included the proportion was 84 per cent. If one allows for a lag, these proportions increase to 67 per cent and 89 per cent respectively.

This kind of exercise can convey potentially useful information. It can tell us, for example, something about differences in implementation by policy instrument. Thus the percentage of trade policy conditions implemented was relatively low, whilst those for energy policy and the exchange rate were relatively high. This may have something to do with the nature of the reforms involved. Thus if those for energy just involve price changes whilst those for trade policy involve replacing QRs with equivalent tariffs, one can see how the greater complexity of the latter could make for greater difficulty of compliance. Another possibility is that greater political interests may be at stake with trade policy than with, say, energy policy. As we saw earlier substantial rents are often associated with direct controls. Agents acquire property rights to such rents and give them up with great reluctance. As a result conditionality may be more difficult to meet. We shall consider these issues in greater detail later when we evaluate the role of constraints, slippage and timing and sequencing. This is where this kind of information is potentially most useful. It is less useful however as a basis for evaluating the impact of SALs on recipient countries. This is so for several reasons.

First, it is possible that it is the least important conditions which are adhered to, and the most important which are resisted. World Bank (1988)

Table 13.1 Degree of implementation of World Bank conditionality

Item	Percentage of conditions: During the loan period		Current situation	
	Conditions fully implemented (1)	*(1) plus 'substantial progress' (2)*	*Conditions fully implemented (3)*	*(3) plus 'substantial progress' (4)*
1. Exchange rate	70.0	90.0	62.5	87.5
2. Trade policies	54.9	84.2	63.4	89.3
Import QRs	62.8	93.0	69.0	90.4
Import duties	61.5	76.9	72.7	81.8
Import/export finance	20.0	80.0	42.9	85.7
Export incentives	60.6	81.8	62.5	91.7
Other trade policies	33.3	76.2	41.1	94.1
3. Fiscal policy	53.2	78.3	69.8	95.3
Tax policy	46.2	53.8	86.7	100.0
4. Budget/public expenditures	68.0	78.0	71.7	84.8
5. Public enterprise reforms (incl. restructuring)	61.3	86.7	70.0	90.0
6. Financial sector	71.4	85.7	73.5	89.8
7. Industrial policy (excl. restructuring)	53.3	93.3	42.9	85.7
8. Energy policy	79.2	83.3	83.3	88.9
Energy pricing	84.6	84.6	100.0	100.0
9. Agriculture policy	57.1	81.6	58.1	83.7
Agricultural pricing	64.3	85.7	61.5	80.8
All conditions, total	60.3	83.7	67.5	89.0
All conditions, SALs	68.3	84.1	73.5	92.4
All conditions, SECALs	59.9	83.2	60.0	84.9
All conditions, SSA countries	52.4	84.6	62.2	86.7
All conditions, HICs	66.9	88.6	73.2	91.4
All conditions, other developing countries	52.8	79.7	56.0	84.0

Source: World Bank (1988) Table 4.3.

did acknowledge this problem. It distinguished between 'key' conditions and other conditions. It concluded that, 'on balance, the performance on key conditions is better than the performance on all conditions' (p. 62).

Second, even if key conditions have been implemented more than other conditions, it could be that implementation has occurred in the most flexible countries with the best economic prospects. In this regard it is notable from Table 13.1 that the proportion of conditions implemented in Sub-Saharan Africa is less than the overall average, although it is also the case that for another problem group, the HICs, it is higher than average.

Third, it may be that misguided or inappropriate conditions have been applied! As we saw in Part I, there continues to be debate over the role of liberal trade policies in development. The SAL programme promotes the adoption of more liberal trade policies. Not all analysts would regard this as appropriate.

Fourth, the conditions we are focusing on are, after all, *inputs* into the policy reform process. Ultimately what we should focus on are the *outputs* of that process – that is to say the eventual impact of the programme on economic performance (however defined).

Thus although compliance with conditionality provides us with useful information for programme assessment, it is not a substitute for evaluating economic performance under adjustment programmes.

Performance under adjustment programmes

Assessing the experience of countries subject to SALs presents us with an entirely different set of analytical constraints. This is so for several reasons. First, as we have seen, many of the SAL reforms are supply side, directed at altering relative incentives in the medium to long run rather than in the short to medium run. It may therefore take some time for the reforms to have an impact on economic activity. Second, we do not have any clear *ante monde*. What would have happened in the absence of the SAL? It is tempting simply to assume that preexisting policies would have continued. Preexisting policies may however have been unsustainable. As a result taking these as a reference point could be misleading. Third, other policy shocks and lending programmes could overlap/interact with a SAL. For instance, it is not unusual to find that a country is simultaneously subject to a SAL and an IMF stabilisation loan – how does one disentangle the effects of the two programmes? Fourth, in any cross-section study one faces the difficulty that different countries start from different positions, they have different conditionality, the sequencing of programmes may be different, and so on. Finally, the conditions of a given SAL may not have been fully adhered to. How does one allow for this? For all these reasons, any evaluation must of necessity be to some extent partial, to some extent qualitative and to some extent incomplete. Notwithstanding these difficulties however, there have been several attempts to evaluate the impact of SALs on the recipient countries, some of which have been cross-section, some case study. The most comprehensive cross-section analyses are World Bank (1988, 1990) and Harrigan and Mosley (1991). A great deal of case study material has now been assembled, including Thomas *et al.* (1992) and Mosley, Harrigan and Toye (1991).

