PRICE EFFECTS FROM PUBLIC SECTOR INTERVENTION.
THE CASE OF MEXICO.

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Thesis Presented in Fulfillment of the Requirements for the Degree of
Doctor of Philosophy.

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December 1989.

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ACKNOWLEDGEMENTS

My greatest debt of gratitude goes to Professor Graham Pyatt for his supervision, guidance, encouragement and interest. At times, when things became confusing, he frequently steered me back to the relevant questions. His contribution to the completion of this thesis is invaluable.

I would like also to express my sincere appreciation to Jeffrey Round who read and commented most helpfully on the entire thesis.

I gratefully acknowledge the financial support provided by the British Council, CONACYT, and Banco de Mexico at various stages of my research.

My thanks also go to Caroline Hansen and Laura Bennett who helped me to improve my far-from perfect English. I also benefited from the frequent chats with Nemia N'gano who, in addition, helped me in shortening the time consuming task of getting familiar with the software used.

SUMMARY

The objective of this thesis is to evaluate the effects on relative prices arising from public pricing policy and economic performance of public enterprises as well as commercial policy in Mexico.

For that purpose, a consolidated Social Accounting Matrix (SAM) for input-output (I-O) analysis is constructed, for the year 1980. This framework then serves as a basis for developing a fix-price model in order to simulate different public pricing scenarios, and to calculate effective rates of protection (ERP). In doing that, deviations of price from marginal cost and inefficiency of public firms are treated as indirect taxes, insofar as their effects on relative prices are concerned. The analysis is therefore carried out very much in line with the studies of tax reform, usually based on I-O models.

However, compared with these studies, the present model, while retaining its fix-price nature, incorporates some features so far not dealt with by others: (i) input substitutability is incorporated at various points; (ii) commodity transactions are valued at market prices; and (iii) production activities are classified, in addition to the principal product criteria, according to their form of organisation, i.e. public and private.

Thus, public pricing policy and economic performance of public enterprises are analysed allowing for substitutability between domestic production and imports and, also, some public prices can be allowed to be fixed. Likewise, the notion of ERP is generalised so as to remain meaningful as a concept, when moving from the fixed coefficients assumption to the more general case in which substitutability is allowed for. Finally, the SAM approach allows for several sources of distortion in prices to be analysed together in a systematic framework.

The following are some of the main conclusions derived from the study:

- The policy of regulating public prices has generated a very distorted price scenario which has benefitted all sectors but, specially, capital goods and intermediates.

- The estimations of ERP suggest that commercial policy has worked in the same direction, even though the mentioned sectors are not the most efficient in terms of their comparative advantages.

- The bulk of the distortions from public pricing, however, comes from two sectors -petroleum and electricity. The remaining public activities do not seem to affect relative prices very much, since they concentrate on the production of final consumer goods, mainly non traded.

- Trade elasticity values and the assumption that some public prices are fixed seem to affect the resulting price structure, when compared to price effects under the traditional assumptions of I-O models.

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CHAPTER ONE

INTRODUCTION

Over the past decades the public sector has expanded very rapidly in both developed and developing countries. In 1980, for instance, public expenditures represented 40 percent of GDP in industrial countries. In the developing areas, the participation of the public sector was no less important; in 1980 the public sector accounted for 15 to 25 percent of value added in GDP and some 50 to 60 percent of total investment (World Bank [1983]).

The increasing public presence in the economies of developing countries in the sixties and seventies took several forms, from direct public intervention through public enterprises (PEs), taxation, as well as the introduction of various forms of regulation, such as quantitative restrictions on imports, and price controls. Thus, while the average share of government revenue in GDP in less developed countries (LDCs) was 14 percent in 1960, by 1970 that figure had risen to 18 percent, and to 24 percent by 1980. (Newbery and Stern [1987]). Likewise, in 1980, the contribution of PEs to GDP averaged 10 percent (World Bank [1983]). Equally important was the inward oriented policy adopted by many countries -especially in Latin America- since the fifties, in which a complex system of protection to promote infant industries was created. Although originally designed to be temporary, such a system became a permanent characteristic of these countries throughout the sixties and seventies. Finally, the introduction of price controls, particularly in the seventies, was a very popular instrument used to keep prices down in years of rampant inflation, as well as a mechanism to achieve social goals.

While successful in the sense that high rates of economic growth were achieved in many countries, such a pattern of economic growth seemed to have reached its limits by the end of the seventies. Indeed, the perception in the eighties is that too much public intervention has led to a very distorted scenario, in which, in many circumstances, prices no longer reflected opportunity costs, thus creating room for widespread inefficiency. As Newbery and Stern [1987] pointed out,

> The 1980s present a very different economic and intellectual environment. Economic performance has been disappointing, the international environment appears hostile, and critics complain of the inefficiency of the public sector. We often find that emphasis has shifted from planning for growth to increasing efficiency, reducing public expenditure, undertaking structural adjustment, and, in particular, 'getting the prices right'.

In 'getting the prices right', the economic theory has unequivocally moved in a single and clear direction; that is, to avoid distortions in prices, for, it is argued, prices constitute the best system of incentives that encourages resources to be allocated efficiently and used optimally. It has for a long time been recognised, however, that a 'first-best world' is purely a theoretical exercise, and that a much more realistic scenario belongs to the so-called 'second-best world'. In this context, the theory of domestic distortions developed remarkably fast, and has by now a well developed and systematic set of ideas regarding how to reach the best possible outcome in a world where some externalities and distortions are inevitable. Perhaps the best example is given by the theory of optimal taxation, pioneered by Ramsey [1927], and formulated within the context of the literature of the second best, as originally developed by Lipsey and Lancaster [1956].

Yet, when it comes to empirical work, one finds that there has been a long gap between the theory and the empirical analysis. Indeed, as argued by Dixit [1985], empirical implementation of the theory in an ideal way is still not possible. One finds, for instance, that despite the theoretical insights of the theory of tax reform, it has very little connection with actual policy analysis, even though the whole issue of tax reform was conceived as a practical one.

One particular area in which relatively little progress has been made corresponds to the empirical analysis of the price system. Indeed, most of the empirical analysis of the price system are based on I-O models, thus adopting assumptions that, on the theoretical literature, are often seen as extreme situations.[1] The reason is not hard to find, since I-O tables provide a rich picture of the production structure, so that it is relatively simple to focus on the main determinants of the relative price structure from the production side, without having to resort to many behavioural assumptions that more complex models such as the type of computational general equilibrium models (CGE) require.

The first aim of this thesis is to construct a framework for analysing the price system. While remaining within the tradition of fix-price models in the sense that prices are determined only on the supply side, our approach incorporates some additional features in the spirit of general equilibrium, which, so far, have not been dealt with by others. The idea is to develop a model of prices for the Mexican economy, in an attempt to investigate the effects that public pricing policy and performance, as well as commercial policy, have on the relative price structure. In a second stage we consider the consequent effects on the reallocation of resources, by looking at the changes that take place in the value added of production activities. The analysis, it should be said, is very much in line with existing studies of tax reform in that departures of price from marginal cost and inefficiency of PEs are viewed as a system of indirect taxes (or subsidies), insofar as their effects on the price system are concerned. Our approach, however, departs from the standard I-O models in several respects, all of which derive from our decision to use a Social Accounting Matrix (SAM) approach for modelling purposes. These departures are, briefly, the following.

First, unlike the traditional I-O models which assume that inputs combine in fixed proportions, our approach enables us to consider the issue of input substitutability at various stages. Thus, for instance, when analysing public pricing policy and performance of PEs we postulate some limited degree of substitutability between domestic production and imports, thus recognis-

[1] For recent studies focusing on tax reform issues see Ahmad and Stern (1987) and Sands (1986).

ing the fact that producers usually do have some possibility of choice between these two sources when formulating their cost minimising decision. More generally, it will be seen that substitutability can be generalised to any set of inputs. In doing that, we intend to move away from the particular view of production technology which essentially involves the Leontief notion of fixed coefficients. This notion is an analytical abstraction which minimises the role of the price system in modifying the use of raw materials.

This Leontief notion of production technology also gives support to the argument that commodity transactions should be valued at basic prices (that is, without including indirect taxes and trade and transport margins), in order to maintain the assumption that each commodity is sold at the same price irrespective of who buys it. That constitutes the rationale behind the valuation of commodity balances at basic prices in most I-O tables. This view, however useful for some purposes, fails nevertheless to recognise the fact that economic agents are not insensitive to prices. Therefore, in our rejection of the fixed coefficients technology model we have made an effort to construct a SAM in which commodity transactions are valued at market prices, thus incorporating not only indirect taxes but also trade and transport margins. In doing that, we recognise the fact that, from the point of view of economic agents, the same commodity sold at two different stages of the distribution process represent, in fact, two different commodities.[2] Our second departure from I-O models, therefore, derives from our decision to value commodity transactions at market prices, thus recognising the fact that it is market prices that economic agents respond to. Such recognition, we think, is essential if our accounting framework is to lend itself to being an accurate framework for the analysis of economic behaviour.

A further area in which we feel that current conventions as envisaged by I-O tables are incomplete for modeling purposes is in the criteria for classifying production activities. The convention in building I-O tables is to classify activities according to the principal product criteria. That is, the principal product approach to grouping establishments is to first group commodities

[2] This issue is explored in depth by Pyatt (1985).

(and services) and then to allocate establishments, which often produce several goods, to these groupings according to their principal products. In such a system, therefore, there are as many activities as there are commodities, and the I-O structure can be looked at as an interdependence between demand for different commodities.

When it comes to modeling, however, such an approach neglects several forms of dualism usually present in developing economies. One very common form of dualism, among many others, is the presence of a very marked public/private dichotomy which, given the purposes of the present enquiry, needs to be incorporated. Thus, in building our SAM this approach has been relaxed to allow greater flexibility in the definition of activities. Specifically, in addition to the principal product criteria we have also classified activities according to their form of organisation, namely public and private. The I-O structure of the economy must now be conceived not only as an interdependance of commodity demands as before, but also as an interdependence among public and private activities.

An obvious implication of introducing this second criteria is that it is no longer appropriate to have the same number of activities and commodities. Activities can now produce more than one commodity or, alternatively, each commodity can be produced by more than one activity. We move away from the simple theory of square matrices. Given the present computational capabilities, however, the symmetry of square matrices is no longer an indispensable condition. Instead, by introducing this second criteria the modeling capabilities are greatly enhanced, since we are in a better position to model more accurately the behaviour of the public sector which, very often, differs substantially from that of the private sector of the economy.

Last but not least, our modeling of the price system benefits a great deal from our SAM approach in the sense that several sources of distortions of the price system are put together in a systematic framework and therefore, compared to I-O models, our modeling of the price system is considerably facilitated.

Taken together, these different aspects of our approach take us some way down the road to a richer and more flexible analysis of the price system. Yet, we retain the power and simple appeal of models in which prices are determined without reference to the demand side.

The second aim of this study derives both from the relevance of the topic and from the scarcity of empirical analysis on the issue of public sector pricing policy. As already pointed out, during the previous two or three decades most countries have experienced an increasing growing intervention of the public sector in their economies. It seems that the general feeling among economists is that the increasing importance of the public sector led to excessive intervention and regulations in many facets of economic activity, which in turn led to excessive price distortions and misallocation of resources that, ultimately, resulted in widespread inefficiency. Not surprisingly, during the eighties PEs became a major concern of economic policy, particularly in LDCs where they are often seen as a drain on public finances while, at the same time, domestic savings are needed to cover external imbalance.[3] This brought to the fore the questions of efficiency and pricing policies of PEs, because it became increasingly clear that PEs were exerting considerable effects on the mobilisation of resources of many economies.

Despite this, very little empirical work exists on the modeling of public pricing policy and economic performance of PEs.[4] Perhaps the main reason for this is the scarcity and inadequacy of data on PEs. Indeed, none of the international organisations publishes comprehensive information on PEs, and statistical sources for individual countries do not generally identify PEs' operations separately. Moreover, as pointed out by Short (1984), there are differences between countries -and sometimes even between different sources for the same country- in the exact definition of PE sector used for statistical purposes (see also Floskovic and Trevino (1985)).

From this perspective, an important by-product of the present study is the construction of a

[3] In many LDCs an important proportion of the external debt contracted by governments during the seventies was devoted to PEs. Trivedi (1984), for instance, points out that between 1976 and 1978 33 percent of all borrowing on international capital markets was attributable to PEs in LDCs.

[4] Some recent work includes Ahmed et al (1984), Floskovic (1982), and Floskovic and Trevino (1985).

consolidated SAM for I-O analysis, where an effort is made to organise and put together data related to the public sector in the Mexican economy, for the year 1980, which is the latest year for which a published I-O table exists.[5] While in our data framework we place especial emphasis on the production structure, extensions for future research work are both possible and desirable.

The thesis is also of interest as an applied study of economic policy. Mexico, as many other Latin American countries, followed an inward oriented policy, thus relying heavily on high levels of protection. Indeed, since the early fifties the whole economic policy was designed to promote the industrialisation of the country. Various instruments of economic policy were used as a means to concentrate resources in the industrial sector. On the one hand, commercial and exchange rate policy combined to promote the development of infant industries by protecting domestic producers against foreign competition. On the other hand, a second important mechanism used to concentrate resources in the industrial sector, was the increasing direct participation of the public sector in the economy through PEs. As will be seen later, since the forties PEs have played a key role because, at that time, the state assumed control over the so-called strategic industries, aiming to promote the industrialisation process not only by providing the basic economic infrastructure, but also by subsidising industrial activities with cheap raw materials.

While successful in the sense that high rates of economic growth were achieved (averaging 6.7 percent growth of real GDP from 1955 to 1970), the cost of such a pattern of economic growth became evident in the mid-seventies, when the accumulated external disequilibrium became a serious obstacle to economic growth, leading to a devaluation of the Mexican peso in 1976.[6]

The oil discoveries of the mid-seventies, however, allowed the country to postpone the correction of the accumulated disequilibria. As a result of the huge revenues obtained from oil

[5] A SAM focusing on the public sector in Mexico was constructed by Pinskovic and Trevino [1985], for the year 1975.

[6] While the external disequilibrium became the main obstacle to economic growth, several other unsuccesses were created during these years, among which a serious regional disconnections and a maldistribution should be mentioned.

exports, and the abundance and easy availability of foreign borrowing, the country was again in a position to grow without having to resort to major economic adjustments, thus postponing, once again, many decisions usually imposed by the trade-offs that a high economic growth rate implies.[7] Government expenditures grew very quickly so that by 1979 the deficit of the public sector as a proportion of GDP had reached 7.3 percent, jumping to 14.5 percent in 1981 (Banco de Mexico [1983]). Because of the abundance of resources, the government was able to keep the prices of several publicly produced commodities down, in an attempt to combat inflation, 'favour' some groups of the population, and 'promote' industrialisation.[8] At the same time, while it was intended that commercial policy would be changed after the devaluation of 1976, it essentially remained the same, and so did the exchange rate policy. As a result of the overheating of the economy imports increased substantially, while exports were not helped by the exchange rate. The external disequilibrium became a severe problem once again.

This situation was to change dramatically, however, in the 1980s. With the sharp reduction of the oil price and the squeeze on foreign borrowing in the international markets, Mexico found itself incapable of continuing to grow without correcting its major disequilibria, especially the external imbalance. The economic policy in recent years has, in contrast, been oriented towards a much more realistic scenario, in which programmes of structural adjustment aimed at correcting the several sources of distortions.

Remarkable changes have been carried out recently, particularly in the areas of trade liberalisation and the reduction of the public sector deficit. As a result, in 1989 less than 20 percent of the value of imports is now subject to any form of quantitative restrictions. Likewise, after several decades of deficits, the public sector has recorded primary surpluses every year since 1983. This has been achieved through expenditure reductions and increases in public sector reve-

[7] The rate of growth of real GDP was 8.2 percent in 1978 and 9.2 percent in 1979 (Banco de Mexico [1983]).

[8] Paradoxically, such a policy induced inflationary pressures, since it led to deficits in many PEs, which in turn had to resort to transfers from the treasury, hence increasing the size of the public deficit and consequently exerting pressures on the money supply.

nues, generated by fiscal reform and adjustments in public sector pricing policies.

Regardless of the eventual success or failure of such a programme of structural adjustment, this scenario provides an excellent opportunity to apply our methodology. Indeed, the whole process of economic growth since the forties, led the Mexican economy to a very distorted scenario. Not surprisingly, the relative price structure of the Mexican economy has been characterised as a 'major source of disequilibria in both microeconomic resource allocation and macroeconomic aggregates' (see Serra (1986)).

Public pricing and commercial policy have both played a major role in this situation. Public prices determine, to a great extent, the size of the public deficit and, at the same time, they influence the absolute price level as well as the relative price structure, particularly when -as in the Mexican case-, PEs are involved in the provision of raw materials and intermediates of general use, such as petroleum and electricity. Likewise, tariffs (and quantitative restrictions) affect domestic prices not only by allowing domestic producers to charge higher prices, but when the affected commodities are intermediates, the effects are spread over the whole production structure.

Therefore this thesis focuses on public pricing policy and performance, as well as on commercial policy. Basically, the purpose of the model is to carry out several policy experiments by simulating different pricing policies and changes in efficiency levels of public activities, in order to ascertain how the relative price structure is affected and what the effects on the reallocation of resources are by looking at changes in the value added of the different production activities. In the same spirit, some additional experiments are intended to calculate levels of ERP, induced by the nominal protection structure. Some very important results emerge from these exercises.

The policy of regulating public prices has benefited all production activities but, especially, it has benefited those industrial activities producing capital goods and intermediates which, paradoxically, are not the most efficient in terms of their comparative advantage. Such a result is

reproduced when we look at the ERP, suggesting that the whole protection structure has been oriented to the benefit of the sectors mentioned above.

Another important result is that petroleum and electricity alone accounted for the bulk of price distortions caused by public sector pricing policies, hence suggesting that the remaining public activities are not very involved in the production of intermediates. It is interesting to note that despite the large number of PEs in 1980, our base year, only two PEs cause the bulk of the distortions arising from public pricing policy.

More generally, and interpreting the results of public pricing and commercial policy together, it can be said that, with the exception of the public activities petroleum and electricity, the main cause of distortions come from protection accorded to private activities by means of high levels of protection to manufactures, whereas public pricing policy affects mainly non traded goods, most of which are final consumer goods. That is not to say that public activities producing intermediates other than petroleum and electricity do not produce distortions, but rather that their effects are on a relatively small scale.

From the methodological perspective several important points also emerge. First, trade elasticity values and different assumptions regarding the pricing behaviour of public activities have shown to be important in terms of the resulting relative price structure. Second, our approach generalised the analysis of ERP in that the traditional estimates build on a particular version of our model viz the case in which market shares between domestic production and imports are constant. In our model it is no longer necessary to assume that domestic and international goods are perfect substitutes. And thirdly, our SAM approach enabled us to analyse several sources of distortions of the price system together. In particular, in estimating ERP our model not only incorporated the effects of removing protection provided by commercial policy but also the effects of domestic indirect taxes. More generally, the whole issue of tax reform can easily be incorporated into the analysis. The contents of the thesis are as follows.

Chapter Two aims to serve as a historical background, concentrating on a brief review of the process of economic growth of the Mexican economy from the forties to the eighties. In particular, the focus of attention is on the industrialization process that took place in this period, and the analysis of the three main instruments of economic policy on which industrial growth rested: exchange rate policy, commercial policy, and direct government intervention through PEs. The aim of the chapter is to clarify how the use of these instruments of economic policy, while successful in the sense that high rates of economic growth were achieved, led to a very distorted price scenario.

Chapter Three is devoted to a review of the existing literature on some aspects related to public sector intervention in economies. Thus, in a first part we emphasise the theoretical developments related to the normative theory of public pricing policy as well as the more recent positive approach to the economic performance of PEs. Some additional comments are also made regarding alternative forms of regulation that affect the price structure, particularly commercial policy. In a second part we review the literature on the empirical analysis of the price system. However, since most of the existing studies addressing this issue are based on I-O models, we will review the study developed by Seade [1986], first because it will enable us to illustrate the underlying assumptions of the I-O approach to modeling, and secondly because it addressed issues similar to those considered in this thesis.

The data framework is set out in Chapter Four. As explained above, a consolidated SAM for I-O analysis for Mexico in 1980 was constructed. This chapter is therefore devoted to explaining in detail the methodology followed in its construction. This is done in several stages. For exposition purposes three SAMs are developed, starting from an aggregated version. Then, further disaggregations are made in order to reach a final SAM that will serve as a basis for modeling purposes.