What are the measuring rods for SAL success or failure? On page 212 we set out the objectives for the programme. It will be recalled that medium-term growth and sustainability of the balance of payments are seen as the

Table 13.2 Details of SAL studies

Study	*Number of Countries*	*Time Period*
World Bank (1988)		All SALs 1980–7, evaluation of impact three years after disbursement
World Bank (1990)	78	1985–8 with 1970–90 1985–8 with 1981–4
Harrigan and Mosley (1991)	40	SALs 1980–7 with 1982–6

key objectives. In assessing the impact of SALs therefore, these are obvious indicators to refer to. Methodologically there are two approaches one can take: 'before and after', and 'with–without' performance. The former traces the path of, for example, GDP growth before the SAL, then compares it with post-SAL performance, the difference being attributed to the impact of the lending programme. There are two major shortcomings with this: first it presupposes the sustainability of preexisting policies. Typically SALs are negotiated in crisis conditions. In other words, against the backdrop of unsustainable policies. The other problem is that it is difficult to control for exogenous shocks such as commodity price changes. 'With–without' relies upon the experience of comparing performance in SAL countries (the 'with' group) against that of non-SAL countries (the 'without' group). Differences are then attributed to the impact of adjustment lending. The principal problem here is in the choice of 'control' and the impact of 'other factors' on the control. This however is the approach used by World Bank (1988, 1990) and Harrigan and Mosley (1991), although the World Bank studies do have a before–after element in them. Table 13.2 gives details of the samples. The number of countries varies from 40 to 78, whilst the data period is constrained by the limited time-frame within which SALs have operated – 1980–8 at the longest. All three studies attempt to evaluate the impact of SALs on the growth of real GDP, growth of real exports, investment as a proportion of GDP and current account balance as a proportion of GDP. World Bank (1988) and Harrigan and Mosley (1991) are close in terms of the time-frame they cover, as well as the country samples. We shall therefore take these as a pair, then refer to the results of World Bank (1990).

Table 13.3 reports the key results from these two studies. Before commenting on them, one methodological observation is in order, namely the SAL/non-SAL comparisons. The World Bank pooled the relevant data, that is all SAL countries were treated as one discrete sub-sample, all non-SAL countries as a separate sub-sample. Harrigan and Mosley regard

Table 13.3 Effectiveness of adjustment lending: comparison of results, (percentage of SAL countries which outperformed non-SAL countries)

Study	Growth of real GDP	Investment as % of GDP	Growth of real exports	Current account as % of GDP
World Bank (1988)	53	37	57	70
Mosley and Harrigan (1991)	50	38	65	79

this as flawed because the countries in each sub-sample may be unrepresentative. Instead they match with and without countries on a pairwise basis using information on, *inter alia*, economic structure, income per capita, growth of GDP and so on. In some cases the pairings work out rather well (for example Burundi and Rwanda or Kenya and Tanzania); in other cases the pairs do not look quite as well matched (for example Pakistan and Egypt, or Turkey and Greece). Nevertheless the approach offers an alternative to that of the World Bank (1988). Despite this difference, one cannot help being struck at the similarity of outcomes across the two studies. Harrigan and Mosley's study is more favourable on exports and the current account (despite excluding two of the most successful adjusting countries from their sample, namely Mauritius and Korea); slightly less favourable on GDP growth, and almost identical on investment. Overall both studies appear to suggest that adjustment lending might encourage real export growth and might contribute to improvements in the current account of the balance of payments. On the other hand, however, they imply that the impact on real GDP growth is neutral, whilst the effect on investment is negative.

The presentation of results in World Bank (1990) is somewhat different. These are reported in Table 13.4. They do not tell a markedly different story to Table 13.3. There is some evidence to suggest an improvement in real export growth, though it is noteable that this only shows up in nominal terms. When measured in real terms the change is still positive but not statistically significant. The impact on GDP growth appears to be positive, although the results are only statistically significant when we compare 1985–8 with 1981–4, a period of recession. Finally, there again appears to be a negative impact on investment and this *is* statistically significant when 1985–8 is compared with 1970–80.

Before appraising these findings, one final piece of evidence should be cited. As well as the with–without comparisons, Harrigan and Mosley also undertook some regression analysis. They correctly observe that the with–without results are likely to be influenced to an unknown extent by several non-SAL factors, in particular the conjunction of other finance with disbursements from the World Bank (notably from the IMF); a differential impact of exogenous shocks across countries; and the possible diversity of responses to adjustment lending across the sample due to different

Table 13.4 Effectiveness of adjustment lending: World Bank's assessment

Period/ dependent variable	*Change in rate*[1] *of growth of GDP (%)*	*Change in investment/ GDP (%)*	*Change in domestic saving/ GDP (%)*	*Change in export/ GDP (%)*
Current prices:				
1985–8 with 1970–80	1.3	−4.1[3]	4.0[4]	6.4[3]
1985–8 with 1981–4	2.0[4]	0.5	4.2[2]	5.0[4]
Constant prices:				
1985–8 with 1970–80	1.0	−5.6[3]	2.0	1.2
1985–8 with 1981–4	1.9[5]	−0.1	5.8[2]	2.3

Source: World Bank (1990).