The modeling of the price system is the subject of Chapter Five, which is presented in two main parts. The aim of the first part is to comment on the general characteristics of fix-price

models as a basis for analysing the price system, emphasising both their advantages as well as their limitations. In particular, we will briefly review some of the limitations imposed by the use of I-O models. In the second part, we set out our own model and see how some of the limitations of I-O models can actually be overcome.

Chapter Six focuses on the analysis of the results of some policy experiments on public sector pricing policy and performance of PEs. Two models are presented: in the first model, all production activities are assumed to follow the cost-plus pricing rule, and in the second model, public petroleum and electricity are assumed to face a regulated price by the government. In the last part we incorporate the effects on relative prices brought about by the removal of tariffs.

The analysis of commercial policy is undertaken in Chapter Seven, in which we concentrate on the estimation of ERP. In contrast to the previous chapter, in which the analysis centers on the public sector, this chapter focuses on the private sector since, as we shall see, commercial policy has been directed to the industrial sector of the economy, which is primarily operated by private agents. In the first part we discuss the concept of ERP and how it can be derived from our model. It will be seen that the traditional concept of ERP becomes a particular case of our model. In the second part, the results of our estimations of ERP are analysed.

Finally, Chapter Eight offers some concluding remarks, discusses the limitations of our approach, and comments on possible extensions for future research.

CHAPTER TWO

THE MEXICAN CONTEXT

2.1 Introduction

Mexico, like many other LDCs in Latin America, is a country where the degree of industrialisation, and more generally, the degree of economic growth has been achieved by following an inward-oriented policy, which relied heavily on high levels of protection in many areas of the economic activity.

Whilst successful in some respects, such a strategy created huge economic imbalances which, at the beginning of the eighties, became unsustainable, thus leading the country to its worst economic crisis in modern history. Contrary to the 'fiesta' of the second half of the seventies, which was the result of large revenues provided by oil exports and excessive foreign borrowing, the eighties have been characterised by a lack of economic growth and a continuous fall in the living standards of the population. Irrespective of the current debate as to what the best economic policy for the future is, it seems that there is a general consensus that the country can no longer rely on the high levels of protectionism that characterised the previous decades.

The state played a major role in this protectionist strategy both by intervening directly in the economy as an economic agent, and by providing the institutional framework to protect domestic producers from foreign competition.

The purpose of this chapter is to provide the historical background to this thesis, by analysing in some detail the role played by the state in the economic growth process, focusing on two main areas, namely, public sector direct intervention in the form of PEs, and commercial policy.

There exists an extensive and very well documented literature on the process of economic growth in Mexico over the past four decades and, therefore, we shall not rehearse the whole issue here.[1] Rather, the idea is to provide the necessary elements to characterise the role of the state in the industrialisation process, focusing on the distortions that its intervention created, which constitute the primary focus of this study.

The chapter is organised in the following manner. Section 2.2 is devoted to a general review of the period 1940-1985 and to a description of the main characteristics of the industrialisation process that took place in these years. Since exchange rate policy, direct public intervention, and commercial policy played a major and determining role in this process, they will be discussed in more detail in Section 2.3. Finally, Section 2.4 summarises the contents of the chapter and outlines the main features of the structural adjustment process on which the Mexican economy has embarked during the eighties, emphasising yet again, the role played by the state.

2.2 The Period 1940-1985

Mexico's modern economic history and, in particular, its industrialisation can be said to have begun in 1940. Although this period is usually seen as crucial, it followed a previous period characterised by the consolidation of political stability and the setting up of an appropriate institutional environment, after the end of the Mexican Revolution. Thus, during the decades of the 1920s and the 1930s various important measures were taken, including the creation of the Central Bank (Banco de Mexico) in 1925, and of several other financial institutions.[2] In addition, the oil, electricity and railway companies were nationalised, and, of no less importance, a land reform programme was implemented between 1934 and 1940.

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[1] See, for instance, Cardoso and Orive [1981], Hansen [1971], Ortiz Mena [1970], Solis [1970], Trejo [1987], and Villarreal [1976], among many others

[2] Banco Nacional de Crédito Agrícola [1926], Nacional Financiera [1933], Banco Nacional Hipotecario Urbano y de Obras Públicas [1934], Banco Nacional de Comercio Exterior [1934], and Banco Nacional Obrero y de Fomento Industrial [1937].

After these years of political and institutional consolidation Mexico entered a period of high rates of economic growth that would last for four decades. Table 2.1 shows annual average rates of growth of real GDP for the whole period, both at the aggregate and at the sectoral level. As can be seen, until 1980 GDP grew, on average, above 6 percent. From 1980 onwards the economy entered a period of crises which led to a sharp reduction in the economic growth rate registering negative rates of growth of real GDP in 1982 and 1983.[3]

Table 2.1
Growth Rates of Real GDP

SECTORS	1941-52	1950-70	1970-75	1975-80	1980-85
GDP	6.5	7.2	6.5	6.6	1.6
Agriculture	5.0	4.9	2.9	3.9	2.6
Mining a)	0.8	3.5	5.8	12.6	4.7
Petroleum	6.2	8.9	+	+	+
Manufactures	8.0	8.6	7.6	7.5	0.2
Construction	6.1	6.1	8.2	7.1	-3.4
Electricity	6.5	11.3	9.8	8.8	6.2
Transport	7.8	9.2	12.8	10.9	1.1
Commerce & Services	7.3	7.9	6.9	6.7	-1.1
Government & Other Services	7.6	6.5	9.0	6.6	4.5

Source: The periods 1941-52 and 1950-70 were obtained from Trejo [1987], p. 29. The subsequent periods are estimates based on National Accounts [1987].
a) After 1970 it includes basic petroleum.

Such high economic growth rates were accompanied by and indeed brought about sharp changes in the productive structure of the economy. For instance, the agricultural sector, whose contribution to GDP in 1940 was 23.1 percent, reduced its participation to 8.9 percent in 1980, while the industrial sector went from 21.4 percent in 1940 to 35.1 in 1980 (see Table 2.2).

[3] Such growth rates of real GDP were -0.5 percent in 1982 and -2.9 percent in 1983 (estimates based on National Accounts [1987]).

Table 2.2
GDP Structure

SECTORS	1940	1950	1960	1970	1978	1980	1985
GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	23.1	21.3	17.4	12.6	10.2	8.9	9.5
Industry	21.4	24.4	27.7	33.5	37.2	35.1	34.8
Services	55.5	54.3	54.9	53.9	52.6	56.0	55.7

Source: From 1940 to 1978, Boirvinik and Hernandez [1981], p. 464. The years 1980 and 1985 were estimates based on National Accounts [1987].

An almost inevitable consequence of the rapid and, as will be seen, induced industrialisation process, was the concentration of economic activity in very few urban areas. This situation, combined with a very high rate of population growth transformed the country from a predominantly rural economy in the twenties and thirties, into a primarily urban society in the seventies. Table 2.3 shows, for instance, that while in 1940 only 30 percent of the population lived in urban areas, by 1980 this proportion had risen to more than 65 percent.

Table 2.3
Population (1921-1980)
(Thousands)

YEAR	TOTAL POPULATION	ANNUAL GROWTH RATE	URBAN POPULATION*	SHARE OF URBAN POPULATION (%)
1921	14,435	-0.5	4,440	30.1
1930	16,653	1.6	5,542	33.3
1940	19,654	1.7	5,901	30.0
1950	25,791	2.8	11,149	43.2
1960	34,923	3.1	18,185	52.1
1970	48,256	3.8	29,128	60.4
1980	66,847	3.3	44,110	66.0

* A town with more than 2,500 inhabitants is considered as urban.

Source: Trejo [1987], p. 43.

Indeed, the whole process of economic growth was to be determined and defined by the industrialisation objective, which became the primary concern of the government and which ultimately defined the quantitative and qualitative degree of economic development.

The process, however, was not uniform, but went through different stages which are often identified by the degree of import substitution reached by the country at different points in time. It has become almost a standard approach to identify three periods, each of them with its own peculiarities. A first period is broadly defined between 1935-40 and 1954, which is characterised by erratic economic growth rates, currency devaluations and price instability. A second period, lasting from 1955 to the end of the seventies, is known as the 'stabilising development' period. And finally, a third period, from the beginning of the seventies onwards, when many of the economic imbalances accumulated in the previous years started to become obstacles to the economic growth. Let us then briefly refer to these three periods.

2.2.1 1940-1954

The forties marked the beginning of the industrialisation of the country. We have seen that in the two previous decades some important measures were taken in order to set up an appropriate institutional and political environment for the industrialisation of the economy to take place. It was the international situation, however, with the Second World War, that actually triggered the industrialisation process. On the one hand, although export markets had been depressed in the previous years, the fact that the main industrial countries were engaged in a war increased the demand for Mexico's products, so that export markets opened up and hence export revenues and purchasing power increased.[4] On the other hand, the scarcity of available imports from industrial countries obliged domestic producers to initiate a more generalised process of import substitution, which had until those years concentrated on consumer goods.[5]

[4] Between 1939 and 1945 total exports doubled. Textiles, which represented less than 1 percent of exports in 1930, went up to 20 percent in 1945. Food processing, beverages, tobacco, and chemicals, whose participation in exports were negligible in 1930, represented 8 percent in 1945 (see Vernon [1963]).

[5] "Though the scarcity of industrial machinery prevented any large investments in equipment, it was still possible to improvise in many ways. Textile plants throughout the country went from a one-shift to a three-

Thus, the international environment created favourable conditions for the import substitution process to begin. For it to be a permanent process, however, it was necessary to adopt an explicit policy at the domestic level, encouraging national producers to "continue in the line", once the war was over. Indeed, a no less important element in explaining import substitution was the clear and firm decision on the part of the state to industrialise the country, at any cost. Two main areas of public intervention are particularly characteristic of this period.

First, in the forties trade policies started to acquire an evident protectionist purpose. During the twenties and thirties, import duties and tariffs were used mostly for revenue collection purposes. Thus, for instance, in 1930 trade duties and tariffs represented 37 percent of total federal revenues (see Story [1986]). From the forties, however, a radical change in trade policy took place, so that tariffs and trade controls in general started to be used for the purpose of protecting particular industries from foreign competition.

Secondly, in its attempt to industrialise the country, the state began to intervene directly in the economy, which in this period concentrated on investment in basic infrastructure. The next section will analyse these two points in detail. Here it will suffice to point out that in this period the state played a very active role in the construction of basic infrastructure. In the forties, for example, the state had control already over the so called strategic activities such as petroleum, electricity, transport and communications (specially rails), as well as credit for the promotion of agriculture (see Cabral [1981]).[6]

In general terms, however, the period was not stable. It was in fact characterised by price instability, erratic economic growth rates, and devaluations of the currency.[7] Essentially, the main difficulties were the presence of a budget deficit and investment in excess of savings. Thus,

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shift basis. Simple distilleries were set up to draw alcohol from sugar. Ingeniously devised machines produced various items for every day household needs." (Vernon [1963]).

[6] Between 1940 and 1944 more than 15 percent of government investment went to agriculture, 60 percent to transport and communications, and the remaining was split into electricity, petroleum, industrial products, and social services (see Cabral [1981], p. 80).

[7] The Mexican peso was twice devalued in this period, in 1948 and 1954.

it was argued by policy makers that a more stable environment was necessary , for which a fixed exchange rate was required. As suggested by Cardoso and Levy [1988], this period fortunately coincided with an era of uninterrupted economic growth in the rest of the world. It was, therefore, the beginning of an era of rapid and stable economic growth that would last until the end of the sixties. Such a period has often been referred to as the 'stabilising development' period.

2.2.2 1955-1970

The so called 'stabilising development' period, - also referred to as the 'Mexican miracle'-, was characterised, as suggested above, by low rates of inflation (3.8 percent a year on average) as well as stable and high economic growth rates (6.7 percent growth of real GDP, on average). In contrast to previous years, when import substitution took place mainly with consumer goods, in these years a new stage of the import substitution process began, concentrating mostly on intermediates and capital goods, since the substitution of consumer goods had, to some extent, already been covered.[8]

At the risk of over-simplification it can be said that, in essence, with the exception of the exchange rate, the economic policy did not change. That is, on the one hand trade policy not only continued protecting domestic producers but the number of commodities under protection increased substantially. Thus, for instance, while in 1956 25 percent of imports were subject to import permits, in 1965 60 percent of categories required licencing. On the other hand, the direct intervention of the public sector in the economy was spreading to new areas of the industry.

The new element in the economic policy during this period was the Government commitment to maintaining a fixed exchange rate, which kept its parity of 12.5 pesos per dollar from 1954 until 1976.

[8] Varesse [1983] points out that by the end of the fifties, less than a fifth of imports were consumer goods.

While the macroeconomic indicators behaved remarkably well in the period, the associated costs were, however, beginning to become evident. First, in a situation where resources are not precisely abundant, a fast expansion of industrial activities has to be achieved at the expense of another sector. The Mexican economy was no exception. Indeed, most of the resources within the economy were devoted to supporting and promoting industry, and, to a great extent, an important share came from the agricultural sector, whose role was to provide cheap inputs to the industrial activities. Thus, while in the fifties the agricultural sector was a net exporter and hence one of the main generators of resources from abroad, by the end of the sixties, and particularly during the seventies, it became a net importer.

Second, excessive dependence upon government measures to promote the industrialisation process meant that most industrial activities concentrated in very few geographical areas, which, together with a very rapid increase of the population, led to a marked regional disequilibrium.

Third, while the population increased its overall living standards, in terms of consumption, employment opportunities, and access to social services, the benefits of economic growth were not equally shared, leading to serious mal distribution of income. Moreover, it can be said that no explicit income redistribution policy existed in the period, since somehow it was assumed that the benefits of economic growth would eventually 'trickle down', once enough wealth had been created (see Trejo [1987]).

Finally, and most importantly, the high levels of protection granted to domestic producers, combined with a fixed exchange rate, led to the most severe imbalance -the external disequilibrium. On the one hand, exports became gradually less competitive not only because of the overvaluation of the currency but also because export activities themselves had not been promoted. On the other hand, while in its early stages the import substitution process led to saving of resources because imports were reduced, in subsequent years the multiplier effect of industrial growth meant that imports were to expand in large quantities.

Therefore, it became clear at the end of the sixties that efficiency and opportunity costs had not been taken into consideration. Domestic producers, given the excessive degree of protectionism in which they grew, were inefficient and hence unable to compete in the international markets, if such external disequilibrium was ever to be corrected. The industrial complexity, on the other hand, meant that as the country advanced in the import substitution process, more highly processed intermediates and more sophisticated capital goods were demanded, hence exerting pressures on the balance of payments. It was evident that fresh resources were necessary if economic growth was to be maintained. This was the scenario at the end of the sixties.

2.2.3 1970-1985

It was clear, at the beginning of the seventies, that the strategy followed had reached its own limits in the sense that the economy was unable to generate enough resources in order to maintain a permanent growth. It was also clear that the economy had to be more efficient and, in particular, that a much more dynamic export sector was necessary in order to generate the resources required by the industrial sector.

Yet, the economic policy of the seventies, in essence, remained unchanged. During the first half of the seventies the exchange rate continued to be fixed, even though there were pressures arising from inflation and balance of payments deficits. Accordingly, trade policy started to be used more for the purposes of solving balance of payments problems.[9] On the domestic side, the public sector increased its participation in the economy substantially, so that the proportion of public sector deficit to GDP went up from 3.0 percent in 1972 to 10 percent in 1975. (International Monetary Fund, International Financial Statistics [1987]).

The expansion of public sector spending, however, was made possible only by increasing foreign borrowing, which in nominal terms rose from 6,641 million of dollars in 1971 to 20,094

[9] In 1975 one hundred percent of imports were subjected to import licensing. (Cardoso and Levy [1988], p.355).

in 1975 (see Trejo [1987]).[10] Inflation continued to grow and capital flight increased substantially, with the result that a significant part of the contracted external debt actually ended up financing capital flight.[11] Finally, in 1976 the exchange rate was devalued after a period of 23 years during which the parity was 12.5 pesos per dollar; it went up to 15.4 pesos per dollar in 1976 and again to 22.5 in 1977.

Luckily for the government, the oil boom was about to begin in 1977. Once again it was possible to postpone the corrections of the major disequilibria. Revenues from oil exports increased substantially and so did foreign borrowing, which reached a level of 84,874 million dollars in 1982. Such a buoyancy allowed the country to register, again, very high rates of economic growth. Thus, for instance, the rate of growth of real GDP was 8.2 percent in 1978, 9.2 percent in 1979, 8.3 percent in 1980, and 7.9 percent in 1981. (Banco de Mexico [1983]). Public expenditures increased considerably and rapidly, so that whereas the proportion of public sector deficit to GDP was 6.8 percent in 1977, by 1981 it had reached 14.5 percent (ibid). As a result of the overheating of the economy and the again overvalued exchange rate, imports increased rapidly and exports became less competitive, with the result that the deficit of the current account of the balance of payments moved from a negative 1,596 million of dollars in 1977 to a negative 12,544 in 1981 (ibid).

The vulnerability of the economy to the huge external disequilibrium became evident when oil prices plummeted in the international markets in 1982. Since then the economy has hardly grown registering in 1982 and 1983 negative growth rates of real GDP of -0.5 and -2.9 percent, respectively.

After the 1982 crises Mexico declared itself unable to service its large foreign debt and, since then, the country has embarked on a programme of adjustment in an attempt to correct the major economic imbalances and liberalise the economy by gradually removing several sources of

[10] Of this figure, in 1975, 14,648 were public debt and 5,643 private. (Trejo [1987]).

[11] According to Cardoso and Levy [1988], the errors and omissions item in the balance of payments jumped from a negative 479 million of dollars in 1974 to a negative 2,996 in 1976 (p. 350).

distortions. The characteristics of these changes will be dealt with later. To end this section, however, it is useful, by way of summary, to make explicit mention of the three major instruments of economic policy that have prevailed over the past four decades, and that served as mechanisms for concentrating resources in the industrial sector. These are exchange rate policy, commercial policy, and direct public sector intervention. In the following section we will discuss these three mechanisms, focusing particularly on the last two, since they constitute our purpose of study in this thesis.

2.3 Economic Policy

2.3.1 The Exchange Rate

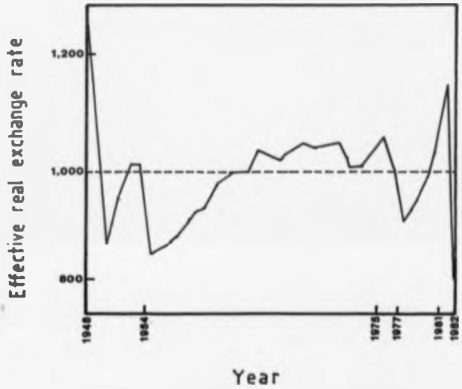
An important mechanism of economic policy used to favour the industrialisation of the economy was the exchange rate. As has already been noted, the nominal exchange rate was kept fixed for a period of 23 years, from 1954 to 1976, at a parity of 12.5 pesos per dollar and then, from 1977 until 1981 its nominal value changed very little. Obviously, since inflation was permanently higher than in the United States, which is the country's main commercial partner, the result was a persistent appreciation of the Mexican peso in real terms.[12] Figure 2.1 shows the effective real exchange rate, defined as the ratio of domestic to foreign prices of main trade partners, between 1948 and 1982. As can be seen, in twenty years between 1955 and 1975 the real exchange rate appreciated slowly but continuously (see Cardoso and Levy [1988]).

This exchange rate policy clearly benefited some groups and damaged others. First, sectors which were traditionally generators of external resources in the first half of the century, such as agriculture and mining, were severely affected, suffering large reductions of their export volumes. This was particularly true of agriculture. Secondly, since imports become cheaper when the exchange rate overvalues, in the case of Mexico, the most favoured groups were those who

[12] According to Reynoso [1983], in the sixties and seventies wholesale prices rose by 32 percent in Mexico and by 10 percent in the United States

Figure 2·1

EFFECTIVE REAL EXCHANGE RATE IN MEXICO. 1948-82



imported intermediates and capital goods in large quantities. In contrast, imports of consumer goods were largely reduced by means of import permits and tariffs.

Therefore, the industrial sector not only benefited from the availability of cheap imported intermediates and capital goods, but also from a protected domestic market since competition from abroad was ruled out by the imposition of trade barriers, whenever domestic production existed. This last point takes us to the second major mechanism used for concentrating resources in the industrial sector -namely, commercial policy.

2.3.2 Commercial Policy

The evolution of commercial policy in Mexico can be analysed with reference to the stages of the industrialisation process. From the twenties until the mid forties trade policy was essentially used for tax collection purposes. During this period Mexico enjoyed a current account surplus and, therefore, balance of payments problems did not constitute an important element in the objectives of commercial policy.

However, by the 1940s, balance of payments considerations and industrial promotion started to play a role in the implementation of commercial policies. In 1947, several important modifications were carried out, among which the most important were the introduction of specific quotas and *ad valorem* duties, levied on the basis of 'official prices', that differed from the prices at which trade actually took place (see Bueno [1971]). While industrial promotion was gaining importance, during the forties and until the middle of the fifties balance of payments problems determined, to a great extent, the course of commercial policy. This occurred because, as has been noted, strong pressures on the balance of payments were present during those years, which led to two currency devaluations.

From 1955 until the beginning of the seventies, however, commercial policy played a key role in promoting the industrialisation of the country. As already mentioned, this period coin-

cided with the so-called 'stabilising development' period, and the role of trade policy was to create an environment for industrial growth, basically by providing an umbrella for domestic producers in an attempt to cover them against foreign competition.

Unlike other Latin American countries where a similar process took place, Mexico was to rely more heavily on the use of direct controls, particularly import permits, as opposed to tariffs, although, formally, commercial policy measures were made up of a combination of the two.

Indeed, from the forties direct controls in the form of import permits became the cornerstone of protection policy, and extended throughout the period to cover an increasing number of items. Thus, for instance, while in 1956 33 percent of import categories required import permits (28 percent in value terms), in 1973 the number of categories subject to licencing represented 80 percent (64 percent in value terms). This is shown in Table 2.4

Table 2.4
Properties of Import Categories Controlled

YEAR	1956	1962	1966	1970	1973	1975	1977	1978	1979
Controlled (%)	33.0	44.0	60.0	65.0	80.0	100.0	77.4	43.4	31.1
Free (%)	67.0	56.0	40.0	35.0	20.0	0.0	22.5	56.5	68.9
YEAR	1980	1981	1982	1983	1984	1985	1986	1987	-
Controlled (%)	23.9	26.4	100.0	78.7	64.7	10.3	7.7	6.1	-
Free (%)	76.0	73.5	0.0	21.2	35.3	89.6	92.2	93.9	-

Source: Balassa [1983], p. 800, and Comercio Exterior [1987].

It is important to note that although trade policy in Mexico has formally been based on a combination of tariffs and import permits, the fact that the latter is heavily used makes tariffs superfluous, as far as the protection effect is concerned.

It is also interesting to consider that although 37 criteria had to be satisfied to grant an import licence, in practice, two criteria were the most relevant:

(a) Is the commodity produced in the country?

(b) Is it produced in sufficient amounts to supply national needs?[13]

These criteria, being the central ones, reveal the explicit emphasis placed on the idea of protecting domestic producers in order to achieve some degree of industrialization. It also suggests that those criteria concerned with efficiency and opportunity costs were most certainly not in the mind of policy-makers.

As expected, the actual levels of protection were concentrated on manufactures. Table 2.5 shows an aggregated version of the effective rates of protection for the years 1960 and 1970.

Table 2.5
Effective Protection in Mexico, 1960 and 1970

	Effective Rates of Protection	
SECTOR	1960	1970
Primary	2.7	-2.7
-Agriculture, Livestock, -Forestry and Fishing	3.0	-1.4
-Mining	-0.3	-12.3
Non-Durable Consumer Goods	21.6	31.6
Intermediate Goods	13.2	16.8
Durable Consumer and Capital Goods	64.6	77.2

Source: Kate and Wallace [1980], p. 135.
Note: Based only on tariffs, not quantitative restrictions.

One of the associated costs of these high levels of protection, as noted, was a permanent loss of competitiveness in the export markets. Not surprisingly, during this period manufactured exports rarely accounted for more than 25 percent of total exports. Likewise, export of primary commodities showed a very poor performance. Thus, for instance, while non-ferrous metals accounted for 15 percent of total exports in the period 1955-57, this proportion shrank to 4 percent in the period 1970-1972. More generally, primary exports increased, altogether, by only 2

[13] See Kate and Wallace [1980], pp. 44-45.

percent during the sixties, whereas these exports rose by 16 percent in Korea and 18 percent in Taiwan, countries which followed an outward oriented policy (see Balassa [1983], p. 801).

We have seen that during the 'stabilising development' period the primary concern of commercial policy was to protect the domestic industry. In the seventies, however, balance of payments considerations regained importance since, as has already been suggested, the external disequilibrium accumulated during the previous years was becoming the main constraint to economic growth. Not surprisingly during the seventies commercial policy was very erratic.

Indeed, during the first half of the seventies the system of protection was reinforced. In 1975, import permits were extended to all import categories. After the devaluation of the currency in 1977, and the oil discoveries that took place in these years, an attempt was made to reduce the levels of protection since balance of payments problems were not a serious limitation any more, and somehow it was clear that some openness of the economy was necessary. In this event, the proportion of commodity categories subject to import permits was reduced from 77.4 percent in 1977 to 34.1 percent in 1979. These changes were accompanied by a rise in tariffs, which were supposed to be temporary, so that eventually they would fall gradually. This, however, did not happen, mainly because of the overvaluation of the currency and the imminence of the economic crises of the eighties. Thus, by 1982, all import categories were subject to the licencing mechanism once again (see Table 2.4)

As can be seen from Table 2.4, after 1982 the proportion of import categories subject to permit has been falling dramatically. We will see later that the process of trade liberalisation in the eighties appears to be permanent, not only because of the reduction on the categories subject to any form of control but also because of the adhesion of Mexico to the GATT in 1986. We will come back to this point later. Meanwhile, it should be underlined that as far as the previous decades is concerned, it seems that the main role of commercial policy was to protect domestic producers, in an attempt to industrialise the country at any cost.

2.3.3 Direct Public Sector Intervention

A third major mechanism of economic policy to promote the industrialisation of the country was, undoubtedly, the direct participation of the public sector as an economic agent, mainly in the form of public enterprises (PEs).

We have already mentioned that in the twenties and thirties some important institutions were created, mainly financial institutions, which were aimed to promote and finance the development of basic infrastructure. Of these, perhaps the most important was the creation of the National Development Bank (NAFINSA) in 1933, which subsequently participated in the creation of many PEs. Likewise, in the thirties three major corporations were nationalised: the oil enterprise (PEMEX), the electricity company (CFE), and the National Railways.[14]

Thus, at the beginning of the forties the state already had control over the so called strategic industries. It was not, however, until the mid-forties and after that public investment started to expand in a significant way and with it, the creation of PEs. Table 2.6 shows the evolution of public sector expenditures in Mexico, and the share that PEs took.

[14] In the commercialisation of staple products the state started to intervene in the seventies through a major corporation called CONASUPO.

Table 2.6
Public Sector Expenditures, Mexico.

YEAR	A TOTAL PUBLIC SECTOR SPENDING	B PUBLIC ENTERPRISES	B/A (%)
1895	1,622	0	0
1900	1,924	0	0
1905	2,903	0	0
1910	1,782	0	0
1925	2,874	296	10.3
1930	3,108	300	9.7
1935	3,660	320	8.7
1940	5,195	822	15.8
1945	6,392	1,178	18.4
1950	10,305	3,197	31.0
1955	13,551	3,392	25.0
1960	24,097	8,499	35.3
1965	39,948	14,343	35.9
1970	55,378	19,202	34.7
1975	98,890	31,241	31.6
1980	162,971	69,263	42.5
1981	1,182,200	430,400	36.4
1982	2,829,300	705,300	24.9
1983	4,468,200	1,171,500	26.2
1984	6,746,600	1,833,400	27.1
1985	11,783,800	3,023,800	25.6
1986	22,799,700	4,292,200	18.8

Source: From 1895 to 1980, Story [1986], p. 42. From 1981 onwards are own estimations based on International Monetary Fund, Government Finance Statistics [1988].

Note: From 1895 to 1980 million of pesos of 1960. 1980 to 1986 current values.

As can be seen, in the twenties and thirties PEs started to participate in the expenditures of the public sector, and from 1940 onwards their participation increased steadily (with the exception of 1955) to reach as much as 42.5 percent in 1980. From 1980 onwards the proportion started to decrease, which is a reflection not only of the privatisation programme that was implemented after 1983 but also of the fact that after this year an increasing proportion of total public expenditure was devoted to service the foreign debt. We shall come back to this point in the next section.

The allocation of public sector expenditures, however, was not constant. Its variation reflects the stages of economic growth of the country. Thus, in the forties and fifties the bulk of public sector investment was devoted to building up basic infrastructure (mainly transportation),

whereas in the sixties and seventies the industrial sector took the major share. This is explained by the expansion of PEs into the production of basic raw materials. Table 2.7 illustrates this point.

Table 2.7
Sectoral Allocation of Public Investment - Mexico

Sector	Public Investment (%) 1940-49	1950-59	1960-68	1969-72
Agriculture	18	15	9	13
Industry	14	30	39	37
Transportation	54	39	26	22
Social Benefit	12	14	23	26
Administration & Defense	2	2	2	2
TOTAL	100	100	100	100

Sector	Public Investment (%) 1973-76	1977-79	1980-82	1983-86
Agriculture	18	21	12	13
Industry	34	43	41	35
Transportation	23	14	17	16
Social Benefit	23	20	28	34
Administration & Defense	2	2	2	2
TOTAL	100	100	100	100

Source: From 1940 to 1979, Story [1986], p. 44. From 1980 to 1986 are own estimations based on International Monetary Fund, Government Finance Statistics [1988].

It should also be stressed that, although the tendency of public sector investment has been to concentrate on industrial promotion, it has always played an important role in the provision of social services, such as education and medical health.

The reasons for the active participation of the public sector in the Mexican economy are not difficult to find and, as in many developing countries, have more to do with the promotion of economic growth than with ideological considerations. In the particular context of the Mexican economy it can be said that, in most cases, the presence of PEs is explained by the absence of private investors willing to embark on projects that require huge initial investment and are characterised by long gestation periods. While this can be said to be the main reason, there are

several other explanations. Ray (1987), referring to Mexico, suggests some additional causes: national security considerations; the rescue of private firms from bankruptcy; the provision of basic goods to some groups of the population; and, finally, the development of new technologies.

What seems clear, however, is the tendency of public sector investment to concentrate in industrial activities. It is then interesting to take a closer look at the way in which the participation of the public sector in the industry is structured. Before that, however, it is important to note that although the participation of the public sector in the Mexican economy increased permanently since it started in the twenties, during the seventies its expansion was particularly significant. Thus, for instance, until the end of the sixties the public sector deficit as a proportion of GDP was kept at relatively low levels: it averaged 1.4 percent from 1966 to 1971. However, after 1971 the deficit increased sharply; it was 10 percent in 1975 and reached 15.4 percent in 1982 (International Monetary Fund, International Financial Statistics [1987]). In particular, during the second half of the seventies, and as a result of the oil boom, the expansion of the public sector was very significant: the contribution of the public sector to GDP went from 14.6 percent in 1975 to 25.6 in 1983. Public firms accounted for a very high proportion of this expansion; they increased their participation in the GDP from 6.6 percent in 1975 to 18.2 percent in 1983 (Secretaria de Programacion y Presupuesto [1985a], Cuentas Nacionales del Sector Publico 1975-1985). It should be said that the oil sector alone represented a very high proportion; its contribution was some 14 percent of GDP in 1983.[14]

Keeping this in mind, let us move on and look at the participation of public firms in the industrial sector. The participation of the public sector in the industry is not difficult to characterise: it concentrates on the production of raw materials of very general use. Thus, almost half of the production of PEs is concentrated in the production of petroleum and petrochemicals, and is followed in importance by the production of other intermediates. Table 2.8 shows the structure of production of the public sector in terms of types of goods.

[14] The petroleum sector alone was responsible for 40 percent of the medium term debt of the Mexican public sector to commercial banks, during the oil boom years (see Bolanos et. al. [1986])

Table 2.8
Structure of Production of PEs in the Industrial Sector
(Percent)

GOODS	1970	1975	1981	1983
Non Durables Consumer Goods	9.7	10.5	16.6	15.6
Durables Consumer Goods	7.7	9.6	13.1	3.1
Non-Petroleum Intermediates	31.6	28.2	33.3	26.8
Capital Goods	3.4	3.2	3.9	2.8
Sub-Total (non petroleum prods.)	52.4	51.5	66.9	48.3
Petroleum and Petrochemicals	47.6	48.5	33.1	51.7

Source: Delgado et. al. [1986], p. 126.

In fact, it can be said that, to some extent, the production of PEs is concentrated in very few industrial classes. Delgado et. al. [1986] shows, for instance, what he calls the 'core of the paraestatal industry', where more than 80 percent of the production of PEs is located in eight industrial classes. This is shown in table 2.9.

Table 2.9
The Core of the Paraestatal Industry

PRODUCT	1970	1975	1981	1983
Sugar	4.9	3.8	6.2	5.1
Other Food Products	2.1	2.1	3.0	4.5
Petroleum and Derivatives	42.1	39.8	26.3	42.6
Basic Petrochemicals	5.5	8.7	6.8	9.1
Fertilizers	4.2	3.7	2.6	3.2
Iron and Steel	17.0	15.9	24.8	17.4
Automobiles	6.9	7.6	9.7	1.5
Transport Machinery & Equipment	2.4	2.2	2.3	1.7
Sub-Total Core	85.1	83.8	81.7	85.1
Total Industry	100.0	100.0	100.0	100.0

Source: Delgado et. al. [1986], p. 128.

The main characteristics of PEs in the industrial sector in Mexico are well described by Peres [1982] and Delgado et. al. [1986]. First, PEs have concentrated their production in intermediate goods; they represented 89.2 percent of such production in 1965, 79.9 percent in 1975, and 81.3 percent in 1983. Secondly, PEs are large, capital intensive, and concentrated in a few

sectors: approximately 80 percent of PEs' production in 1983 was concentrated in only twelve activities or industrial classes.[15] Thirdly, the productivity increase of PEs in the period 1965-1975 was below the increase in productivity in the manufacturing sector; the increase in the manufacturing sector was 4.6 percent while that of the parastatal sector was 3.0 percent.[16] Finally, the most important characteristic is that the general policy followed by PEs has been to hold prices down, in a deliberate attempt to subsidise economic activity. According to Peres [1982], in the period 1965-1975 price increases were lower in those activities in which the state participated than in the non-oil Mexican industry. Thus, for instance, the domestic prices of combustibles did not change for a period of 15 years, until 1974, and even after this increase, if prices are measured in dollars, the price increases were very low (see Table 2.10).

Table 2.10
Internal Prices of Petroleum Derivatives
(In Dollars per Gallon)

OIL PRODUCTS	1970	1974	1977	1978	1979	1980	1981	1982
-Diesel	0.09	0.15	0.11	0.11	0.11	0.16	0.16	0.39
-Petrol (Nova)	0.30	0.42	0.46	0.46	0.46	0.46	0.46	0.50
-Petrol (Extra)	0.36	0.60	0.66	0.66	0.66	1.13	1.13	0.75
NATURAL GAS								
-Industrial Sector	0.27	0.41	0.32	0.32	0.33	0.36	0.40	
-Residential Sector	0.27	1.58	0.96					

Source: Szekely [1983].

In general, as suggested by Trejo [1986], the policy followed by the group of PEs has been to subsidise the economic activity by keeping the prices of many publicly produced goods down. Trejo [1986] points out that rail transport, fertilisers, electricity, and iron and steel were among the more controlled prices in the seventies, and suggests that such a policy has meant large transfers of resources to the industrial sector.

[15] See also Villarreal [1986].

[16] This may be a reflection of the fact that PEs had been under some pressure to employ a greater proportion of the labour force, and of the fact that such productivity indexes are calculated as the ratio between gross output and number of workers employed (see Philip [1984]).

Moreover, it has often been the policy of the government to control inflation by holding down prices in the public sector. Philip [1984] stresses that this policy was particularly important in the period 1976-1982.

Finally, it should be noted that although a few large PEs, such as PEMEX (petroleum), CFE (electricity), National Railways, and SIDERMEX (iron and steel), account for a very large proportion of resources, the number of PEs increased very significantly in the whole period. Rey [1987] mentions that between 1940 and 1981 the state founded 111 enterprises that introduced 37 new basic products, was partner in 124 more enterprises in 35 of which it participated as a major shareholder, and 59 more were created by enterprises in which the state already participated (subsidiaries).

2.4 Summary and Conclusions

The analysis of the economic growth of the Mexican economy over the past four decades suggests that, although to some extent the country succeeded in achieving some degree of industrialisation, efficiency and opportunity costs were not taken into consideration.

In its attempt to develop the industrial sector, three major mechanisms of economic policy were used as a means of concentrating resources in industry: a fixed exchange rate, a clear protectionist commercial policy favouring manufactures, and a growing intervention of the public sector in the economy, whose role was to provide cheap inputs to the industry

Such a set of policies, while successful in promoting industrial growth, led to a very distorted scenario in which prices no longer reflected opportunity costs. Indeed, the relative price structure of the Mexican economy has been characterised as a major source of micro and macroeconomic disequilibrium.

Many economic imbalances were created during the past four decades such as a very marked regional disequilibrium, a very concentrated income in relatively few hands and, more

important, to the extent that it became the main obstacle to the economic growth in the seventies, the external disequilibrium.

The picture in the eighties has changed dramatically. With the second largest foreign debt in the developing world and most oil export revenues going to service this debt, Mexico has embarked on a programme of structural adjustment in an attempt to correct the major economic disequilibria.

Without entering into the discussion of the merits of such a programme, or of whether it has succeeded or not, it should be pointed out that major economic reforms have been carried out with the aim of liberalising several areas of the economy.

Thus, for instance, after several decades of public deficits, the public sector has recorded primary surpluses[18] every year after 1983 through reduction in public expenditure, adjustments in public sector pricing policies, and fiscal reform. Additionally, the structural reform of public sector enterprises has entailed divestiture programmes that have favoured public sector finances.[19]

As far as trade policy is concerned, after joining the GATT, a comprehensive external trade liberalisation programme has been carried out, the result of which is that by 1989 less than 20 percent of imports by value is subject to any form of quantitative restrictions (see International Monetary Fund, Survey [1989] and Table 2.4). Likewise, with the help of a programme of export promotion and an undervalued exchange rate, exports have increased substantially. In particular, it is interesting to note that non-oil exports, which in 1982 represented 23.6 percent of total exports, increased their participation to 59.2 percent in 1987.

It is perhaps too early to assess with certainty whether or not such structural adjustment programmes will succeed or not, particularly because of the macroeconomic constraints imposed by

[18] That is, once interest payments of the external debt have been discounted.

[19] It should also be mentioned that in 1988 the Mexican government set up the so called "pacto" (PECE), which essentially is a programme to control several prices in the economy. So far it has succeeded in bringing inflation down.

the huge external debt. However, it seems beyond doubt that some degree of liberalisation of the economy is required if Mexico is to maintain growth in future. Surely the effects will have far reaching consequences both at the micro and macroeconomic levels which deserve to be addressed.

CHAPTER THREE

A REVIEW OF THE LITERATURE

3.1 Introduction

The purpose of this chapter is to review the existing literature on public sector intervention in economies. Since we are particularly interested in the effects that PEs have on relative prices special emphasis will be put on the most relevant theoretical developments that focus on departures of price from marginal costs as well as the economic performance of PEs. Some additional comments will be also made regarding alternative forms of regulation. In the last part some comments will also be made regarding the empirical evaluation of price effects arising from public sector intervention.

The exposition is organised as follows. In Section 3.2 we look at the main theoretical reasons why prices usually deviate from marginal costs in PEs. This section will cover the classical theoretical developments on normative issues concerned with public sector pricing policy. In recent years, however, a growing literature has flourished, shifting its focus of attention from normative to positive issues, emphasising the role of economic performance of PEs, and arguing that inefficiency is a very common cause of distortions created by PEs. We shall therefore devote Section 3.3 to highlighting the most relevant elements of this approach. Section 3.4 focuses on a different source of distortions of the price structure, namely commercial policy. Finally, in Section 3.5 some comments will be made on the existing literature addressing the empirical analysis of price effects arising from taxation and public pricing policy.

It should be mentioned that rather than attempting an exhaustive review of the literature, we shall outline the main theoretical points that are directly relevant to this thesis. From that perspective, it should be clear that we leave out many sources of distortions of the price system which,

though relevant, go beyond the scope of the study. Thus, for instance, the effects of indirect taxation will not be discussed directly although, as it will be seen at various points of the exposition, the theoretical analysis of deviations of price from marginal costs resembles to the results of the theory of optimal indirect taxation.