Notes:
1. The rate of growth of GDP is measured at constant prices in both cases but the estimation procedure requires the use of lagged values of all the performance indicators and that is the reason for slightly different estimation of the effect of programs on rate of growth of GDP in the top and bottom of the table.
2. Statistically significant at the 2.5% level.
3. Statistically significant at the 5% level.
4. Statistically significant at the 7.5% level.
5. Statistically significant at the 10% level.

implementation and sequencing patterns. Thus they regress GDP growth, real export growth, investment growth and so on, on a set of independent variables for the period 1980–6. The results are reported in Table 13.5. It has to be acknowledged that there are some fairly fundamental problems with these estimates. What we have is a series of ad hoc equations designed to scan the characteristics of the data. Whilst this can be a useful starting point in empirical analysis, it makes it difficult to offer a convincing economic interpretation. For example it is not clear why we should truncate the lags on SALs at two periods; nor is it obvious why there are no lags on IMF stabilisation loans. Moreover there are very likely to be statistical problems with the results – collinearity between some of the independent variables (for example EPI and gEX), and, judging from the DW statistics, autocorrelation in at least some cases. One must therefore interpret the results with great caution. In terms of the signs of many of the coefficients,

Table 13.5 Effectiveness of adjustment lending: further evidence

Dependent variable (R squared in brackets)	*Regression coefficients on independent variables (student's T-statistics in brackets beneath coefficient)*													
	Constant	*IMF(t)*	*SAL(t)*	*SAL(t-1)*	*SAL(t-2)*	*CI(t)*	*CI(t-1)*	*CI(t-2)*	*W(t)*	*TOT(t)*	*DPI(t)*	*INV(t)*	*gEX(t)*	*DW Statistic*
GDP growth (0.40)	–24.65** (–5.65)	–0.11 (–0.46)	0.03 (0.50)	–1.85* (–2.54)	0.98 (1.30)	0.23 (0.53)	1.35** (2.87)	0.23 (0.52)	0.12** (4.54)	0.16** (4.07)	n/a	0.01 (0.16)	0.04* (2.57)	1.68
Export growth (0.17)	–0.51 (–0.02)	2.64 (1.83)	–10.03** (–3.08)	3.72 (0.84)	1.89 (0.41)	9.63** (3.96)	–6.04* (–2.15)	1.72 (0.64)	–0.15 (–0.97)	n/a	–0.20 (–0.94)	–0.25 (–0.71)	n/a	2.49
Import growth (0.13)	24.84 (0.93)	2.91* (1.99)	–6.13 (–1.86)	–2.07 (–0.46)	3.57 (0.77)	6.69** (2.71)	–4.58 (–1.61)	0.34 (0.13)	–0.18 (–1.13)	–0.15 (–0.63)	n/a	0.12 (0.34)	n/a	2.62
Investment as % of GDP (0.25)	–16.37 (–2.42)	0.00 (0.00)	–0.70 (–0.83)	0.53 (0.46)	–0.72 (–0.60)	–0.38 (–0.60)	0.49 (0.67)	–0.20 (–0.28)	0.10* (2.39)	0.32** (6.03)	n/a	n/a	n/a	0.66
Private Foreign Finance (0.18)	–1269.71* (–1.97)	–61.81 (–1.76)	–30.62 (0.39)	–16.16 (–0.15)	–108.64 (–0.97)	–25.46 (–0.43)	–2.04 (–0.03)	62.43 (0.96)	8.17* (2.15)	6.67 (1.17)	n/a	16.99* (2.01)	n/a	0.81

Source: Harrigan and Mosley (1991).

Note:
** denotes significance of a coefficient at the 1% level and * at the 5% level.

CI = Conditionality index
W = Weather index
DPI = Export price index
INV = Investment as a share of GDR
gEX = Growth rate of exports

the results do not appear to be inconsistent with the results of the with–without analysis. For the most part however the coefficient estimates fail to reach statistical significance. They should not therefore be taken as seriously as the other results reported earlier.

What can we make of all of this? The results suggest several conclusions. First it would seem that some current account improvement has been experienced in adjustment lending countries. The evidence on real export growth suggests that this is partly attributable to improved export performance. However more detailed analysis also suggests that it is in part due to import compression. Since many SAL countries also have IMF stabilisation loans in place, and since conditionality there tends to apply to demand-side restraint, this effect could be due to the impact of Fund lending rather than SALs. As yet no work has successfully disentangled the impact of structural adjustment and stabilisation lending.

Second, there may be a modest growth bonus from adjustment lending. The evidence here is somewhat more equivocal. Harrigan and Mosley suggest SALs are neutral in their impact on real growth, whilst the World Bank (1990) suggests that the bonus could be up to two percentage points (in nominal terms, less in real terms). This is a case where it may genuinely be too early to judge. At present we do not have a great many data points from which to work.