3.2 Deviations of Prices From Marginal Costs

Perhaps one of the most standard results in economic theory is that in a competitive environment firms should determine their level of production at the point where prices are equal to marginal costs. Such a result guarantees that the economy as a whole is at its optimum.

In a partial equilibrium framework the marginal cost pricing rule ensures that total surplus of both consumers and producers are at their highest values. Figure 3.1 illustrates this point.

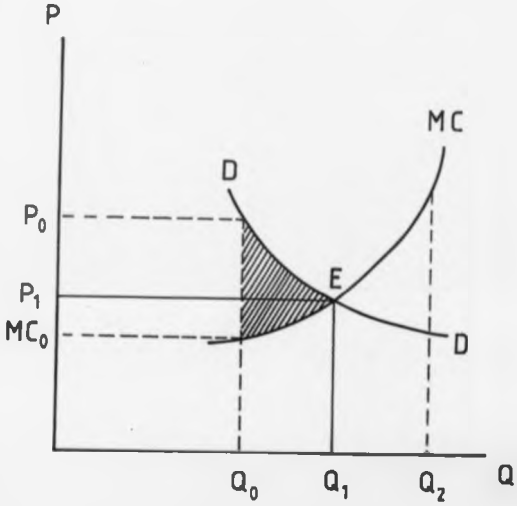
The supply curve is depicted by MC which also represents marginal cost, whereas DD describes the demand curve. It is clear that the equilibrium point is E, where price equals marginal cost. Any other point would result in an efficiency loss. At the very intuitive level, starting from Q_0 an increase in the level of production would increase utility of consumers by an amount P_0, which is higher than it costs to the economy, MC_0. At this point the inefficiency loss is measured by the shaded area i.e. the so-called deadweight loss. Such a situation would prevail until production level reaches Q_1 where price equals marginal cost and the deadweight loss vanishes. By the same token, any point beyond Q_1, say, Q_2, is not optimal because it would be unprofitable for firms to produce since, at this point, marginal cost would be greater than price.

In an slightly more formal way, if $p = p(q)$ denotes the inverse demand function, the standard measure of consumer benefit, B, in a partial equilibrium analysis is the integral under the demand function

$$B(q) = \int p(q)\, dq \tag{3.1}$$

Figure 3·1

MARGINAL COST PRICING



If short-run marginal cost measures social cost then net social benefit, $S(q)$, is simply

$$S(q) = B(q) - C(q) \tag{3.2}$$

which, when maximised with respect to q yields

$$p(q^*) = MC \tag{3.3}$$

where q^* denotes the optimal level of output.

Equation (3.3) is our famous marginal cost pricing rule. It will also be our starting point.

As is well known, the rule, when applied in an economy in which public production takes place has generated a great deal of controversy. Essentially, the reason is that many PEs belong to the category of the so-called natural monopolies in which, because of the presence of increasing returns to scale, long-run average cost is decreasing and hence marginal cost is lower than average cost. It follows that pricing at marginal cost in these industries would require them to operate with losses. Despite this consideration Hotelling [1938] supported the marginal cost pricing rule for PEs arguing that whenever industries operated under decreasing costs the resulting deficit ought to be covered by lump-sum taxation.

It was soon recognised, however, that there is very limited capacity, in practice, to raise and redistribute income via lump-sum taxation. In particular, it is often argued that the basic difficulty with lump-sum taxes is that the information on which differential taxes would be based is not observable or, if observable, is costly to obtain. An additional complication is that individuals have no incentive to reveal the relevant information (see Atkinson and Stiglitz [1980], p. 357). Accordingly, the subsequent literature concentrated on how to maximise welfare under such a constraint. This is the well known second best approach, originally formulated by Lipsey and Lancaster [1956].

It was Boiteux [1971] who formalised the ideas of the second best approach in the context

of public pricing policy. Given the difficulties of covering deficits by means of lump-sum taxation, Boiteux reformulated the problem so that the question became: "What are the optimal departures of price from marginal cost subject to the constraint that nationalised industries should break even in a world where lump-sum taxation is ruled out ? He found what he called a vector of "fictitious prices", that is, those prices that guarantee the smallest welfare losses.

More generally, the so-called Ramsey-Boiteux pricing scheme sets a number of rules to be followed in a situation in which PEs are allowed to make a determined level of profits which may be a positive level of profits, or losses, or, as in the Boiteux model, a break even position. Essentially, what all these scenarios have in common is that deviations of prices from marginal costs will be determined by two elements: (a) the predetermined level of profits (losses) in the budget constraint, in such a way that, the higher the level of profits (the lower the level of losses) the greater the deviations of prices from marginal costs; and (b) on the demand side, the elasticities of demand should determine which products are going to be priced higher; the more inelastic the demand for a particular product the higher the price charge while for products with high elasticity of demand prices should deviate very little from marginal costs.[1]

To see this result we can reformulate our problem of maximising S, as in (3.2), but now for the group of public firms[2]

$$S = \sum_i B_i(q_i) - \sum_i C(q_i) \tag{3.4}$$

subject to the constraint that profits should be greater or equal than a predetermined value, R,

$$\sum_i (p_i q_i - C_i(q_i)) \geq R \tag{3.5}$$

[1] A very complete and detailed review of the theory of pricing policy of PEs is in Ben [1986]. See also Marchand et. al. [1984] and Cassanis [1982]. An historic review on this issue is in Rosenzol and Bradford [1970].

[2] See Ross [1976].

Then, necessary conditions are

$$p_i - C_i' + \lambda \left[p_i + \sum_k q_k \frac{\partial p_k}{\partial q_i} - C_i' \right] \tag{3.6}$$

$$\sum_i (p_i q_i - C_i(q_i)) - R \geq 0 \; ; \; \lambda \geq 0 \quad : \quad \lambda \left[\sum_i p_i q_i - C_i(q_i) \right] = 0 \tag{3.7}$$

where $i = 1,\ldots,n$, and the demand function is specified as the inverse, $p_i = p_i(q_1,\ldots,q_n)$. It can be shown that

$$\frac{\partial S}{\partial R} = -\lambda \tag{3.8}$$

where λ gives the marginal welfare cost of a tightening of the profit constraint. Then, rearranging (3.6) gives our new pricing rule

$$p_i - C_i' = \frac{-\lambda}{1+\lambda} \sum_k q_k \frac{\partial p_k}{\partial q_i} \tag{3.9}$$

That is, deviations of prices from marginal costs depend on both the value of the profit constraint and demand. For analytical purposes equation (3.9) can be further simplified if we assume demand independence so that $\partial p_k / \partial q_i = 0$, $i \neq k$. Then

$$\tau_i = \frac{p_i - C_i'}{p_i} = \frac{-\lambda}{1+\lambda} \frac{q_i}{p_i} \frac{dp_i}{dq_i} = \frac{1}{\varepsilon_i} \tag{3.10}$$

where ε_i is the price elasticity of demand, and τ is the rate of divergence between price and marginal cost.

As can be seen, the extent of the divergence of price from marginal cost is inversely related to the elasticity of demand, which looks very intuitive result since it suggests that the more inelastic the demand for a commodity is the easier it would be for a PE to set a higher price, minimising, at the same time, the distorting effects.

This result is, as a matter of fact, the same that Ramsey [1927] postulated for the problem of optimal taxation. All we need is to interpret the divergence between price and marginal cost as a tax, t_i, and the profit constraint should be seen as the revenue constraint of the government. Then, the traditional Ramsey rule applies. Notice the similarity of the problems of pricing policy and optimal taxation. In particular, if we think that an optimal taxation policy is applied throughout the economy, PEs prices will be determined as a part of this and hence there would not be separate PEs pricing policies.

In practice, however, even though the problems of optimal taxation and public pricing look very similar, in the former case there is only one general budget constraint whereas in the problem of public prices each PE faces a particular budget constraint so that the relation between a particular PE and the government becomes relevant (see Atkinson and Stiglitz [1980], p. 460). Nevertheless, we should bear in mind the similarity because, as will be seen in the last part of this chapter, for the purpose of addressing the empirical analysis of the price system deviations of prices from marginal costs can be treated as a form of indirect taxation.[1]

Marginal cost pricing in industries operating with decreasing costs would lead to losses since marginal cost is below average cost. One obvious solution to this problem is to price at average cost. However, in those cases where demand is insufficient in relation to costs, even average cost pricing would lead to losses.

A usual way to deal with this problem is to impose a multi-part tariff pricing policy. The most common case is the two-part tariff system, whereby customers pay a fixed amount for the right to buy, and a variable amount, which depends on the quantity consumed. Thus, two costs are present: a variable cost which essentially reflects the marginal cost of producing, and a fixed cost to recoup the resulting deficits. Such a system is essentially a discriminating lump-sum tax which is welfare optimum. Telephone and electricity are typical examples of this two-part tariff

[1] The complementarity between public pricing policy and taxation was addressed by Diamond and Mirrlees [1971]. Their results were somewhat similar to Boiteux's but the approach was more complete in so far as Diamond and Mirrlees introduced the budget constraint.

system (see Brown and Sibley [1986], Oi [1971], and Ng and Weisser [1974]).

It should also be noticed that marginal cost pricing in a competitive environment does not necessarily lead to a public sector deficit, even if natural monopolies are present. This may be because if all PEs price at marginal cost some of them may end up making losses, while others may make profits. If the surpluses of the latter exceed the losses of the former, then there is no need to establish rules for deviating prices from marginal costs, provided inter-firm transfers within the government are achievable. This solution, however, deals only with the problem of the public sector deficit. Welfare considerations are absent. Furthermore, such inter-firm transfers are in practice difficult to achieve because public firms do not give up revenues easily (see Trivedi [1986]).

Remembering, however, that in many circumstances PEs are interrelated in the sense that they often buy products from one another, it is perhaps more realistic to recognise the common sense argument that it is pointless to make one enterprise achieve its profit target while ignoring the fact that this makes it harder for another to do so, and in the end leads to a greater welfare loss overall. Accordingly, it might be more realistic to think of PEs policy as a coordinated policy package.

Essentially, the argument here is that it is better to determine the total surplus generated by one enterprise as a derived value rather than predetermining a target value and then deriving the divergence between price and marginal cost. In other words, the profit target of each enterprise becomes derived rather than predetermined. For instance, Rees [1976] (p. 164) demonstrates that with n profit constraints the most efficient pricing result should be

$$\frac{p_i - MC_i - \sum_{j \neq i}^{n} MR_{ij}}{\sum_{j \neq i}^{n} MR_{ij} - MC_i} = \lambda_1 = \lambda_2 = \ldots = \lambda_n \qquad (3.11)$$

where MR_{ij}, $i, j = 1,2,\ldots,n$ is the effect of the ith output on the revenue of the jth PE. That is, an

efficient allocation of profit targets requires that the marginal welfare loss of each target in each PE is the same ($\lambda_1 = \lambda_2 = \ldots = \lambda_m$).

The foregoing analysis has focused on public pricing policies under two main assumptions: (a) that the government is only concerned with efficiency, and (b) that the private sector is perfectly competitive.

Income distribution considerations however, provide another reason why prices deviate from marginal costs in PEs. Indeed, very often public pricing is not only seen as an instrument for allocation of resources but also as an instrument for influencing a prevailing distribution of income. It was not until 1971 that Feldstein [1972] analysed public pricing rules taking into account income distribution aspects. It seems surprising that income distribution elements were not analysed until the seventies. Moreover, in the Ramsey-Boiteux approach, the analysis is carried out through compensated demand functions, that is, focusing only on the substitution effects. As Bos [1986] stresses, such an approach assumes "that incomes are redistributed optimally by some sort of compensating lump-sum payments even though the empirical feasibility of such payments is at least questionable." (p. 103).

Perhaps the main reason why it took so long to analyse income distribution elements is the belief that public pricing is not the most appropriate instrument for achieving a desired redistribution of income. This is due to the fact that, while an income tax only distorts the labour leisure decision, public prices will distort the whole structure of relative prices. It follows that through an income tax the same redistribution objective can be achieved but creating fewer distortions and hence a smaller welfare loss.

Whether or not public pricing is an effective instrument for redistributing income is a debatable issue. From a more practical perspective, however, public pricing has been widely used as such. How are our results modified in the light of this consideration ?

To look at this point in a more systematic way assume an economy with no lump-sum taxes, n goods, $i = 1,...,n$, and m consumers, $k = 1,...,m$. The kth consumer's indirect utility function is represented as

$$v_k = v_k(p_1,.....,p_n,y_k) \tag{3.12}$$

where y is income. And the social welfare function, W, is

$$W = W(v_1,.....,v_m) \tag{3.13}$$

Then it can be shown that maximising (3.13) subject to the same profit constraint as before, and assuming also demand independence, leads to the following result[4]

$$\tau_i = \frac{p_i - MC_i}{p_i} = \frac{1}{\beta e_i}(\beta - d_i) \tag{3.14}$$

where d_i is the distributional characteristic, and is defined as

$$d_i = \sum_k \sigma_k \theta_{ik} \tag{3.15}$$

where $\sigma_k = \frac{\partial W}{\partial v_k}\lambda_k$, and $\theta_{ik} = \frac{q_{ik}}{q_i}$, and $\lambda_k = \frac{\partial v_k}{\partial y_k}$ is the k's marginal utility of income, and β is the shadow price associated with the profit constraint.

It can be seen that now the mark-up is lower the higher is d, where d_i can be interpreted as the marginal social utilities of the consumption share of various income groups. Notice that now a high distributional characteristic would tend to offset the low values of demand elasticities. Notice also, yet again, the perfect similarity with the problem of optimal taxation since (3.14) can equally be used to determine the optimal pattern of commodity taxes, provided $p_i - MC_i$ is interpreted as a tax on commodity i. Naturally, the practical implementation of (3.14) becomes much more difficult to the extent that now it is not only necessary to estimate demand elasticities and

[4] See Ram [1976], p. 164-165.

consumption shares, but also trade-offs between the welfare of different groups of consumers.

The relaxation of the second assumption, that the private sector is perfectly competitive, has led to some additional work, which focuses on how pricing rules would be affected in the presence of imperfect competition in the private sector. When the private sector is not perfectly competitive, that is, when prices in the private sector deviate from marginal costs due to the presence of monopolistic competition, for instance, then the theory suggests that prices in the public sector would have to deviate from marginal costs as well, in order to minimise the welfare costs that such distortions generate. The adjustment of the public sector pricing to a non competitive private sector has been analysed from two different perspectives, which Bos [1986] calls general and partial microeconomic models.

General microeconomic models are an extension of the Ramsey-Boiteux model. In that case, when the private sector behaves as a monopolistic competitor, the resulting structure of prices will depend on whether publicly and privately produced commodities are substitutes or complements. If they are substitutes, publicly produced goods would be relatively more expensive so as to reduce the degree of competition with the private sector. If, on the other hand, the goods are complementary, then publicly produced commodities should be cheaper, in order to guarantee that the purchase of the "composite" good is going to be cheaper. Therefore, no general results can be drawn because the direction of the deviation of prices from marginal costs would be determined by the kind of commodities actually produced in any particular context. In so far as the question of how far prices will deviate from marginal costs, it will be very much determined by cross effects of demand (see Spencer and Brander [1983] and Hagen [1979]).

The second approach to analysing the case of a non perfectly competitive private sector, as mentioned above, is based on partial microeconomic models. Rather than using a general equilibrium framework, these models are based on a game theoretical approach and hence focus more on the interactions in a duopolistic, or more generally, an oligopolistic context, in which one of the players is a PE. Thus, while in the traditional Ramsey-Boiteux approach the public sector

adapts passively to the behaviour of the private sector, in this more recent approach PEs play an active role, since private firms are assumed to maximise profits given the reaction function of the public firm. The concept of an active public firm was introduced by Harris [1978]. In short, the effects originated by the actions of a public firm would generate different outcomes depending, basically, on the reaction function of both public and private firms. Bos [1986], for instance, analyses different outcomes in a Cournot type behaviour and Stackelberg type behaviour, in which either a public or a private firm is the active player.[5]

The points above mentioned give a summarised account of the different situations in which the economic theory predicts that prices will differ from marginal costs in PEs. Yet, in practice, there are several more instances in which PEs set prices away from marginal costs. Weller [1982], for instance, argues that because of the inflexibility inherent in many actual indirect tax systems, public sector pricing can be thought of as a means of short-run adjustment to changing circumstances. A classical example of this point arises when, in a period of rapid inflation, governments resort to public pricing changes rather than to taxation changes, since the latter usually have to go through a process of institutional reforms which usually take a relatively long period to be implemented. Politically, it is also easier to modify public prices rather than the indirect tax system, because reforming the tax system may find an organised resistance from producers, whereas changing public prices is likely to meet a softer response since consumers are usually widespread and unorganised.

More generally, one finds that very often socio-political criteria constitute an important element among the objectives of PEs. It is indeed quite a common practice, particularly in LDCs, to use PEs as instruments for employment generation, or as instruments for the promotion of industry by subsidising the private sector through the provision of cheap raw materials.[6]

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[5] For another application see also Besso and Mac Collel [1984].

[6] On this issue see Lakshman [1984], World Bank [1983] and Mellor [1982].

All in all, there are several reasons both from the theoretical point of view and from a more practical perspective that explain why prices so often deviate from marginal costs in PEs. It has been seen that revenue, efficiency and distribution all come into the pricing rule. One perhaps would have to agree with Mallon [1982] when he suggests that, despite its theoretical merits, marginal cost pricing is still a rare exception in practice, rather than the rule.

3.3 Economic Performance of PEs

After Hotelling [1938], from the forties until the seventies, most of the economic literature on PEs concentrated on normative issues, namely the prescription of the most appropriate pricing and investment policies, in order to minimise welfare losses. As we have seen in the previous section, a good deal of this literature was developed in those years.

In recent years, however, and particularly during the eighties, there has been a shift of emphasis of the economic literature from normative to positive issues, focusing on the economic performance of PEs. Indeed, it seems that owing to the growing public intervention of the public sectors in many mixed economies in the past two decades, it became increasingly clear that the economic performance of the public sector was having significant effects on economies' performances as a whole. In its 1987 report the OECD [1987], for instance, pointed out that:

> In 1969, an eminent United States specialist concluded a survey of the costs of regulation by noting that though these costs were increasingly recognised, the prospect for reform were slight. Yet, less than two decades later, substantial parts of previously highly regulated industries have been liberalised and greater use of market forces is widely seen as indispensable if these industries are to have incentives to be efficient and innovative. (p. 299).

As noted above, the economic literature has responded by shifting its emphasis towards efficiency issues, focusing on the economic performance of PEs as the main cause of inefficiency

losses. Reasons are not difficult to find. First, quite complex rules are prescribed which are, in practice, very difficult to calculate because of the high informational requirements. Secondly, and more importantly, even if it were possible to calculate such rules their application would require that (a) public managers were only concerned with the interests of the public and, if that were not the case, then (b) managers would be properly monitored by the government, and if such monitoring were not possible, then (c) the government would be able to establish proper incentives so as to ensure that managers would not act solely on their own interest (see Marchand et. al. [1984]). None of these assumptions seem to be very realistic. Originally born as a part of the economic theory of property rights, this new approach intends to explain the performance of PEs from a different perspective, emphasising the absence of proper incentives in a public owned firm to produce efficiently.

It can be said that, generally, in a private firm the maximisation of profits as the main objective guarantees that every effort (of managers and workers) is linked to incomes and hence an incentive to be efficient is present.[7] In a public firm, however, since the profit motive is not necessarily present, there is no guarantee that the interest of the managers will coincide with the interests of the public and hence, in the absence of proper incentives, there is no guarantee that X-inefficiency will not arise.[8] Sen [1983], for instance, argues that:

> Indeed, it may be argued that the great advantage of the criterion of profits is the rigidity of the discipline that managers have to conform to it and cannot provide *ad hoc* justification for their performance by invoking *ad hoc* criteria. Even if the market prices are misleading as signals for resource allocation, the merits of the firm discipline may not be trivial in avoiding managerial and operational slackness. (p. 11).

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[7] That, of course, is not necessarily true. Indeed, the theory related to incentive schemes was originally developed in the context of a private firm in an attempt to address the problem of supply of labour effort. However, it can be said that, in general, in a private firm it may be easier to establish a proper incentive scheme than in a public firm, where very often one finds multiple objectives.

[8] X-inefficiency exists when a firm does not operate in its production possibility curve.

In its early stages this positive approach was developed by the so called public choice school.[9] In a few words, the public choice school focuses on issues different from allocation of resources and views a PE as a place where conflicts between managers, bureaucrats, and government arise. One view is, for instance, that of Florina and Noll [1978] in which the bureaucracy in PEs is dominated by politicians who use them to favour their own political position. Although quite useful because of the stress on positive elements, this initial approach has often been characterised by lack of rigour and by the absence of a coherent theoretical formulation.

A more recent and perhaps better theoretically founded approach is that which emphasise the absence of incentives. This "incentive scheme approach" characterises the relation between PEs, government, and the public, as a typical principal-agent relationship, in which the public acts as the principal and the government as the agent or the government as the principal and public managers as agents.[10]

Whatever the particularities of the approach, the asymmetrical distribution of information and the difficulty of monitoring completely the behaviour of the agent are at the heart of these models. These characteristics, applied in the context of the analysis of PEs, refer to the fact that managers usually have more information than the government, and when the latter is not able to monitor properly the actions of the former, then managers may have the possibility of obtaining benefits for themselves by hiding information. The problem is therefore reduced to finding an appropriate scheme which guarantees that managers act in the interest of the public.

In addition to the asymmetrical distribution of information, which may lead to inefficiency, it is often argued that the relation between government and PEs poses two problems; (a) objectives are sometimes not clear and/or conflicting, and, (b) when government intervention is excessive, PEs may lose autonomy in taking decisions, hence creating room for possible inefficiency,

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[9] For a survey on the public choice school see Blankart [1983].

[10] Aharoni [1982], for instance, conceptualises a PE as an agent without a principal because, he says, the principal cannot be the public (who do not have shares or ways of monitoring) nor the government, which is in itself a "loose coalition of agents: spending ministers, the treasury, the civil servants, other ministers, and the parliament." (p. 70).

since managers of PEs, and not government, are the best informed individuals insofar as concerns decisions on the performance of PEs (see Floyd [1984] and Shirley [1983]).

The reasons outlined above help to explain, to some extent, why some PEs may operate with levels of X-inefficiency. Yet, even if productive efficiency were achieved in the production process of PEs, it does not necessarily follow that a first best situation would be the final outcome. This is so because many PEs, as we have already pointed out, belong to the category of the so called natural monopolies and, therefore, there is no guarantee that allocative efficiency will be reached. In other words, while in a competitive environment a firm would set prices equal to marginal cost, when a firm enjoys a monopoly position it is likely that such a firm will set higher prices and will relate these prices to the intensity of competition in its different markets as well as to the relative costs of production (see Kay and Thompson [1986]).

The issue is important because, from the theoretical point of view, one of the reasons for justifying public ownership of some industries is the presence of increasing returns to scale, where "natural monopoly" position arises. Public ownership is then seen as a way of preventing the private sector from exploiting such a position.[11]

The primary concern for precluding the private sector is that the interests of the consumers are not affected since, by definition, consumers of natural monopolies are unlikely to be able to express their preferences by switching to other suppliers. The assumption is then that ,if a natural monopoly is held in public hands, the interest of the public would be the primary concern of a PE.

Paradoxically, this situation has led to the argument that lack of competition is another source of inefficiency of PEs. Indeed, it is often argued that the presence of productive

[11] Whether or not a monopoly is natural depends very much on the possibility of entrance of other firms in the industry and, then, the problem is reduced to knowing whether or not monopolies are sustainable (see Shepherd [1982]). The idea of sustainability is discussed in Baumol, Bailey and Willig [1977] and Baumol and Willig [1981].

inefficiency in PEs has more to do with operational (competitive) environment than ownership in itself (see Henisher [1986]). Accordingly, many supporters of public ownership, invoking the theory of contestable markets, claim that a way of reducing such levels of inefficiency may be simply to expose PEs either to competition or to the threat of potential entrants. We will come back to this point later.

In short, the economic literature on PEs has moved its emphasis from a normative to a much more positive approach, strongly emphasising inefficiency of PEs as the main cause of distortions. In particular, three main explanations have been put forward as causes of inefficiency. First, and related to ownership, it is argued that proper incentives for efficiency in PEs are not present, especially the profit motive, which in a private firm constitutes the mechanism that ensures productive efficiency. Secondly, and related to the previous point, the fact that the maximisation of profits is not necessarily the central objective of PEs, usually leads to the establishment of multiple and sometimes conflicting objectives. Finally, to the extent that some PEs are natural monopolies, they will be the only suppliers in the markets. It follows that the absence of competition may create room for the generation of allocative inefficiency. This is also true for those PEs which, while not being natural monopolies, operate as the only suppliers in the market.

A considerable part of the discussion of inefficiency of PEs has been developed within the debate of privatisation, and some authors have pointed out that privatisation, in the absence of the introduction of a more competitive environment (or the threat of competition) will not resolve the problem of allocative inefficiency (see for instance Kay and Thompson [1986] and Henisher [1986]). Indeed, two main arguments -namely lack of incentives and lack of competition- have been the main support for privatisation in the recent debate, a process which, with different intensities, is present in a large number of countries.

A discussion of the issue of privatisation goes beyond the scope of this thesis.[12] It will

[12] For a discussion on privatisation see Sappington and Stiglitz [1987], Rothenberg [1987], Chamberlin and Jackson [1987], Henisher [1986] and Kay and Thompson [1986].

suffice to outline the basis on which such a debate has taken place.

First, the debate has concentrated on privatisation as a means of improving the economic performance of PEs. The main argument, as has already been noted, is that which refers to the absence of proper incentives. Most of the economic literature in this field has addressed this point by trying to evaluate the performance of PEs versus private firms.[13] These results, however, are not conclusive, because very often the indicators chosen as a measure of relative performance are inadequate or incomplete. For instance, it is perfectly possible for a natural monopoly to be efficient and yet operate with losses, since pricing at marginal cost in increasing returns to scale industries implies making losses. On the other hand, a PE may be making profits and still be inefficient, which implies that the actual price charged for its product is higher than it would have been in a competitive environment. Perhaps most important is the fact that very often comparisons between the performances of public and private firms are biased to the extent that such comparisons are usually based purely on economic performance grounds, whereas a PE may well have been created with a different objective, such as redistribution of income or employment generation, for instance. Therefore, a comparison only with the criteria of economic performance may be misleading since a PE may still be efficient in terms of the criteria for which it was originally created. Nonetheless, in general terms one would have to recognise that 'in the private sector objectives are usually better defined (even when there is some room for improvement), incentive mechanisms better articulated, and monitoring performance better tuned' (Henisher [1986], p. 160).

Secondly, some authors have argued that when a public monopoly is privatised without creating competition, the result is a private monopoly in which allocative efficiency is still absent and hence, privatisation may be harmful since once an industry has been privatised a change of rules may be more difficult (see Kay and Thompson [1986]). Much of the recent debate on privatisation has centered on that point, suggesting ways of actually creating competition once an

[13] See, for instance, Kirkpatrick [1984], Pryke [1982], Caves and Christensen [1980] and Borchardtsing et. al. [1982].

industry has been privatised, or simply introducing the threat of competition. The controversial point here is whether a private monopoly is less likely to introduce inefficiency than a public firm. In particular, and advocating the theory of contestable markets, it is argued that the possibility of potential competition may be enough to induce a private firm to perform efficiently. Indeed, this argument constitutes the theoretical basis of those who sustain that franchising is an alternative method for ensuring that private firms become more efficient than PEs, because it preserves the incentives for efficiency created by the profit maximisation motive while, at the same time, ensuring a cheap and self-securing mechanism that firms would not exploit their monopoly position because of the threat of competition. In practice, however, franchising has not proved as successful as it initially appeared. Some disadvantages have been pointed out, such as; (a) the change in circumstances of the firm in the market cannot usually be foreseen when setting out the contract; (b) when the contract is about to expire the firm may be tempted to depart from its conditions; and (c) once the contract has expired it is likely that the old company would have advantages over new proposed entrants and hence the new franchise will not be perfect (see OECD [1987]). The debate on privatisation is far from finished and one would expect much more literature on the issue, particularly because privatisation is a process which has been implemented in many countries, both industrial and LDCs.[14]

Taking stock of what has been said so far, the theoretical elements outlined above are usually presented as a dilemma between pricing policy and performance of PEs as a means of improving the role of PEs in economies. While pricing policy is often used for purposes of eliminating public sector deficits, theoretical and empirical evidence suggests that this approach deals only with the revenue side but, as long as the economic performance of PEs (cost side) is not properly tackled, both public deficits and distortions in prices will remain characteristics of PEs.

[14] For a discussion on privatisation in LDCs see Balassa [1987], Kirkpatrick [1986], Shackleton [1986], and Ayub and Hegstad [1987].

3.4 Tariffs

The last potential source of distortions in the price system to be mentioned in this chapter refers to the question of tariffs. They will constitute an important ingredient in our empirical assessment of price distortions. Although a sudden shift from pricing policy to trade taxes may, in principle, seem out of place, from the point of view of the theory of domestic distortions tariffs are simply another source of distortions which, just like public pricing policy and domestic indirect taxes, is considered by the theory of optimal taxation.

We have already mentioned that Ramsey [1927] originally described the more general principle of the theory of optimal taxation, that is, that taxes ought to be inversely related to the elasticity of demand. It was seen that the underlying idea is that commodities which are relatively close substitutes for untaxable goods (such as leisure) should be taxed at a lower rate than those which are not, so as to minimise the distorting effects. In its simplest case, when income distribution considerations are not present, and cross elasticities of demand are assumed to be zero, it was seen that this result implies that indirect taxes should be inversely related to the elasticity of demand in order to guarantee that distorting effects are minimised, once the inevitability of taxation has been recognised.

Nevertheless, the original Ramsey rule was applied only to the case of a closed economy. Perhaps the first attempt to extend such a rule to the case of an open economy was made by Pigou [1947]. According to Pigou, imports should be taxed at a lower rate than domestically produced goods. This conclusion derived from the original Ramsey rule because, if taxes should be proportional to the sum of the inverse of demand and supply elasticities and, in general, the supply elasticity of foreign goods is supposed to be greater than the domestic supply, it follows that rather than taxing foreign goods more heavily, they ought to be taxed at a lower rate. However, Pigou did not suggest what would happen when a commodity is produced both at home and abroad. Moreover, for imported goods, the resulting producer surplus, which is used for evaluating welfare effects, goes to producers outside the country (see Dasgupta and Stiglitz [1974]).

A more formal and coherent exposition of trade taxes was undertaken by Dasgupta and Stiglitz [1974].[15] We will not review here all their results since it goes beyond the scope of this thesis. It will suffice to indicate the two main principles that are derived by the theory of optimal taxation in an open economy.

First, taxes on intermediates, including tariffs, ought to be avoided and taxes placed only on final consumer goods. The argument is intuitively very simple. If taxes on intermediates are imposed, a situation of inefficiency will arise because different industries would face different relative prices and then marginal rates of transformation between inputs for the industries would differ from one to the other. It follows that one can always find ways of increasing the output of one industry without decreasing the outputs of the remaining ones by a suitable reallocation of resources (Diamond and Mirrlees [1971]). There is no case then for treating domestic and trade taxes differently in the sense that the focus of attention should be on final consumer goods. Such a result may look surprising when one looks at the reality, particularly of LDCs, where very often infant industries producing intermediates are heavily protected by high tariffs or quantitative restrictions on imports.

This point lead us to our second principle, which in its simplest form suggests that, whenever possible, any distortion ought to be corrected at the point where it arises, in order to avoid secondary distortions. In terms of the classic infant industry argument then, one would have to argue that if a growing industry producing intermediates is to be protected, it should be done by some instrument other than tariffs, which would directly correct the source of the distortion or disadvantage. More generally, the direct corollary is that trade taxes should not be used for correcting distortions unless trade is in itself the source of distortion.

These are, of course, very general principles that should be adjusted or corrected when additional considerations other than efficiency are present. Their validity, however, in general, and is

[15] See Dixit and Norman [1980], Chapter Six, for an exposition of these issues.

equally applicable for quantitative restrictions with the only difference that, in this case, revenues go to producers rather than to government.

3.5 Empirical Analysis

In the previous sections of this chapter we have attempted to present a short summary of the main theoretical points concerned with public sector intervention in economies. Special emphasis was put on public sector pricing policy and economic performance of PEs and, in the last part we briefly referred to commercial policy. It was seen that, in practice, a great variety of elements have to be considered when designing any particular policy, and very often, in choosing the "better" policy, governments face conflicts between goals.

The purpose of this thesis, however, is not to reflect judgements about how a government should resolve conflicts between objectives. This is a normative issue which we shall not address here. Rather, its purpose is to show the implications of different policies and thereby contribute to a rational weighting of different objectives. Essentially then, the nature of the thesis is on the positive side. Therefore, before moving on to the next chapter, our present discussion must say something about the literature concerned with the empirical analysis of price effects arising from public sector intervention.

As noted in the Introduction of this thesis, when compared to the theoretical developments in the field, the literature on the empirical analysis of price effects from PEs pricing policies is far behind. The position taken in this study, however, is that insofar as their effects on the price system are concerned, public pricing and inefficiency of PEs can be viewed as a form of indirect taxation. That is, if a public firm sets a price above marginal cost the effects on prices are similar to a tax, whereas a situation in which price is below marginal cost can be viewed as a subsidy. By the same token, when a PE is being inefficient, and hence setting a higher price, the effects on the price system are equivalent to a tax. Moreover, we have seen that such an analogy arises very neatly in the theory, in the sense that the rules for determining optimal pricing policies and

optimal indirect taxes are, in fact, the same.

From this perspective, even though empirical analysis on price effects from PEs pricing policies are scarce, we can nevertheless focus our attention on the existing empirical studies focusing on the analysis of tax reform. Instead of reviewing several existing works on the field, however, we have chosen to concentrate on just one: "The Analysis of Price Distortions from Commodity Taxation, Pricing Policy and Commercial Policy in Mexico", developed by Seade [1986]. Such a choice serves three functions.

First, the referred study was developed in a input-output (I-O) framework and hence it is a representative example of the way in which I-O models tackle the analysis of the price system. By reviewing it then we will be providing an initial background which will be useful for the subsequent development of our own model. Naturally, in a latter stage of the thesis we shall discuss in more detail the characteristics and particularly the limitations of the I-O approach. Secondly, unlike most applied studies on tax reform issues, the referred study tackles also the question of public sector pricing policy, in addition to the analysis of tax reform. And thirdly, to the extent that the study is applied to the Mexican context it can be taken as our starting point.

Within the context of the literature of the analysis of tax incidence, the referred study intends to ascertain the welfare effects arising from reforming the indirect tax system. It was developed in two stages. First, using a I-O model as a base, the tax component of commodity prices were estimated. Second, by simulating changes in the indirect tax system and hence on commodity prices, the resulting welfare effects were computed. In doing this last point, of course, it was necessary to establish an appropriate link between commodity prices and the demand system. For our purposes, however, only the first stage is relevant since, in our research, the resulting price structure will be used to calculate the effects on the production side of the economy, namely value added, instead of consumption patterns. Accordingly, we will only comment on the methodology followed for evaluating price effects.

Specifically, the idea was to compute the tax component embodied in commodity prices, for two years, 1978 and 1983.[16] As argued by Seade, however, in an economy like the Mexican, where publicly produced goods are heavily subsidised, the analysis of tax reform calls for the explicit consideration of subsidies channeled through low public prices, if the government revenue constraint is to be treated in a realistic way. Likewise, commercial policy influences not only government revenue through the imposition of tariffs, but affects also the relative price structure, even though the revenues created by non-tariff restrictions accrue to private producers. Accordingly, the study intends to calculate not only the domestic tax component but also price raising effects from public sector pricing policy as well as commercial policy.

The analytical framework in which such calculations were carried out can be outlined as follows. In line with the conventional treatment of the price system in I-O models, if raw materials are assumed to combine in fixed proportions the price structure can be represented as

$$p_j = \sum_i a_{ij} p_i + v_j \tag{3.16}$$

where p_j is the unitary price of commodity j, p_i is the unitary price of commodity i, a_{ij} is the amount of commodity i required to produce one unit of commodity j, and v_j represents the payments to factors of production involved in the production of one unit of good j. If, in addition, imports are explicitly shown and the presence of domestic indirect taxes and tariffs is recognised, (3.16) can be reexpressed as

$$p_j = \sum_i (p_i + t_i) a_{ij} + \sum_i (p_i^m + t_i^m) m_{ij} + v_j \tag{3.17}$$

where t_i is the tax per unit of domestically produced good i, p_i^m is the unitary price of imported commodity i, t_i^m is the tariff per unit of imported commodity i, and m_{ij} is the amount of imported

[16] It should be mentioned that in Mexico the value added tax system (VAT) replaced a sales tax system in 1980 and hence the results for 1983 are perhaps less interesting than those for 1978 since under the VAT system the tax incidence becomes much more transparent, even though tax evasion or special treatment of taxes in the law may reduce such transparency. Nevertheless, the comparison of the two scenarios (1978 and 1983) offers something to say about the effects brought about by the introduction of the VAT system.

commodity i required to produce one unit of domestic good j. To simplify things, (3.17) can alternatively be expressed, using matrix notation, as

$$p' = (p' + t')A + (p^{m'} + t^{m'})M + v \tag{3.18}$$

where prime denotes row vectors. Here, p is a vector of domestic prices, t^m is a vector of import duties (rates), v a value added price vector, and A and M the domestic and import I-O matrices whose typical elements are the coefficients a_{ij} and m_{ij} respectively.

Let us also distinguish between consumer prices, q, and producer prices, p, so that

$$q = p + t \tag{3.19}$$

adding t on both sides of (3.18) we get

$$p' + t' = (p' + t')A + (p^{m'} + t^{m'})M + v' + t' \tag{3.20}$$

and using (3.19)

$$q' = q'A + v' + t' + (p^{m'} + t^{m'})M \tag{3.21}$$

solving now for q gives

$$q' = v'(U - A)^{-1} + t'(U - A)^{-1} + p^{m'}M(U - A)^{-1} + t^{m'}(U - A)^{-1} \tag{3.22}$$

and finally, rearranging terms

$$q' = [v'(U - A)^{-1} + p^{m'}M(U - A)^{-1}] + [t'(U - A)^{-1} + t^{m'}M(U - A)^{-1}] \tag{3.23}$$

As can be seen, equation (3.23) is made up of two elements. The first term on the r.h.s. gives the basic price or resource cost of commodities whereas the second term shows the total tax component or effective tax, t^e,

$$t^e = t'(U - A)^{-1} + t^{m'}M(U - A)^{-1} \tag{3.24}$$

provided we assume no changes in the prices of factors of production, fixed coefficients in the use of raw materials, and that commodity taxes are fully passed on to consumers.

Equation (3.23) is the basic expression Seade used to estimate the price raising effects from changes in commodity taxes (vectors t and/or t^m). Notice that t^d, unlike the vector of nominal taxes, t, contains the total (direct and indirect) tax component originated in the production process since it incorporates the indirect effects of tax shifting arising as a result of the interindustry transactions, as described by matrix A. That is, any change in the vector of nominal taxes t can be simulated and the effects on the remaining commodity prices traced.

As far as public pricing is concerned the effects on relative prices were also estimated using expression (3.23). In doing that, t was alternatively interpreted as the rate at which prices deviate from marginal costs in those production sectors where the presence of the public sector is substantial.

The last set of calculations developed by Seade, as we noted before, were the evaluation of price effects created by the presence of non-tariff restrictions in the Mexican economy. We will not go into the details of this last part of the study since it requires a somewhat modified analysis. It will suffice to mention that the general idea was to simulate changes in the prices of some commodities brought about by the removal of their protection level (or the increase of the level of protection), and then the effects on the remaining commodity prices in the system were computed by a similar process to the one described above.

Finally, to conclude this brief review, it should be pointed out that the study used as a data framework two updated versions[17] of the published I-O table of 1975, for the years in question, 1978 and 1983.

The foregoing analysis, in spite of its simplicity, give us some relevant information not only

[17] By the RAS method

on the sort of empirical analysis of the price structure existing for Mexico but also on the way in which the analysis of the price structure is carried out in an I-O framework. Many other studies can be referred to in the same tradition as described above among which perhaps the most relevant is the analysis of tax reform applied to India and Pakistan, and developed by Ahmad and Stern [1987] which, essentially, is carried out in the same spirit as Sonde's.[18]

Indeed, virtually all the empirical literature addressing the analysis of the price system in an I-O framework follow a similar method as the one described above and therefore we will not extend the discussion any further in this chapter. In a subsequent chapter, however, the characteristics, and particularly the limitations of the I-O approach will be extensively discussed.