Third, it would appear that adjustment lending is associated with investment slumps. This is an alarming finding, particularly from the perspective of those who make a case for adjustment lending programmes. Since investment is directly related to growth, it may not augur well for the future.

There are several possible explanations for the finding. The World Bank (1990) argues that since an integral aim of adjustment lending is to curtail private and public sector investment whose efficiency is low, some reduction was to be expected. This may be so. In itself it is not a convincing explanation however, if only because proponents of adjustment lending would also argue that reduction of the public sector should have 'crowded in' private sector investment. A second possibility is that the greater fungibility of adjustment finance facilitates a switch from investment expenditure to consumption expenditure to alleviate repressed consumption. Thirdly, as public sector budgets are squeezed, one finds this impacting on capital expenditure to a greater degree than current expenditure. The latter is dominated by wage costs. As a result there is far greater resistance to cuts than with capital expenditure. For political economy reasons then, investment expenditures fall. Both of these explain why public-sector investment falls. What about the failure of private investment to increase? A convincing explanation here relates to the role of credibility. In the early stages of a SAL the private sector has doubts about its sustainability and holds off from making investments until it is clear whether or not the regime change is permanent. In view of the unstable policy environment in many developing countries this is an appealing explanation and is certainly

consistent with the facts. Unfortunately however it means that the lags associated with an investment response could be 'long and variable' (to coin a phrase!)

As is often the case with empirical work, both sides could probably find some comfort in these findings. Those who emphasise the need for supply-side reforms, and who do not see them coming without the threat of conditional finance, would emphasise the findings on real export growth, the current account, and perhaps even GDP growth. In contrast those who see the entire philosophy as fundamentally flawed would emphasise the findings on investment and probably those on GDP growth. Whilst it is true that adjustment lending programmes have been associated with very rapid and impressive growth in some countries, for example in Mauritius (see Greenaway and Milner, 1991c), the aggregate results are disappointing, especially those pertaining to investment performance. There is a good case to be made that it is simply too early to judge – we need more evidence. Only time can resolve this one. One could also argue that, especially in the early years, insufficient attention has been paid to issues of sequencing and infrastructural support. In other words reform programmes have not addressed themselves to the order in which reforms were implemented, nor have they concerned themselves sufficiently with the resources required for effective implementation.

13.3 Timing, sequencing and adjustment

To an increasing extent, attention is being paid to the timing of liberalisation reforms, the sequencing of reforms across sectors/markets and adjustment of agents to the reform programme. As Chart 13.1 shows, these issues are interrelated and, as experience with adjustment programmes demonstrates, they have important implications for the sustainability of a given reform programme and its eventual success or failure. Although the issues of liberalisation mechanisms, timing and sequencing are interdependent, for expository purposes it is helpful to treat them separately.

In designing a liberalisation programme the first decision one faces, as Chart 13.1 shows, is whether the programme should be partial or complete. This actually has two dimensions: should reforms pertain to all sectors (capital controls, traded goods, non-traded goods, financial sector, labour market and so on), or to a specific sector (for example traded goods); second, should the reforms sweep away all interventions or modify existing policy. Thus for example, in the event that policy was aimed at liberalising trade policy, should the objective be free trade or reduction of existing tariffs? Economic theory offers some guidance, although for most practical purposes it may not be terribly helpful. One can show relatively easily that, if the economy is free of distortions, on efficiency grounds complete liberalisation is superior to partial liberalisation (see for instance

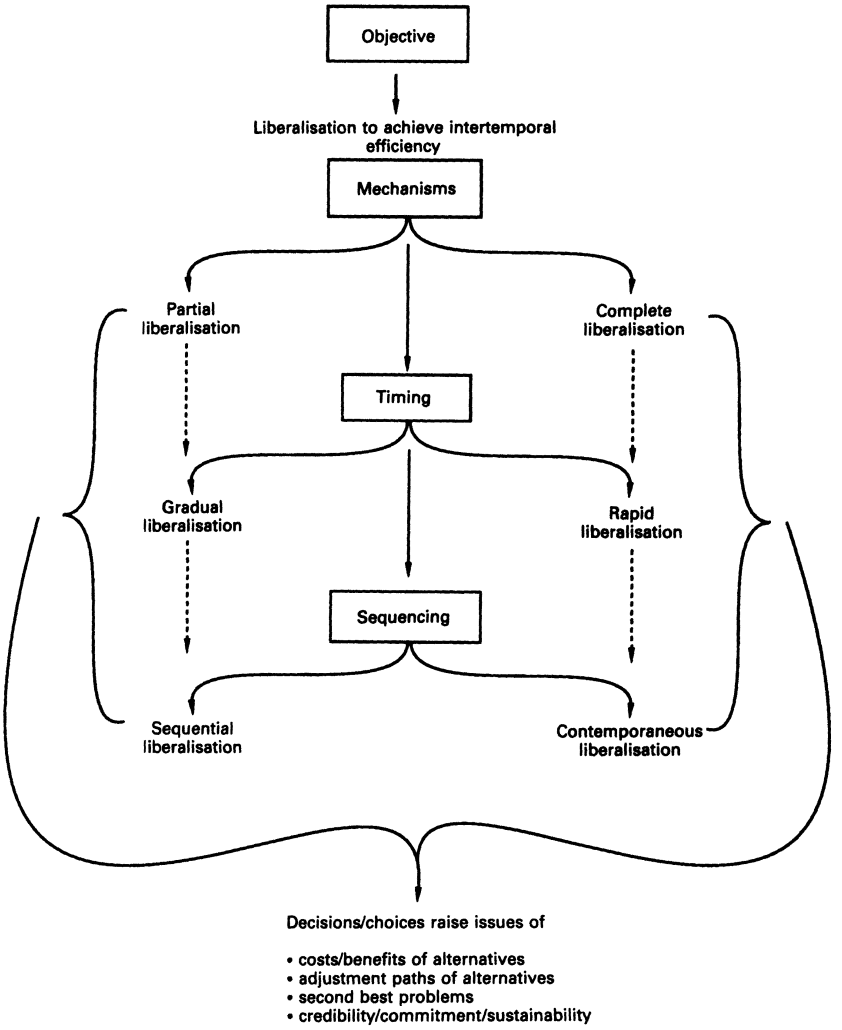


Chart 13.1 Timing and sequencing of liberalisations

Michaely, 1986). This in fact is a fairly standard result of welfare theory. Sadly however, as we have seen elsewhere in this volume, the economies of many developing countries are typically not free of distortions. In such circumstances the lead given by economic theory is less conclusive in that we face a classic second-best problem. In principle this applies to any partial liberalisation, whether this refers to liberalisation of one sector with others left untouched, or partial removal of restraints in a given sector.

The danger of using second-best theory as a touchstone in policy reform is that it becomes a recipe for inactivity. Being a purist also involves being a

nihilist in this respect. In practice advice tends to be given on a *ceteris paribus* basis. Thus, notwithstanding the general theory of second-best, economic theory shows quite clearly that a tariff is generally superior to a quota as an instrument of protection. This can be used to defend the replacement of quotas with equivalent tariffs as an act of liberalisation. Moreover political economy considerations will often also be brought to bear. For example replacing quotas with tariffs can be defended on distributional grounds. Ultimately of course the issue of whether liberalisation is general or partial is a political one determined by bargaining between the World Bank and the government of the host country.

Having taken a decision to liberalise, whether partially or generally, the next issue is one of timing: should the programme be implemented rapidly or gradually? Again this is a tricky issue. Economic theory would suggest that, in the absence of distortions and with full factor mobility, liberalisation should be rapid – the 'big bang' approach. In such circumstances adjustment would be smooth. Theory also shows, however, that even without distortions adjustment might be sticky if some factors are sector specific (see for instance Mussa, 1986). Factor specificity results in some wage/price rigidities and quantity rationing. As a result sector-specific unemployment follows liberalisation. This can be used to make a case for gradualism on one of two counts, depending upon the specific factor: first it allows time for sector-specific labour to retrain; second, it permits sector-specific capital to be written off at some 'optimal' rate. Of course one could take the view that adjustment costs are the price we pay for change and are simply a short-run phenomenon. Since the discounted value of the benefits from liberalisation will typically exceed to a significant degree the discounted value of any adjustment costs, we should still go ahead and implement reforms quickly in order to realise the benefits quickly. At least two objections are often raised against this proposition. On the one hand it is sometimes argued that 'fairness' demands adjustment assistance in the form of time to adjust; on the other hand it is often argued that gradualism makes good sense on political economy grounds – with rapid adjustment you are likely to get maximum resistance to liberalisation. The former point is not wholly convincing. Although 'fairness' is (quite rightly) a powerful motive force, it is not clear why traded goods sectors should be singled out – as they often are. In other words, if this is to be used as an argument for gradualism it should apply to *all* economic policy where there are gainers and losers. The second argument is potentially more cogent. If the costs of adjustment are heavily concentrated in a specific factor, or on specific sectors, one might find that powerful lobbies opposed to the policy change are galvanised in their opposition by rapid adjustment. If so, this could then constitute a real threat to the sustainability of the entire programme.

This is certainly plausible. Equally however another perspective can be taken, *viz.*, gradualism allows lobbies opposed to liberalisation to organise,

resist and ultimately undermine the programme. In practice this has been a problem in some countries – gradualist programmes have never reached full fruition. This is not, incidentally, a problem peculiar to developing countries. It arises because the benefits from liberalisation are widely dispersed whilst the losses are concentrated. Thus beneficiaries are poorly organised and ineffectually counter the lobbying efforts of losers from liberalisation. This problem has led Laird and Yeats (1990) to propose the establishment of permanent commissions which record the costs of protection/benefits of liberalisation and are charged with the responsibility of defending the gains realised from liberalisation programmes.

Tied in with timing is the question of sequencing – no matter whether we are dealing with partial or complete liberalisation, should all sectors be liberalised contemporaneously or should liberalisation in some precede that in others? This question has been scrutinised fairly closely by analysts, especially by reference to Latin American experience (see for instance Edwards, 1990). Again theory is not unequivocal in its recommendations, although practical experience does give us a few useful counters. Thus, for example, Latin American experience suggests that financial market liberalisation should precede the removal of capital controls. Removal of capital controls prior to reforming financial markets appears to be a recipe for capital flight. In turn capital flight creates pressures for a policy reversal and potentially erodes commitment.