Instead, to conclude this chapter a reference ought to be made to the paper written by Pyatt [1987] on the analysis of public enterprises in a Social Accounting Matrix (SAM) context which, even though is not an applied empirical analysis, it nevertheless sets out some general guidelines as to how to approach the analysis of public enterprises in a broader general equilibrium framework. We shall not analyse the referred paper here but it should be mentioned that our research follows such guidelines in an attempt to incorporate into the analysis of the price system some characteristics in the spirit of general equilibrium but, at the same time, remaining within the relative simplicity and transparency of the fix-price approach, to which I-O models belong. These characteristics will also be extensively discussed in subsequent chapters.

[18] See also Malvin for an application of the I-O framework to the analysis of corporate taxation. See also UNIDO [1973] for some additional applications of I-O models

CHAPTER FOUR

THE DATA FRAMEWORK

4.1 Introduction

Over the past decade or so there has been an increasing concern in the economic literature over the effects that the public sector has in economies. We have seen in the last chapter that, on the theoretical side, a good deal of literature has flourished in an attempt to determine the consequences of growing public intervention in economies. Of no less importance is the concern among economists about the possible effects that programmes of structural adjustment exert on the overall economic performance of developing countries. Such programmes usually envisage an important reduction of the degree of public sector intervention in these economies.

As a consequence of such a theoretical development there has also been an effort to assess empirically both the micro and macroeconomic effects of public intervention not only in developing economies but also in industrialised countries. Yet, when it comes to assess the impact that public enterprises have in the economy, one usually finds that data on public enterprises is not exactly abundant and the information available is usually scattered and unorganised (see Floyd [1984]).

The purpose of this chapter is to organise and put together some statistical data related to the public sector in the Mexican economy. A social accounting matrix (SAM) approach has been chosen because it facilitates both the interpretation of the data framework and the modelling. In particular, in developing our data framework we intend to show explicitly the input-output (I-O) relations as well as the public/private dichotomy of the Mexican economy.

Our ultimate purpose in building a consolidated SAM for I-O analysis is to evaluate the

effects on the price system generated by public policy intervention and commercial policy. Therefore, it should be clear that, to a great extent, the characteristics of our accounting framework have been very much determined by such a purpose. This chapter, however, intends only to look at the consolidated SAM as a data framework, leaving the issues related to modelling of the price system to be discussed in the next chapter.

The exposition is organised as follows. In Section 4.2 a schematic framework of a consolidated SAM is presented in an attempt to discuss briefly the main concepts involved as well as some general characteristics. Section 4.3 deals with an aggregated version of the consolidated SAM for the Mexican economy, without distinguishing between public and private sectors. The intention of this first approach is to focus both on the general methodology followed in putting the data together as well as on the main sources of information. In Section 4.4 the accounting framework is expanded in order to incorporate the public/private dichotomy of the Mexican production structure. Since the general procedure is basically the same as the one used in the previous section, greater emphasis will be put on numbers in the Mexican context. Finally, Section 4.5 deals with a further expanded version in an attempt to organise the data framework for modelling purposes. In the last part of this section some comments will also be made in relation to our accounting frameworks as compared with other data framework used for the purposes of analysing the Mexican price structure.

4.2 A Schematic Framework

Our starting point will be a schematic presentation of our accounting framework. Since our focus of attention is ultimately on the production side of the economy, we concentrate our attention on a consolidated version of the SAM for I-O analysis. Therefore, the accounting framework disaggregates extensively the production accounts, while the institutional dimension of the economy is aggregated in a single consolidated account.

Table 4.1 sets out such a framework. As in any SAM, rows and columns are identically labelled. Columns show expenditures of the accounts while rows should be read as receipts. Thus, any one cell shows the account making the expenditure in the column whereas the account receiving the corresponding payment arising form the sale appears in the label of the row.

This arrangement of rows and columns illustrates the fact that for any outlay in the economy there must exist a corresponding income. It follows that Table 4.1 has to be square and balanced, that is, the total of any column must be equal to the total of the corresponding row. In other words, expenditures of accounts in the columns must match the incomes of the corresponding rows. It should be also stressed that, although Table 4.1 is a representation of a very aggregated version of the economy, its system of classification is, nevertheless, exhaustive. That is to say, every transaction that takes place in the economy in, say, one year, is recorded.

Let us make a start by looking at the main components of Table 4.1 and how they are interrelated. Six accounts are identified: production activities, commodities, indirect taxes, factors of production, rest of the world and other accounts consolidated.

The first column, production activities, describes the cost structure of activities. It is made up of three components -purchases of raw materials, activity taxes and value added. The intersection of column one with row two constitutes the details of intermediate purchases of commodities by production activities. It is known as the "technology" or "absorption" matrix and its dimension depends, obviously, on the number of commodities and activities identified in any particular system. The second component of the cost structure of activities is given by a row vector containing positive numbers for any activity tax whereas a subsidy to the activity should be recorded as a negative number. Finally, the third element in column one records payments to factors of production contributing to the production process -capital, labour and natural resources. By adding these three components in column one we obtain the total expenditures incurred by activities in the production process, that is, total cost of producers.

Table 4.1
Schematic Framework

		EXPENDITURES						
		PRODUCTION ACTIVITIES	COMMODITIES	INDIRECT TAXES	FACTORS OF PRODUCTION	REST OF THE WORLD	OTHER ACCOUNTS CONSOLIDATED	TOTAL
RECEIPTS		1	2	3	4	5	6	
PRODUCTION ACTIVITIES	1	0	SALES OF GOODS V	0	0	0	0	VALUE OF OUTPUT AT PRODUCER PRICES
COMMODITIES	2	PURCHASES OF RAW MATERIALS V	0	0	0	EXPORTS	DOMESTIC FINAL DEMAND	TOTAL DEMAND AT MARKET PRICES
INDIRECT TAXES	3	ACTIVITY TAXES	COMMODITY TAXES	0	0	0	0	INDIRECT TAXES
FACTORS OF PRODUCTION	4	VALUE ADDED	0	0	0	0	0	PAYMENT TO FACTORS OF PRODUCTION
REST OF THE WORLD	5	0	IMPORTS	0	0	0	0	IMPORTS
OTHER ACCOUNTS CONSOLIDATED	6	0	0	ACTIVITY AND COMMODITY TAXES	RECEIPTS OF FACTORS OF PRODUCTION	DEFICITS/SURPLUS WITH THE REST OF THE WORLD	0	DOMESTIC INCOME PLUS IMPORTS
TOTAL		TOTAL COST OF PRODUCERS	TOTAL SUPPLY AT MARKET PRICES	INDIRECT TAXES	RECEIPTS OF FACTORS OF PRODUCTION	EXPORT PLUS DEFICITS/SURPLUS	FINAL DOMESTIC EXPENDITURES	

The receipts of production activities are recorded in row one column two. This cell is in fact a matrix, known as "make matrix", and should be of the same dimension as the technology matrix since its elements describe the sales of goods from activities to commodity markets. It should be noted that this matrix records the sales of goods at producer or ex-factory prices, that is, the cost to the producer at the factory gate. In other words, the total of row one is a column vector containing value of gross output of production activities at producer prices which means that neither the cost of moving commodities from the factory gate to the place of consumption is included nor are the commodity taxes levied in the sale of these goods. We shall come back to this point later in more detail.

The total supply of commodities is captured in column two and consists of three elements: domestic output (make matrix), commodity taxes and imports from the rest of the world. This can be seen by reading downwards in column two. The make matrix, as we saw above, records along its rows the domestic supply of commodities at producer prices. Total supply, however, is not only made up of domestic production. Some commodities need to be imported either because they are not produced at home or simply because their counterparts abroad are cheaper and/or of better quality. This is recorded in row five, column two. We have now recorded total supply from both domestic and foreign origin. If we want to arrive at the concept of total supply of commodities at market prices, as opposed to producer prices, however, it is still necessary to add commodity taxes, which in Table 4.1 are recorded in row three, column two. We can later see in detail that to actually arrive at this concept of market prices a special treatment will have to be given to trade and transport margins. By the same token, it will be required to distinguish between domestic commodity taxes and import duties. Meanwhile, let us turn our attention to the demand side of our accounting framework.

The demand side, which must match total supply, is displayed along row two. It consists of three elements -intermediate demands (row two column one), domestic final demand (row two column six) and exports (row two column five). Intermediate demands are shown in the technology matrix which, as we mentioned earlier, describes the purchases of raw materials by

production activities. The second component of total demand is, of course, final demand and demand from abroad, namely exports. Domestic final demand is represented by a column vector, in row two column six.

Traditionally, domestic final demand is split, for analytical purposes, into three main components; private consumption, government consumption, and capital formation. However, we shall not do so, at least for the time being, since we will focus our attention on the supply side of the economy, that is why domestic final demand is represented by a single vector. The last component of final demand is given by exports of commodities to the rest of the world, also represented by a column vector (row two column five).

The remaining parts of our framework are composed of residuals and the description of the direction in which transfers arising in the production process go. Thus, row three records indirect taxes both in activities and commodities. Its counterpart in column three shows the payment of those taxes to the account labelled "other accounts consolidated", where the government is included. The payment to factors of production, in row four, column one, goes to the same account (row six, column four), presumably to households and companies. Finally, the difference between exports and imports constitute a deficit (surplus) with the rest of the world. It is shown in row six, column five.

Having outlined the main components of Table 4.1, the next step is to develop an analogous, though more disaggregated, accounting framework. Before that, however, an important remark ought to be made regarding to actual construction. Specifically, the point to make has to do with the fact that in Table 4.1 and indeed in our actual accounting framework, commodity transactions will be recorded at market prices unlike the SAM in the System of National Accounts (SNA) as recommended by the United Nations Statistical Office (UNSO [1968]), where commodity balances are recorded at basic prices, that is, without including indirect taxes and trade and transport margins. The rationale underlying UNSO recommendations is that indirect taxes and margins (trade and transport) differ according to the purchaser and hence, for purposes

of I-O analysis, if taxes and margins are not removed, the price of a commodity will not be independent of the purchaser.

However, as has been suggested by Chander et al [1980]) and Pyatt and Round [1985], on the one hand the use of basic prices poses the problem of estimating the appropriate amounts of margins to be removed. In practice they are frequently unknown. On the other hand, market prices are the relevant ones when the purpose is the modelling of economic behaviour, since those are the prices economic agents actually face when making decisions. Moreover, UNSO suggests the use of approximate and not basic prices because even though taxes are discounted from values at producer prices, the indirect effects spread in all the commodities in the production process are not actually removed (see Greenfield and Fell [1979]).

Therefore, in our accounting framework values will be recorded at market prices. It has to be mentioned, however, that the adoption of market prices as a basis for valuation has problems on its own, not only because more work at the data level is necessary, but also because we shall be assuming that there are no differences in the amounts of margins (and indirect taxes) paid by different buyers of a commodity. That is, we shall ignore the fact that, in certain circumstances, margins vary from buyer to buyer. Moreover, to the extent that we shall build a fix-price model (where the demand does not play an active role), the presence of margins may not be very important in determining the magnitude of the results.

Nonetheless, we believe that the use of market prices is more accurate for the purpose of modelling economic behaviour and indeed, once market prices have been estimated, it is always possible to move backwards to obtain producer or basic prices (approximate). Furthermore, since market prices are more relevant in a flex-price model, the use of market prices guarantees a more accurate framework for future extensions to the present thesis. The precise way in which market prices have been estimated can be deferred to a latter stage of the discussion, once we have explained how our data framework was constructed. This is the purpose of the next section.

4.3 The Consolidated SAM.

In this section we intend to present and describe the consolidated SAM, constructed for the Mexican economy for the year 1980. Particular emphasis will be given to the methodology followed in putting the data together as well as to the main sources of information consulted. For expository purposes we will initially present a SAM where no distinction between public and private activities is made. The idea is to use this first SAM for explaining the general procedure followed in its construction. In the next two sections the accounting framework will be expanded in order to incorporate the public private dichotomy of the Mexican economy. The reader should be warned that in the following two sections very little attention will be given to the actual numbers in the Mexican context. In a final version, however, some comments will be made on the characteristics of the Mexican economy, as envisaged by our accounting framework.

Two additional points should be made in advance. First, all numbers referred to are in million of pesos of 1980, unless otherwise stated. Secondly, in order to have a reference point it will be convenient to refer to each component of the Mexican SAM as part of the schematic framework developed above in Table 4.1. We will refer them as T_{ij} where i and j indicate row and column respectively.

4.3.1 The Classification of Activities and Commodities

The social accounting approach to any particular issue requires to develop an appropriate set of classifications or taxonomies as a basis for analysis. In the present case, in which we attempt to examine the role and performance of PEs a crucial point was to capture the public/private dichotomy of the Mexican economy. Accordingly, in determining the level of disaggregation of commodities the key issue was the form of organisation under which commodities are produced i.e. public or private. Likewise, since emphasis will be given to specific public sector pricing policies, it was also necessary to distinguish between commodities whose pricing setting mechanisms are different in nature, as is the case, for instance, of those commodities produced by sectors that

traditionally have pursued a policy of regulated prices.

As we will also be concerned with commercial policy, an important criterion in defining our level of commodity disaggregation was whether commodities are traded or non traded. It will be seen, when developing our analysis in a subsequent chapter, that such a distinction will enable us to examine the role played by the private sector since commercial policy is directed towards industrial activities, which are mainly operated by private agents.

These are all issues of strategic importance for this enquiry and, in in one way or another, all of them had to be considered when determining our actual levels of disaggregation.

The following twelve commodities were identified[1]

- -Agriculture
- -Mining
- -Petroleum and petrochemicals
- -Food processing
- -Textiles
- -Chemicals
- -Capital goods
- -Other manufactures
- -Construction
- -Electricity
- -Trade and transport
- -Other services

The main characteristics of this initial classification in terms of the presence of the public vs. the private participation can be described as follows. Agriculture is predominantly operated by the private sector, although there is a small public participation on fishing and forestry. In mining there is a substantial participation of the public sector. Petroleum and petrochemicals is mainly produced by the public sector. It also constitutes the main export of the economy. Manufactures, other than petroleum and petrochemicals, were aggregated in five categories -food

[1] The details of the grouping of commodities in each of the aggregates here identified are shown in Appendix A.

processing, textiles, chemicals, capital goods and other manufactures. With the exception of capital goods, in all the commodities produced by the manufacturing industry the public presence is not very important. In the commodity capital goods, however, there is a substantial participation of the public sector.[2] Construction is entirely privately produced while electricity is produced by a public monopoly. Finally, the area of services consists of trade and transport and other services, where the public presence is important.

Insofar as the classification of activities is concerned thirteen were initially identified

- -Agriculture
- -Mining
- -Petroleum and petrochemicals
- -Food processing
- -Textiles
- -Chemicals
- -Capital goods
- -Other manufactures
- -Construction
- -Electricity
- -Transport and communications
- -Other services
- -Trade

As can be seen, in all cases, with the exception of transport and communications, and trade, there is one to one correspondence between activities and commodities. That is, in this first approach, activities were classified according to the principal product criteria. We will see later, however, that, in addition to this criterion, a crucial and necessary distinction we shall adopt is to separate activities according to the form of organisation i.e. public or private. Meanwhile, for purposes of explaining our initial aggregated SAM we shall ignore the criterion of ownership in favour of the conventional principal product criteria.

It should be mentioned that "communications" as a commodity is grouped in "other services" whereas as an activity it was placed in "transport and communications". The purpose of

[2] Mainly in the production of steel and the automobile industry.

that change was to allocate the output of communications to the commodity other services so that the remaining gross output of the activity (only transport) may be distributed along the make matrix in order to arrive at the concept of market prices, as we will later explain in detail.

4.3.2 The Consolidated SAM - A Basic Framework

Table 4.2 shows our basic accounting framework. It is a representation of the production structure of the Mexican economy in million of pesos of 1980, and has exactly the same structure as that of our schematic framework in Table 4.1. For expository purposes we will first explain in some detail each one of the main components of Table 4.2, emphasising both the way in which it was obtained and the sources of information used. In a second part we will look at Table 4.2 in a broader way in order to have a view of the whole picture.

4.3.2.1 The Cost Structure of Activities

The first component of the cost of activities are the purchases of raw materials by the production activities, T_{21} in Table 4.1 and known, as already noted, as the technology or absorption matrix. In Table 4.2 the technology matrix is located in rows 14 to 25 and columns 1 to 13. It shows the intermediate purchases by each activity, at market prices, inclusive of imports as well as trade and transport margins. It was obtained from a reduction to our sectoral-commodity level of disaggregation of the published I-O table for 1980.[3] Two main steps were followed.

First we aggregated the domestic version of the I-O table to our level of disaggregation, so that columns showed purchases of raw materials at our sectoral level. The same procedure was followed with the published I-O table of imports. We then added our two I-O tables so as to obtain the purchases of raw materials, both domestic and imported.

[3] Secretaría de Programación y Presupuesto [1986].

				1	2	3	4	5	6
ACTIVITIES	AGRICULTURE		1						
	MINING		2						
	PETROLEUM& PETROCHEMICALS		3						
	FOOD PROCESSING		4						
	TEXTILES		5						
	CHEMICALS		6						
	CAPITAL GOODS		7						
	OTHER MANUFACTURES		8						
	CONSTRUCTION		9						
	ELECTRICITY		10						
	TRANSPORT& COMM.		11						
	OTHER SERVICES		12						
	TRADE		13						
COMMODITIES	AGRICULTURE		14	53198	4	0	272553	14223	2165
	MINING		15	485	23765	1357	175	5	3678
	PETROLEUM& PETROCHEMICALS		16	5665	550	58291	2258	257	31426
	FOOD PROCESSING		17	33415	1	6	90154	97	7963
	TEXTILES		18	2871	78	16	4625	25824	884
	CHEMICALS		19	20445	1245	2932	4899	22180	42701
	CAPITAL GOODS		20	7245	3123	4328	5959	1327	3761
	OTHER MANUFACTURES		21	10434	1218	787	8397	2588	14999
	CONSTRUCTION		22						
	ELECTRICITY		23	2798	2465	3858	3375	1564	6011
	TRADE AND TRANSPORT		24						
	OTHER SERVICES		25	5919	3145	6466	8852	4295	4984
	DOMESTIC INDIRECT TAXES		26	-8205	0	0	-11706	0	-5268
	IMPORT DUTIES		27						
	FACTORS OF	LABOR	28	94109	20599	20361	44152	20319	30618
	PRODUCTION	CAPITAL	29	277159	37845	79578	137156	39049	56199
	REST OF THE WORLD		30						
	OTHER ACCOUNTS CONSOLID.		31						
	TOTAL		32	505538	94038	177980	570849	131728	200121

I N I T I A L

T A B L E

6	7	8	9	10	11	12	13	14	15	16
								505538		
									94038	
										177980
								26835	1640	3986
								108987	3530	17988
3188	0	208880		0		1980				
8878	32924	15557	18103	0	4	481				
3[illegible]8	1964	6259	9196	24084	31628	3887	2546			
[illegible]	0	[illegible]		0		4113				
884	1156	36095	8[illegible]8	31	381	2721	2632			
42701	9811	48730	9201	[illegible]	488	28938	5314			
3081	[illegible]	31432	147328	2002	32113	30332	10793			
14999	23619	173003	100617	1040	18878	41168	36305			
6011	8697	14092	2686	4383	1438	6016	11053			
4884	23061	[illegible]	33014	2403	34828	182841	128380			
-5268	-119	-119		30166	-13430	-3280	-17285	14455	4014	175[illegible]
								673	151	1[illegible]
30618	93561	125396	185108	24029	98862	514416	283458			
56199	126691	227386	100838	19877	198433	631349	637481			
								46629	9031	2[illegible]
200121	560448	750781	607569	58388	398178	1416862	1020477	703117	112404	399[illegible]

L SAM

4·2

16	17	18	19	20	21	22	23	24	25	26
177980										
	570849									
		131728								
			200121							
				560448						
					750781					
						607069				
							58388			
3586	51227	11595	20060	66778	69548			116083	31827	
									1416562	
17696	179477	15847	62853	287644	344443					
175218	14464	4424	9807	25191	69066	1218	20535	8662	30894	
1130	3544	563	3566	22305	12369					
23558	29914	3837	38744	251744	68250		249	29200	26909	
										298367
399168	849475	167994	335151	1214110	1314457	608287	79172	153945	1506192	298367

24	25	26	27	28	29	30	31		
								505538	1
								94038	2
								177980	3
								570849	4
								131728	5
								200121	6
								560448	7
								750781	8
								607069	9
								58388	10
116083	31827							399179	11
	1416562							1416562	12
								1020477	13
						15645	313857	703117	14
						21083	-5136	112404	15
						177433	43724	399168	16
						24918	663603	849475	17
						9626	79256	167994	18
						7931	133744	335151	19
						22943	670409	1214110	20
						28127	873480	1314457	21
							608287	608287	22
						2044	5692	79172	23
						9267	144678	153945	24
						35131	1025109	1506192	25
8662	30894							298367	26
								44301	27
								1476078	28
								2564040	29
29200	26909							528065	30
		298367	44301	1476078	2564040	173917		4556703	31
153945	1506192	298367	44301	1476078	2564040	528065	4556703	23404184	

In a second step trade and transport margins were distributed among commodities in order to get the purchases of raw materials at market prices. Let us explain this point in more detail. Following UNSO recommendations, the published I-O table for Mexico shows trade and transport margins as separate commodities so that among the 72 sectors in the I-O originally defined there are two rows (and columns) called trade and transport. The purchases of trade and transport by each activity are usually estimated as a certain margin[4] and then discounted from the purchases of commodities and allocated to the rows for trade and transport.[5] Therefore, we simply distributed backwards those margins to each commodity so that purchases of raw materials are now inclusive of trade and transport necessary to move them from factory to factory. The procedure used in making such a redistribution will be explained later in detail.