McKinnon (1973, 1982) has argued that not only should abolition of capital controls follow financial market liberalisation, it should also follow trade liberalisation. His reasoning is as follows: if financial markets are reformed and capital controls are abolished prior to trade liberalisation, there will be capital inflows to the reforming economy. In turn these lead to real exchange rate appreciation which erodes the competitiveness of industries producing tradeables. This would then make trade liberalisation much more difficult. Clearly, if reform of policy in traded goods sectors precedes the abolition of capital controls, the problem simply does not arise. Frenkel (1983) has given a slightly different gloss on this by emphasising relative speed of adjustment across markets. Specifically, asset markets clear much more quickly than goods and labour markets. Consequently he argues that these markets need a shorter time to adjust. Appropriate sequencing then means liberalising the trade account some time ahead of the current account.

As we can see therefore, issues of timing and sequencing are complex and complicated. From a policy standpoint they are crucially important. If the wrong decisions are taken regarding the scale of liberalisation and/or speed of implementation and/or sequencing across sectors, government commitment to the programme and/or the credibility of government's commitment could be eroded. In these circumstances the programme would simply not be sustainable. It is to the issue of sustainability that we now turn.

13.4 Factors influencing sustainability

For the most part SALs tend to involve partial liberalisation, they tend to be implemented gradually and, to an increasing extent, reforms which apply to real sectors precede those which apply to financial markets. Some SALs are sustained, others show evidence of slippage at an early stage and *in extremis* complete collapse results. The sustainability of a given lending programme appears to be fashioned by a combination of programme design, government commitment, adequacy of funding and external environment.

Programme design clearly overlaps our discussion in Section 13.3, particularly regarding sequencing. In addition however, several other points are relevant. Experience has shown that consistency of policies within a package is important – ideally policy reforms should reinforce each other. In practice this is not always the case. For instance, incentives may be given to exporters to reduce anti-export bias. If at the same time protection to producers of intermediate goods is raised, then exporters are disadvantaged. As a result a potentially vocal lobby in support of reforms is alienated. Related to the above, where lending programmes from more than one agency are in place simultaneously it is crucially important to ensure that they are consistent. An interesting example of conflict here occurred in the Ivory Coast in the early 1980s. At the same time as the World Bank was recommending tariff liberalisation on allocative grounds, the IMF was pushing for tariff increases on fiscal grounds. In addition to compromising the credibility of the institutions, such conflicting advice must compromise sustainability. Fortunately greater attention is now being paid to cross-conditionality between the key multilateral agencies and the prospects of this occurring are, as a result, lower. A final aspect of programme design that should be acknowledged is feasibility – conditions should be capable of implementation. This is an obvious point. On occasions however, conditions have simply been too ambitious. To illustrate this point we can refer again to the experience of the Ivory Coast in the early 1980s, when tariff reforms were set by reference to effective rather than nominal tariffs. Quite apart from the advisability of the objective of a uniform effective tariff, setting the bureaucracy the task of calibrating and monitoring uniform effective tariffs was simply too ambitious. Clearly in such circumstances the policy reform is not sustainable.

Government commitment is central to sustainability. Here several influences are relevant, some of which overlap the points made in Section 13.3. We can identify two sources of pressure – internal and external. The former refers to the way in which responsibility for implementing different elements of the programme is devolved within the government machinery and the extent of any infrastructural support provided. As we saw in Chapter 12, SALs can be very complex packages involving policy reforms in a wide range of areas. Typically government bureaucracies are

fragmented, with different agencies responsible for carefully delineated spheres of influence. Moreover it is not unusual to find that these spheres of influence are jealously guarded. This means that internal coordination may be difficult. It also means that officials some way down the chain of command can be readily identified as targets for lobbying activity. Both may help erode commitment. It has been argued by Halevi (1988) that this was an important factor in Ghana.

The other internal factor, infrastructural support, overlaps comments made in Section 13.3 above about feasibility of reforms and in Section 13.5 below regarding adequacy of funding. The point is a simple one: if the necessary administrative infrastructure is not in place, the ability of a government to see a particular programme through must be in question. A good example here was in Tanzania in the late 1980s when wholesale tariff reform was proposed in order to raise customs collections. At the time there were only 12 customs posts in the country and no formal mechanism for training new customs officers.

'Externally' the key influences on commitment are the speed of any positive supply response to an adjustment programme and the impact of the programme on protected sectors. If implementation of conditionality results in a rapid contraction of previously protected sectors but a sluggish response from export orientated industries, as may be the case due to credibility problems, the social costs of adjustment would appear to be relatively high. As occurred for instance in the Philippines, the government then comes under early and severe pressure to slow down, or even reverse, some of the changes and slippages take place. Typically producer lobbies are well organised and effective. Often they are 'pushing against an open door' in dealing with governments that have implemented policy reforms in which they may not have complete conviction and which have uncertain outcomes. As we noted earlier, this can be used as an argument for making adjustment assistance available to exposed sectors in order to enhance the prospects for sustainability.