The last point to note regarding our absorption matrix is that, as can be seen in Table 4.2, there are no intermediate purchases of the commodity construction. The reason is that in the published I-O table for Mexico all the output of this commodity was allocated to final demand in the form of capital formation.

The next component of the cost structure of activities is given by activity taxes, represented by the row vector T_{31} in table 4.1 and located in row 26 columns 1 to 13 in Table 4.2. The fact that numbers are negative means, of course, that rather than being taxed, activities receive subsidies. The total amount of subsidies is 79,581, a figure obtained from national accounts (Secretaria de Programacion y Presupuesto [1983], vol I), and allocated to each sector according to the proportions given by Masso de et al [1984]. This procedure of allocation was necessary since the published I-O table shows only taxes net of subsidies. In other words, our published I-O table shows explicitly only the amount of commodity taxes, net of subsidies. What we did then was to separate commodity taxes from production subsidies, following national account figures, (ibidem), and then allocated production subsidies to the different production activities. It should

[4] Calculated from a commercial survey.

[5] Primary data in the National Accounts is inclusive of margins since producers declare costs inclusive of trade and transport.

be stressed that the total amount of subsidies appearing in Table 4.2 are those reported in the national accounts and hence they refer only to direct transfers, mainly to public enterprises, but do not include implicit subsidies to the private sector. We will come back to this point in the next section, where our framework is expanded to take into consideration the public/private dichotomy.

The last component of the cost structure of activities corresponds to value added or payment to factors of production in the production process, namely, capital and labour. Those numbers were obtained directly from the published I-O table and thus it was only necessary to aggregate them according to our own level of classification. This component is shown in rows 28 and 29, and columns 1 to 13, which corresponds to cell T_{41} in Table 4.1.

4.3.2.2 The Supply of Commodities

The supply of commodities is recorded in columns 14 to 25 and consists of three elements namely, domestic supply, imports and commodity taxes. Domestic supply is described in the "make matrix", rows 1 to 13 in Table 4.2 and cell T_{12} in table 4.1. The make matrix, as we have already pointed out, records gross output of production activities at producer or ex-factory prices. With the exception of activities trade and transport and communications, the make matrix is diagonal, since we are assuming that each activity produces only one (the principal) commodity.[6]

This, however, is not a necessary restriction. Indeed, a commodity may well be allowed to be produced by different activities or an activity may also be allowed to produce several commodities. The latter is precisely the case in Table 4.2 where the activities trade and transport are assumed to produce a homogeneous commodity and placed in certain proportions into the different commodity markets. In other words, instead of grouping the output of the activities trade

[6] Following the tradition in the SNA as recommended by UNSO traditionally activities are classified according to the principal product criteria. That, nevertheless, may not be always the best criteria. Pyatt (1985) stresses the necessity of breaking away from this criteria, specially in developing countries where many problems are typically manifested as a dualism.

and transport into single commodities, "trade" and "transport", we distributed their outputs along the commodity columns. As suggested earlier, the purpose of giving this treatment to trade and transport margins is to arrive at market prices. That is, in the make matrix gross output is recorded at producer prices, which, therefore are not market prices because they do not include the cost of moving commodities from the factory gate to the place of consumption. In addition, it is also necessary to add commodity taxes. We will come back to the question of taxes in a latter stage of the exposition. Let us concentrate for the moment on how those margins were distributed along the commodity columns in our make matrix.

Three stages were followed in this process. First, we made an initial distribution of total gross output of trade and transport at producer prices among three aggregate commodities -agriculture, mining and manufactures. This first distribution was very straightforward since national accounts (Secretaria de Programacion y Presupuesto [1983]) provide the required proportions in which margins are distributed among the three aggregates. It should be stressed that for our purposes we subtracted before the gross output of communications (31,827) which was then allocated to the commodity "other services" and (116,083) as purchases of transport by households[7] which leaves us with 1,271,746 to distribute.

Once this amount was distributed between the three aggregate commodities the second stage consisted simply of separating trade and transport as activities. Although in principle it would have been convenient to treat both as an aggregate activity, we split them up because transport is an activity where there is a substantial public participation and, at the same time, is an input heavily demanded by the remaining activities. It is then important, for our purposes, to have public transport as an individual activity whose pricing policy would presumably exert far reaching effects on the whole production structure. Finally, the third step was more complicated because we needed a criterion for distributing margins within the commodities of the manufactur-

[7] The proportion of purchases of transport by households as a proportion of total gross output of transport was obtained from a special publication of national accounts (see Secretaria de Programacion y Presupuesto, Estructura Economica Regional (1985), p. 369).

ing industry. Fortunately it was possible to get such a criterion from the 1976 commercial census for Mexico (see Secretaria de Programacion y Presupuesto [1980], VII Censo Comercial, 1976). We therefore looked at the difference between sales and costs both at wholesale and retail level for all the activities in the manufacturing industry, calculated a margin for each activity, and then grouped them according to our own level of classification. This gave us a picture of how trade margins were distributed among the different commodities produced by the manufacturing industry in 1976. Finally, we applied the same structure as in 1976 to our base year of 1980.

Unfortunately, for the case of transport, we were not able to get the same detailed information. In this case we distributed the output of transport according to the proportions of each commodity within manufacturing industry. At this stage it is important to note that in both cases trade and transport margins refer to both domestic supply and imports

Up to this point we have referred to the make matrix as describing the domestic supply of commodities, margins included. To arrive at total supply, however, it is still necessary to add imports which, in Table 4.2 are recorded in the row labelled "rest of the world" (row 30), and corresponds to the cell Y_{32} in Table 4.1. Imports are recorded in *cif* values and were obtained directly from the published imports I-O table. A minor adjustment was necessary to the import figures because of a small number of imports (11,465), comprising transactions at the border, which are not classified by sector of destination. Those imports were distributed among total imports according to the proportions given by the import structure in the I-O table. The final amount of imports, as can be seen in the total of 'rest of the world' row, is 528,065.

It is important to notice that, in this first approach, imports do not include the trade and transport margins necessary to move them from the border to the place of consumption, to be consistent with the treatment of domestic production. This point, however, will be dealt with later when we expand our accounting framework.

The last component of the supply of commodities is given by commodity taxes recorded in

rows 26 and 27 and columns 14 to 25 (T_{32} in Table 4.1). Two levels are distinguished, taxes on domestic production (including taxes on exports) in row 26, and import duties, recorded in row 27. Although the published I-O tables shows taxes on each commodity, they are not disaggregated into domestic taxes and import duties. It was therefore necessary to estimate import duties indirectly. In order to do so, we used previous estimations made by Seade [1986]. He estimated a tariff vector at a 71 commodity level disaggregation by calculating tariff collections and value of imports for more than eight thousand different commodities, as contained in the tariff catalogue published by the Ministry of Commerce,[8] and then these were allocated to the 71 commodity level of disaggregation of the I-O table. We then took such calculations and applied the same structure to the total of import duties as given in national accounts.

As far as domestic taxes are concerned, they were obtained by subtraction, once import duties were obtained. Again, in the case of domestic taxes, taxes levied on trade and transport were distributed among taxes of the remaining commodities assuming, therefore, a vertical demand curve. Such an assumption is rather arbitrary since we do not have enough data to provide empirical support. We should then be careful when reading domestic taxes in row 26 because they include taxes on the corresponding commodities plus a fraction of taxes levied on trade and transport, which are effectively passed on to final consumers. This last allocation of taxes was made according to the proportions in which trade and transport margins themselves were distributed and naturally, a share of those taxes was retained as paid by households purchasing transport, 8,862 in column 24.

4.3.2.3 The Demand for Commodities

The demand for commodities is shown in cells T_{21}, T_{22} and T_{23} in Table 4.1 whereas in Table 4.2 it is located in rows 14 to 25. Three main components of total demand are identified; intermediate demands, exports and domestic final demand. We have already made reference to intermediate

[8] Catalogo de la Tarifa del Impuesto General de Importaciones.

demands when talking about the technology matrix. It only remains to add final demand so as to arrive at total demand. Column 31 in Table 4.2 records final domestic demand which, although not disaggregated at this stage, is made up of private consumption, government consumption and capital formation. Column 32, on the other hand, shows exports of commodities. It is important to underline that the three components of total demand referred to above are recorded at market prices, that is, inclusive of indirect taxes and trade and transport margins.

4.3.2.4 Other Accounts

The last account to be referred to in Table 4.2 is labelled "other accounts consolidated". In a more disaggregated version of our framework this account would give the details of transfers among institutions. At our level, however, it only comprises aggregates. Thus, columns 26 and 27 record payments of taxes to government; columns 28 and 29 contain the transfers of income among institutions (households, companies and government); and finally, the number 173,917 in column "the rest of the world" intersecting with "other accounts consolidated" shows the deficit in the transactions with the rest of the world.

4.3.3 The Whole Picture

It is perhaps useful to look at Table 4.2 in a broader, way since we have concentrated very much on the details. Let us then, for expository purposes, pick up one sector-commodity and read it through. Take chemicals, for instance. The activity producing chemicals is shown in column 6 which describes its cost structure. It pays 118,572 million of pesos in the form of purchases of raw materials to the different commodity markets, imports included. These intermediate purchases are recorded at market prices. Reading downwards in column 6 it can be seen that activity chemicals receives a subsidy of 5,268 million of pesos, recorded as a negative number. Presumably those subsidies are directed to the public production of fertilisers, which constitute the main component of public participation in this activity. The next and last component of the cost of producing chemicals in column 6 is given by payments to factors of production, 30,618 to labour

and 56,199 to capital. Adding all these elements we arrive at the total cost of production of the activity chemicals of 200,121 million of pesos.

Looking now at row 6, column 19, it can be seen that total cost of production is also recorded as the gross output of the activity. Since the commodity chemicals is only produced by one production activity -chemicals-, then 200,121 constitutes also the domestic supply of chemicals, recorded in Table 4.2 at producer prices. To get total supply it is necessary to add imports of chemicals, recorded in column 19 row 30, amounting to 38,744. Hence total supply of chemicals is 238,865. We still need to add indirect taxes as well as trade and transport margins in order to arrive at total supply of chemicals at market prices. In column 19 those margins are recorded in the intersection with rows 11 and 13 while indirect taxes appear in rows 26 and 27. Therefore, total supply of chemicals at market prices is 335,151 million of pesos.

Finally, the demand for chemicals is displayed along row 19 and consists of 193,476 as intermediate demands (adding row 6 along columns 1 to 13), 133,744 corresponding to domestic final demand, while 7,931 is exported. Again, those figures are at market prices.

4.4 The Expanded Consolidated SAM with Public/Private Distinction.

When discussing the classification of activities and commodities in a previous section it was said that, for purposes of exposition, the first approach for classifying activities would be the conventional principal product criteria. It was also said, however, that if we want to fully capture the public/private dichotomy of the Mexican economy a further criteria for the classification of activities, based on type of organisation or ownership was needed, namely public and private. Therefore, in this section we shall present an expanded version of our accounting framework where production activities are further split into their public and private components. Before starting, however, it should be mentioned that apart from the introduction of the distinction between public and private activities the new accounting framework presented in this section was constructed following essentially the same methodology as with Table 4.2, and hence, in the

exposition, more emphasis will be given to the numbers themselves.

The new consolidated SAM is presented in Table 4.3. As mentioned above, its structure is basically the same as Table 4.2. The only difference is that now, instead of having thirteen production activities we have twenty four, twelve public and twelve private. Accordingly, the cost structure of activities is now made of twenty four columns, one for each activity, while in the make matrix, two blocks for public and private supply are distinguished, with the already noted exceptions of construction which is operated only by private agents, and electricity which is a public monopoly. Following the same order as in the earlier section our starting point will be the cost structure of activities.

4.4.1 The Cost Structure of Activities

The cost of production activities is shown in columns 1 to 24. The first twelve columns refer to public production activities while columns 13 to 24 record the cost structure of private activities. Before going in detail into each of the components of the cost structure, however, let us explain how this division of activities was made.

The main source of information was provided by a special publication of national accounts for the public sector (see Secretaria de Programacion y Presupuesto [1985], Cuentas Nacionales del Sector Publico, 1975-1985), with aggregated data on production statistics for the public sector in Mexico. Specifically, this source provided figures for ten aggregate sectors, namely, agriculture, mining, petroleum and petrochemicals, manufacturing industry, construction, electricity, trade restaurants and hotels, transport and communications, financial services, and other services. Thus, it was necessary to make some regrouping in order to have the same classification as ours. In particular, the manufacturing industry had to be disaggregated into five categories - food processing, textiles, chemicals, capital goods and other manufactures.[9] In order to do so a second

[9] Although petrochemicals belongs to manufactures it is treated as a separate aggregate called "petroleum and petrochemicals" and includes oil extraction, refining and petrochemicals.

			1	2	3	4	5	6
ACTIVITIES	PUBLIC AGRICULTURE	1						
	PUBLIC MINING	2						
	PUBLIC PETROL. & PETROCH	3						
	PUBLIC FOOD PROCESSING	4						
	PUBLIC TEXTILES	5						
	PUBLIC CHEMICALS	6						
	PUBLIC CAPITAL GOODS	7						
	PUBLIC OTHER MANUFACTURE	8						
	PUBLIC ELECTRICITY	9						
	PUBLIC TRANSPORT & COMM	10						
	PUBLIC OTHER SERVICES	11						
	PUBLIC TRADE	12						
	PRIVATE AGRICULTURE	13						
	PRIVATE MINING	14						
	PRIVATE PETROL. & PETROCH	15						
	PRIVATE FOOD PROCESSING	16						
	PRIVATE TEXTILES	17						
	PRIVATE CHEMICALS	18						
	PRIVATE CAPITAL GOODS	19						
	PRIVATE OTHER MANUFACTURE	20						
	PRIVATE CONSTRUCTION	21						
	PRIVATE TRANSPORT & COMM	22						
	PRIVATE OTHER SERVICES	23						
	PRIVATE TRADE	24						
COMMODITIES	AGRICULTURE	25	1540			[illegible]	551	288
	MINING	26	14	2819	1344	35		635
	PETROL. & OTHER CHEMICALS	27	180	44	[illegible]	232	14	[illegible]
	FOOD PROCESSING	28	927		5	[illegible]	7	932
	TEXTILES	29	69	9	18	484	[illegible]	59
	CHEMICALS	30	592	148	2227	484	570	[illegible]
	CAPITAL GOODS	31	268	370	4250	663	18	[illegible]
	OTHER MANUFACTURE	32	223	144	772	224	108	1744
	CONSTRUCTION	33						
	ELECTRICITY	34	81	232	3816	336	63	[illegible]
	TRADE AND TRANSPORT	35						
	OTHER SERVICES	36	171	374	6414	223	172	583
	DOMESTIC INDIRECT TAXES	37	6400			-11700		[illegible]
	IMPORT DUTIES	38						
FACTORS OF PRODUCTION	LABOR	39	[illegible]	[illegible]	[illegible]	7204	747	[illegible]
	CAPITAL	40	173	[illegible]	[illegible]	[illegible]	447	1346
REST OF THE WORLD		41						
OTHER ACCOUNTS CONSOLID.		42						
TOTAL		43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13114

INTEF

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6	7	8	9	10	11	12	13	14	15	16
258		567	9		718		51658	4		245853
430	7207	299	3	1	138		471	20946	13	145
3638	448	132	24084	10064	1395	219	5500	485	587	2026
932	3	493	3		1483		32448	1	1	81312
98	252	742	21	115	968	213	2788	69	1	4161
4969	1687	967	700	155	9704	441	19853	1097	35	4415
439	52641	643	2002	10224	10942	881	7035	2753	48	5356
1744	5163	3038	1040	5946	14836	3020	10132	1074	14	7563
699	1915	278	4383	463	3248	926	2717	2172	42	3040
583	5057	731	2403	10977	55329	10617	5748	2771	52	7997
-5268	-119	-119	-20166	-13433	-3280	-17285	-2803			
2246	19573	2049	24029	36590	382445	3961	90541	17894	334	36858
1346	11723	1227	19877	17261	11388	10528	276981	34757	1703	132787
12114	105550	11047	58388	78363	489314	13521	503069	84023	2830	531513

TERMEDIATE SAM

TABLE 4·3

16	17	18	19	20	21	22	23	24	25	26
									269	
										10015
									203	207
									50309	
										84023
									2532	1433
									10817	3530
245853	13662	1907		28916			1262			
145	5	3248	25717	15258	18103	3	263			
2026	243	27788	1516	6127	9196	21564	2472	2347		
81312	90	7031	5	24701			2630			
4161	24838	786	904	36213	978	236	1753	2419		
4415	21310	37732	5984	47803	9201	325	17234	4873		
5356	1272	3322	188574	30789	147328	21889	19390	9712		
7563	2482	13255	18456	149965	100617	12729	26332	33285		
3040	1502	5312	6782	13814	2686	975	5768	10127		
7997	4123	4401	18004	36642	33014	23562	98212	117743		
									1415	4014
									73	151
36858	19572	28372	73988	123347	185108	63362	131971	199497		
132787	38602	54853	114968	226159	100838	176171	619961	626953		
									4629	9031
531513	127701	188007	454898	739734	607069	320816	927248	1006956	78317	112404

26	27	28	29	30	31	32	33	34	35	36
10015										
	175150									
		39336								
			4027							
				12114						
					105550					
						11047				
								58388		
207	487	4261	939	1906	7418	6027			22788	31827
										489314
		9727				3794				
84023										
	2830									
		531513								
			127701							
				188007						
					454898					
						739734				
							607069			
1433	3099	46966	10656	18154	59360	63521			93295	
										927248
3530	17696	169750	15847	62853	287644	340649				
4014	175218	14464	4424	9807	25191	69066	1218	20535	8662	30894
151	1130	3544	563	3566	22305	12369				
9031	23558	29914	3837	38744	251744	68250		249	29200	26909
112404	399168	849475	167994	335151	1214110	1314457	608287	79172	153945	1506192

35	36	37	38	39	40	41	42	TOTAL	
								2469	1
								10015	2
								175150	3
								39336	4
								4027	5
								12114	6
								105550	7
								11047	8
								58388	9
22788	31827							78363	10
	489314							489314	11
								13521	12
								503069	13
								84023	14
								2830	15
								531513	16
								127701	17
								188007	18
								454898	19
								739734	20
								607069	21
93295								320816	22
	927248							927248	23
								1006956	24
						15645	313857	703117	25
						21083	-5136	112404	26
						177433	43724	399168	27
						24918	663603	849475	28
						9626	79256	167994	29
						7931	133744	335151	30
						22943	670409	1214110	31
						28127	873480	1314457	32
							608287	608287	33
						2044	5692	79172	34
						9267	144678	153945	35
						35131	1025109	1506192	36
8662	30894							298367	37
								44301	38
								1476078	39
								2564040	40
29200	26909							528065	41
		298367	44301	1476078	2564040	173917		4556703	42
153945	1506192	298367	44301	1476078	2564040	528065	4556703	23404184	

major source of information was provided by Delgado et al [1986], which provides more detailed information on public sector intervention in the manufacturing industry. It is unfortunate that the industrial census for 1980 has not been published, since this would have made the details of the industrial structure of public sector activities much richer. The general procedure consisted in calculating data for public sector activities, and then the figures for the private sector were obtained by difference against our basic data framework in Table 4.2.