Adequacy of funding is implicit in some of the points made above but should be mentioned in its own right. The point is that expectations on the part of the lender may be unrealistically high, given the level and distribution of funding. This was certainly the case with many of the early SALs for Sub-Saharan African countries – too much was being asked given the absence of funding earmarked for infrastructural support in the form of training and internal mechanisms for monitoring and evaluation. Inevitably, if the internal machinery for seeing reform through is not properly resourced, commitment will wane.

External environment. As we saw in Section 12.2, exogenous shocks can impact on countries whilst they are subject to a lending programme. Shocks may be beneficial or adverse. In the event of the latter they can easily erode commitment. A good example here is Zambia in 1987. In that year the Zambian government implemented a series of radical reforms,

including auctioning foreign exchange and reducing quantitative restrictions. During the programme, however, the world price of copper fell significantly. As copper accounted for around 90 per cent of Zambian exports (by value), this not only reduced export revenues quite dramatically, it also reduced government revenue and as a result the reform programme was reversed. There is probably not a lot one can do within the context of an SAL to insure against such contingencies, beyond perhaps making available more compensatory finance.

Sustainability cannot be taken for granted therefore. It depends upon the characteristics of programme design, the nature and adequacy of funding, external shocks during the lending period and, above all, government commitment. Can policy appraisal help?

13.5 Policy appraisal, timing, sequencing and adjustment

The answer to the above question is, regretfully, probably not a lot. We saw in Chapter 12 how the techniques of policy appraisal can be helpful in pre-loan and post-loan evaluation. We can make use of many of the techniques discussed in Chapters 4 to 11 to inform and persuade. Many of these techniques are partial equilibrium and therefore incapable of being used to evaluate adjustment paths as a basis for evaluating timing and sequencing. Some were of course general equilibrium, most notably CGE modelling. However as we saw this particular methodology tends to be used against the backcloth of necessarily restrictive assumptions. Apart from the fact that some of the results are not always robust, the technique is still in its infancy and is not as yet a perfectly reliable basis for analysing adjustment paths. The comparison of endstates is one thing, tracking sectoral and intersectoral adjustment over time is quite another.

Referring back to our discussion in Chapter 12, what this means is that the 'persuasive' function is probably uppermost in this context. In the light of experience the economist qua adviser can allude to experience with sequencing in countries where a series of lending programmes have been implemented and use this as an input to policy design. The only role that measures such as effective protection, DRC and the like then play is in highlighting the consequences of past policy and emphasising the potential benefits of sustaining a particular reform programme.

13.6 Concluding comments

In Chapter 12 we evaluated the characteristics of SALs and the rationale behind the programme as a whole. In this chapter we have focused on the economic effects of adjustment lending. In particular we have been interested in how those countries subject to lending programmes appear to

have fared, as well as the impact of different sequencing arrangements.

Evaluating SALs is not easy, partly because of the difficulty of disentangling the effects of adjustment lending from everything else that is going on; partly because it may just be too early to tell. The evidence adduced so far appears to suggest that the impact on export growth and the balance of payments may have been beneficial whilst that on output growth and investment has been disappointing. Various explanations for these findings were discussed, including programme design. We saw that the timing and sequencing of a particular programme is likely to have an impact on the effects of that programme and on its sustainability. There is evidence to suggest that the international agencies are learning from experience and greater thought is being given to issues of timing and sequencing with a view to enhancing the prospects of sustainability. One of the items for the research agenda of the mid to late 1990s should be an evaluation of the relative impact of SALs in the early to mid 1980s with those of the late 1980s to early 1990s to see whether this may have had an impact on performance.

Notes

4. The Structure of Nominal Protection

1. Economic Community of West African States and Communaute Economique de l'Afrique de l'Ouest
2. Weighting by import share downwardly biases the measure of protection with the import share and scheduled tariff positively related.
3. Burundi is a member of the Communaute Economique Pays de Grand Lacs (CEPGL), the Communaute Economique des Etats de l'Afrique Centrale (CEEAC), and of the Preferential Trading Arrangement for Eastern and Southern African States.

6. Domestic Resource Cost Analysis

1. Note that if competitive conditions prevail, with undistorted markets and free trade, there is no reason in principle why we should observe DRCs of less than unity.
2. This approach and notation are adapted from Bruno, 1972, pp. 18–22.
3. This section draws upon Greenaway and Milner, 1990b.
4. This is an opportunity cost valuation of factors which differs somewhat from the shadow prices concept using general equilibrium, cost–benefit analysis. In that case the shadow price of a factor is the social value of endowing the private sector with one more unit of the factor.
5. International value added in process j (IVA_j in for example Equation 6.4) was estimated by revaluing domestic Madagascan value added at border prices, and not identified in a non-Madagascan setting.
6. The most extensive data on labour utilisation in rural Egypt is provided by the labour-force surveys carried out by the Agricultural Development System Project (ARE Ministry of Agriculture–University of California), Egypt Agricultural Mechanisation Project (Egypt–USAID Project) and the Ministry of Agriculture's Economics Research Unit.

7. Shift Analysis and the Incidence of Protection

1. This analysis draws on the work of Dornbusch (1974), Sjaastad (1980a), Sjaastad and Clements (1981), Clements and Sjaastad (1985) and Greenaway and Milner (1987a).
2. The implications of relaxing this assumption are explored in Greenaway and Milner (1988a) and Milner (1989).

3. This theoretical extreme is rather perverse in that the relative price changes induce no substitution in domestic demand towards exportables nor in production away from exportables. There is no resource effect for the exportables sector, but real income in the sector is reduced by the implicit tax paid on the consumption of higher priced importables and home goods.
4. Incidence is equally shared insomuch as the implicit tax rate on the consumption of importables is the same for producers of both exportables and non-tradeables.
5. Singh (1988) argues that the limits for w are not necessarily zero and unity. But Greenaway and Milner (1988b) show it to be the case for the model as currently specified.
6. Clements (1980) also computes an alternative set of price elasticities derived from income elasticities by applying separability theory. The estimated shift parameter for these revised values is 0.65.
7. Smeets (1989) argues for instance that application of Equation 7.17 involves a misspecification, where price change is influenced by other variables such as the domestic money supply and international prices. Although there is a problem of observational equivalence, correct interpretation of Smeets' results shows that relative prices are not fundamentally affected in the way that Smeets argues.
8. OLS results for time series regressions are likely to suffer from autocorrelation. Many of the studies report results for both OLS and other estimations which have corrected for serially correlated error terms.

8. Computable General Equilibrium Modelling

1. The Arrow–Debreu model was further elaborated on in Arrow and Hahn (1971).
2. For other useful considerations of these issues see Shoven and Whalley (1984), Dervis, de Melo and Robinson (1982) and de Melo (1988).
3. See for example Isard (1977).
4. Early models used Scarf's algorithm (1967) or approximated an equilibrium using Johansen's (1960) procedure. Other possibly more rapid solution methods have been developed subsequently. These include other local linearisation techniques and a Newton-type algorithm. For a further discussion of this last type of solution procedure see Drud, Grais and Pyatt (1983).
5. It was convenient in this case that QRs were modelled as inducing rent-seeking activity in intermediate goods only. Rent-seeking activities in consumer goods would complicate the utility specification. For an alternative approach to rent seeking see Dervis, de Melo and Robinson (1982).
6. See for instance de Melo (1978).

9. Applied GCE Analysis of Trade Policy

1. In 1981 (the nearest year for which information is available) 70 per cent of imports (by value) were subject to licensing and 8 per cent were on the quota list. In addition durable and non-durable consumer goods such as cars, washing machines and televisions were not listed, with imports *de facto* prohibited in the absence of specific authorisation by the government.
2. This problem was first noted by Eastman and Stykolt (1960) for Canada.
3. Arguably it may be the transitional impact on revenue that is important if reform of non-trade taxation is possible. But if the administrative costs of other, potentially more efficient, forms of taxation are expected to remain high, then the longer term revenue impact of trade tax reform may also be a concern.

4. This is an ad hoc response to the inadequacies for long-run analysis of the standard foreign trade specifications in CGE models. Further elaboration of modelling technique is required in this area.
5. This has been a selective review in order to illustrate types of applications, rather than a comprehensive review. A similar approach can be found in de Melo (1988) and Dervis, de Melo and Robinson (1982). More comprehensive reviews can be found in Robinson (1988), DeCaluwe and Martens (1986), Devarajan, Lewis and Robinson (1986) and Bandara (1991).
6. See for example Bell and Srinivasan (1984).

10. Revealed Comparative Advantage

1. Baldwin (1971) is a pioneering example of this type of empirical analysis. For a review of this type of work see Deardorff (1984).
2. See for example Hillman (1980) and Bowen (1983).
3. Hillman (1980) and Forstner (1984) identify circumstances where cross-country comparisons of RCA indices for specific commodities may provide consistent results. Webster (1991), reviewing recent theoretical developments, concludes however that 'we should treat single good, many country comparisons of RCA with considerable caution. Comparison between a single country and the rest of the world across several industries are more capable of justification' p. 938.
4. Ballance, Forstner and Murray (1985, 1986) express these concerns about comparisons of actual and expected values derived from the hypothesised autarkic situation.

11. Potential Comparative Advantage

1. This evidence is surveyed in Greenaway and Milner (1987b).
2. There is some more comprehensive evidence for India for example (Bhagwati and Bharadwaj, 1967), but here again there is limited factor disaggregation.
3. The index has also been used by Pomfret (1981) to examine the similarity of manufactured exports to the EEC from Spain, Greece and Portugal.
4. It is possible that the rankings arising from the index may not be consistent over time and at different levels of statistical aggregation (see for example Kellman and Schroder, 1983). In the present context there is no attempt to use the index for formal testing purposes. There is, in any case, less likelihood of product heterogeneity in the case of developing countries. It would also be possible to calculate the index for a number of years if rapid structural change was evident.
5. The dangers of inferring total resource cost effects of non-marginal resource allocations from DRC ratios are discussed in Chapter 7.

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