The first component of the cost structure of activities, as before, is the technology matrix giving the details of intermediate purchases made by our twenty four production activities. Thus, columns 1 to 12 describe the purchases of raw materials made by public production activities whereas the remaining columns (13 to 24) refer to private production activities. For all activities, except those in the manufacturing industry, we simply took total intermediate purchases as published by national accounts of the Public Sector [op.cit.] and then applied the same commodity structure of intermediate purchases as given in the published I-O table. For the case of manufacturing industry the procedure was essentially the same, except that it was first necessary to disaggregate them according to our classification by using the information provided by Delgado et al [1986]. Once we estimated the cost structure of public sector activities, the difference with the total of the respective sector was allocated as intermediate purchases made by private activities.

It is important to note that we only had knowledge of the total amount of intermediate purchases by public production activities but not their structure, which is why the same input structure as in the I-O table was applied. Therefore, in doing that, we are implicitly assuming that public and private sectors have a similar structure of intermediate purchases whenever they participate in the same activity. It is important to underline that, for the purpose of modelling the efficiency of public vs private sectors, this point will represent a limitation in terms of our results since we are assuming, a priori, that both sectors are equally efficient (or inefficient) in the use of material inputs. This problem, which arises from the aggregation in the I-O table, could have been partially overcome by data from the industrial census for 1980 which, as already said, has not been published.

The second component of the cost structure of activities is of interest because it shows how subsidies to the public sector are distributed (row 37, columns 1 to 24). The distribution of subsidies reveals, to some extent, the traditional policy of the Mexican government of subsidising economic activity by keeping the prices of several of its products down. It can be seen that the main receivers of subsidies are: electricity, trade (in the commercialisation of staple products), transport and communications, food processing, agriculture and chemicals (fertilisers). The private sector, on the other hand, receives subsidies only in the activity agriculture.

It should be said that the fact that the public sector is the main receiver of subsidies is explained because in the Mexican national accounts the only subsidies that are recorded as such are direct transfers, basically directed to public enterprises. Indeed there are other mechanisms of implicit subsidies, such as cheap credit, that are directed to the private sector. However, they do not appear explicitly in our accounting framework.

The last component in the cost of activities is given by the payments to factors of production or value added (rows 39 and 40). Perhaps the most striking point when looking at these figures, is the great difference in the ratio of operating surplus/wages between public and private sectors. Table 4.4 summarises this point.

Table 4.4*

Value Added. Ratio operating surplus/wages

Activity	Public	Private	Total
Agriculture	0.04	3.06	2.94
Mining	1.14	1.94	1.83
Petroleum & ptrochem.	3.88	5.10	3.90
Food processing	0.60	3.60	3.10
Textiles	0.60	1.97	1.92
Chemicals	0.60	1.93	1.83
Capital goods	0.60	1.55	1.35
Other manufc.	0.60	1.83	1.81
Electricity	0.82	-	0.82
Construction	-	0.54	0.54
Transp. & communic.	0.47	2.78	1.93
Other services	0.03	4.70	1.22
Trade	2.65	3.14	3.13

* (Source: Table 4.3)

It can be appreciated that, with the exception of mining, petroleum and petrochemicals, and trade, the public sector ratios are lower than unity, whereas in all cases, except construction, the private sector has high values, all of them above unity.

4.4.2 The Supply of Commodities

The supply of commodities from production activities is described in the make matrix in rows 1 to 24 and columns 25 to 36, in Table 4.3. The first twelve rows describe the supply of commodities produced by activities in the public sector whereas rows 13 to 24 record supply of commodities produced by the private sector. Again, these figures are recorded at producer prices and the output of trade and transport has been distributed along columns to the different commodities. We will come back to the question of margins in this section. Meanwhile it is interesting to note the structure of production of both public and private activities.

This is shown in Table 4.5, which shows the supply structure at producer prices, as revealed by our make matrix. It can be seen that with exception of petroleum & petrochemicals and capital goods, the public sector concentrates on the production of non traded commodities -other

services, electricity and transport. Private production, on the other hand, is more diversified, specially in the manufacturing industry, whose production is essentially made up of traded goods.

Table 4.5*
Supply at Producer Prices

Commodities	Public	%	Private	%
Agriculture	2469	0.24	503069	9.16
Mining	10015	1.00	84023	1.53
Petrol. & petroch.	175150	17.52	2830	0.05
Food process.	39336	3.94	531513	9.67
Textiles	4027	0.41	127701	2.32
Chemicals	12114	1.22	188007	3.42
Capital goods	105550	10.57	454898	8.29
Other manufc	11047	1.10	739734	13.46
Construction			607069	11.05
Electricity	58388	5.84		
Trade & transp.	60057	6.01	1327772	24.17
Other services	521141	52.15	927248	16.88
TOTAL	999294	100.00	5493864	100.00

* (Source Table 4.3)

An important point to note regarding the make matrix in Table 4.3 is in relation to the treatment given to trade and transport margins. As before, they have been distributed along the commodity columns and, as we did previously with the remaining activities, margins (trade and transport) have also been split into public and private. The criteria for distributing margins for public and private sectors were the same as the criteria used with total margins, with the exception of public trade which was allocated to only two commodities, food processing and other manufactures. The reason for that is that the intervention of the public sector in the commercialisation process is concentrated in staple products[10] and some other commodities of basic use, all belonging to our category of food processing or other manufactures. The precise proportion in which public trade was allocated to these two commodities was taken from a published document on the role of the public sector in the Mexican economy by the Ministry of Planning (see Secretaria de Programacion y Presupuesto [1980], El Papel del Sector Publico en la Economia Mexicana, p.

[10] Through a big public enterprise called CONASUPO.

40).

Finally, adding downwards, in columns 25 to 36, domestic taxes, import duties and imports, we arrive at the total supply of commodities at market prices.

4.4.3 The Demand For Commodities

The demand side in Table 4.3 is not very different from the demand side in Table 4.2, except for the fact that intermediate purchases are now split into public and private. Domestic final demand and exports are not disaggregated at this stage, although it appears clearly that the main export is by and large made up of the commodity petroleum and petrochemicals. In the next section, we will look at the performance of both public and private activities in more detail.

4.5 The Framework for Modelling

4.5.1 A Further Expansion

In this section we expand further our accounting framework. The purpose is to obtain a consolidated SAM with enough information to model accurately the effects on the price system of different public pricing policies. It should be said, however, that in this section we will limit our exposition to the consolidated SAM as a data framework while the theoretical issues related to the modelling of the price system will be dealt with in the next chapter. The final accounting framework, which will serve as a basis for modelling purposes, is presented in Table 4.6. The general structure of Table 4.6 is the same as Table 4.3. Nevertheless, for constructing Table 4.6 more information relative to Table 4.3 was needed. In particular, two major changes have been made in Table 4.6 in relation to Table 4.3.

On the activity side, the sector transport was split in two in order to capture transport used in domestically-produced commodities, on the one hand, and transport used in moving imports

TABLE 4.6

				1	2	3	4	5	6	7	8	9	10
ACTIVITIES	PUBLIC AGRICULTURE	NET OUTP	1		7796								
		GROSS OUT	2										
	PUBLIC MINING	NET OUTP	3				3797						
		GROSS OUT	4										
	PUBLIC PETROLEUM AND EXTRACTION REALS	NET OUTP	5						97902				
		GROSS OUT	6										
	PUBLIC FOOD PROCESSING	NET OUTP	7								11063		
		GROSS OUT	8										
	PUBLIC TEXTILES	NET OUTP	9										1196
		GROSS OUT	10										
	PUBLIC CHEMICALS	NET OUTP	11										
		GROSS OUT	12										
	PUBLIC CAPITAL GOODS	NET OUTP	13										
		GROSS OUT	14										
	PUBLIC OTHER MANUFACTURES	NET OUTP	15										
		GROSS OUT	16										
	PUBLIC ELECTRICITY	NET OUTP	17										
		GROSS OUT	18										
	PUBLIC DOMESTIC TRANSPORT AND COM	NET OUTP	19										
		GROSS OUT	20										
	PUBLIC IMPORTS TRANSPORT AND COM	NET OUTP	21										
		GROSS OUT	22										
	PUBLIC OTHER SERVICES	NET OUTP	23										
		GROSS OUT	24										
	PUBLIC TAXES	NET OUTP	25										
		GROSS OUT	26										
	PRIVATE AGRICULTURE	NET OUTP	27										
		GROSS OUT	28										
	PRIVATE MINING	NET OUTP	29										
		GROSS OUT	30										
	PRIVATE PETROLEUM AND EXTRACTION REALS	NET OUTP	31										
		GROSS OUT	32										
	PRIVATE FOOD PROCESSING	NET OUTP	33										
		GROSS OUT	34										
	PRIVATE TEXTILES	NET OUTP	35										
		GROSS OUT	36										
	PRIVATE CHEMICALS	NET OUTP	37										
		GROSS OUT	38										
	PRIVATE CAPITAL GOODS	NET OUTP	39										
		GROSS OUT	40										
	PRIVATE OTHER MANUFACTURES	NET OUTP	41										
		GROSS OUT	42										
	PRIVATE CONSTRUCTION	NET OUTP	43										
		GROSS OUT	44										
	PRIVATE DOMESTIC TRANSPORT AND COM	NET OUTP	45										
		GROSS OUT	46										
	PRIVATE IMPORTS TRANSPORT AND COM	NET OUTP	47										
		GROSS OUT	48										
	PRIVATE OTHER SERVICES	NET OUTP	49										
		GROSS OUT	50										
	PRIVATE TAXES	NET OUTP	51										
		GROSS OUT	52										
COMMODITIES	AGRICULTURE	DOMESTIC	53										
		EXPORTS	54										
		IMPORTS	55										
		COMPOSITE	56		1540						26700		561
	MINING	DOMESTIC	57										
		EXPORTS	58										
		IMPORTS	59										
		COMPOSITE	60		14		2817		1344		90		
	PETROLEUM AND PETROCHEMICALS	DOMESTIC	61										
		EXPORTS	62										
		IMPORTS	63										
		COMPOSITE	64		105		65		57504		232		14
	FOOD PROCESSING	DOMESTIC	65										
		EXPORTS	66										
		IMPORTS	67										
		COMPOSITE	68		907				5		8042		5
	TEXTILES	DOMESTIC	69										
		EXPORTS	70										
		IMPORTS	71										
		COMPOSITE	72		85		9		15		404		906
	CHEMICALS	DOMESTIC	73										
		EXPORTS	74										
		IMPORTS	75										
		COMPOSITE	76		592		148		3897		484		870
	CAPITAL GOODS	DOMESTIC	77										
		EXPORTS	78										
		IMPORTS	79										
		COMPOSITE	80		218		770		4280		605		35
	OTHER MANUFACTURES	DOMESTIC	81										
		EXPORTS	82										
		IMPORTS	83										
		COMPOSITE	84		302		144		775		854		136
	CONSTRUCTION	DOMESTIC	85										
		EXPORTS	86										
		IMPORTS	87										
		COMPOSITE	88										
	ELECTRICITY	DOMESTIC	89										
		EXPORTS	90										
		IMPORTS	91										
		COMPOSITE	92		81		393		3016		735		62
	TRANSPORT AND TRANSPORT	DOMESTIC	93										
		EXPORTS	94										
		IMPORTS	95										
		COMPOSITE	96										
	OTHER SERVICES	DOMESTIC	97										
		EXPORTS	98										
		IMPORTS	99										
		COMPOSITE	100		171		379		8414		852		178
	INDIRECT TAXES		101		-5400						-11706		
	FACTOR OF PRODUCTION	LABOR	102	7042		2905		8907		7294		747	22
		CAPITAL	103	178		4388		7975		4364		447	13
	OTHER ACCOUNTS CONSIDERED		104										
	REST OF THE WORLD		105										
	TOTAL		106	7042	2600	3797	3015	97902	175150	11063	39236	1196	4037	35

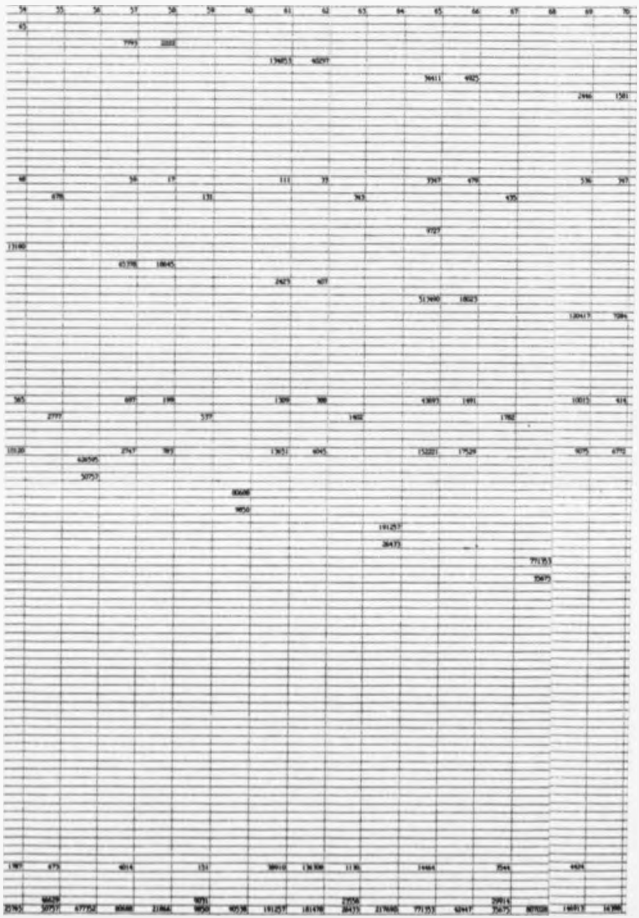
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	1194																
			2592														
					31296												
							376										
									43906								
											49134						
													4717				
															393973		
																	14495
	561		258				567		9						718		
			450		7007		296		5		1				139		
	14		3638		648		172		2484		3182		882		1395		215
	5		932		5		493		5						1493		
	506		98		252		762		21		125		10		968		217
	870		4864		1487		967		700		141		14		9504		447
	35		439		5284		843		2002		9588		896		10962		80
	106		1744		5163		930		1040		3425		521		14836		3080
	62		886		1915		278		4393		622		61		3048		506
	170		305		5017		751		2402		1013		962		5126		1017
			-5264		-119		-119		-8144		-1054		-170		-3486		-7589
54		22		1972		2040		24439		2780		500		302947		96	
67		13		11703		1271		19877		15190		1512		11306		10248	
196	4027	35	12114	31296	105550	3276	11047	43906	50300	49134	71490	4717	6864	393973	489516	14495	17521

25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	14408															
			367522													
					52651											
							2037									
									189445							
											58174					
													87025			
															180056	
			51856		4				245857		13662		1907			
			47		20948		15		135		5		3248		25717	
	216		7260		485		587		2026		243		27788		1516	
			30444		1		1		81312		90		7031		5	
	215		2784		88		1		5181		24838		786		826	
	442		14851		1097		35		4415		21310		37750		5886	
	881		7031		2753		48		5756		1272		7502		18857	
	3080		10130		1074		14		7503		2440		13055		14456	
	506		2511		2172		65		3042		1502		7312		4782	
	10617		5744		2771		58		7807		4125		4401		18806	
	-17285		-2891													
3861		8054		1984		356		36458		18175		20122		71860		127767
10248		27648		34757		1705		132987		20802		34873		114968		108158
14408	17521	367522	303064	52651	84072	2037	2038	189445	331513	58174	127701	87025	180057	180056	424408	349208

F I N A L S A M

	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
														2404	65		
														1771	48		
																678	
														409000	13180		
	18956																
			39750														
					20594												
						21051											
								20982						20990	365		
											75192					2791	
													604450				
														98867	10120		
																	626505
																	30757
			2916								1262						
	2717		15454		10105		2		1		263						
	1516		6127		5136		19675		1800		2472		2967				
	5		24701								2430						
	904		36213		978		215		21		1751		2619				
	5484		47903		9401		297		28		17574		4972				
	180574		50700		347520		19072		1917		17390		9712				
	18956		149965		330617		11414		1115		36730		73895				
	6782		13816		2606		842		95		3768		10127				
	18956		36432		39016		21498		2064		98012		117943				
														12868	1987	675	
		127767		185128		570		3250		131892		196607					
		226127		330836		1407		15430		819961		626505					
																30757	
	456498	369526	739774	1050946	1070504	2195	292714	20982	28152	751192	927248	604450	1004050	630505	25365	30757	677952

S A M



70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
1581																
			10006	2105												
							107929	1621								
											9094	1953				
397			1109	273			3697	58			4143	890				
	56				564				3663				996			
											3794					
7084																
			102808	5199												
							475390	19508								
											713785	23448				
															607069	
416			15450	394			62606	1756			58117	1395				
	227				2310				14990				4069			
4772			37073	3580			271512	1613			320866	19703				
		146913														
		6683														
						276456										
						45184										
										880325						
										282710						
														1180865		
														85682		
	567		9807		3566		25191		22305		69066		12364		1219	
	3027				38744				251744				68250			
14398	6605	153596	276456	13511	45184	303468	880325	39075	282710	175095	1180865	47610	85682	1266547	606097	0

86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
			56344	2044												
							22788				31827					
											699514					
							86028	9267								
											882117	35131				
		606287														
		0														
						76879										
						249										
										115478						
										29000						
														1444152		
														26809		
			20535		0		9662		0		30894		0			
															262668	1476078
					249				29000				26806			
0	0	606287	76879	2044	249	77128	115478	9267	29000	144678	1444152	35131	26806	1471061	262668	1476078

Z	93	94	95	96	97	98	99	100	101	102	103	104	105	106	
														3746	1
														2464	2
														3312	3
														10015	4
														97002	5
														175150	6
														11663	7
														9978	8
														1194	9
														4027	10
														3046	11
														12114	12
														31296	13
														109550	14
														3056	15
														11047	16
														43906	17
														39380	18
														9936	19
20700					31427									71499	20
														4715	21
														4863	22
														30973	23
					609514									609514	24
														14489	25
														17511	26
														367502	27
														329847	28
														52651	29
														39424	30
														3037	31
														2836	32
														108645	33
														735135	34
														38176	35
														137982	36
														49605	37
														180027	38
														180056	39
														434000	40
														369006	41
														739776	42
														207700	43
														407000	44
														21451	45
84428	9287													250715	46
														20982	47
														39102	48
														751192	49
					886117	75131								107548	50
														88450	51
														1004456	52
														64550	53
													25705	25705	54
														2303	55
														3277	56
													303737	677752	57
														40400	58
													21966	21966	59
														8050	60
													5818	40530	61
														161257	62
													181478	181478	63
														20472	64
													39678	21900	65
														75135	66
													42947	42947	67
														35675	68
													446076	407008	69
														14481	70
													16700	16700	71
														3487	72
													72486	152546	73
														250456	74
													17511	17511	75
														6146	76
													138144	301440	77
														86320	78
													38675	38675	79
														292750	80
													674277	1175975	81
														1180965	82
													67910	67910	83
														85400	84
													853697	1864557	85
														40687	86
													0	0	87
														0	88
													600287	600287	89
														36879	90
													2044	2044	91
														200	92
													3692	75138	93
				113478										113478	94
													9287	9287	95
				29000										29000	96
													194178	194178	97
							144152							144152	98
													75131	75131	99
							26800							26800	100
													1325109	1475261	101
9662			0		30896		0							76844	102
														127679	103
														254042	104
								762668	1470078	2544042			93175	4475958	105
		29000				26800								55800	106
113478	9287	29000	194178	144152	75131	26800	147126[illegible]	762668	1470078	2544042	4475958	520002	3975130		107

from the border to the place of consumption, on the other hand.[11] The purpose of allocating transport to domestic production and imports separately is to arrive at market prices of both, and then in modelling the price system, to allow for substitution between imports and domestic production, both at market prices. Therefore, two new activities appear in Table 4.6, public and private transport in imports. In order to split transport in this way we used the proportions between value of imports and value of domestic production for each commodity.

We must note that trade margins on imports are not specified. The assumption here is that they do not exist. In other words, it is assumed that no intermediary process between the border and the place of consumption exists. Moreover, since a high proportion of imports are used by activities in the form of raw materials,[12] we assumed that imports are directly ordered by domestic producers, without going through the hands of intermediaries, other than transporters. It is very likely, however, that, in reality, a large number of small firms have to pay commerce cost. Our assumption, therefore, is imposed by the lack of statistical information.

The second major change was made in the details of commodities. As can be appreciated in Table 4.6, for each one of the original commodities in Table 4.3 we are now distinguishing between domestic, exports, imports, and an additional account, composite, made of domestic and imported commodities. An important consequence of this four account classification for each commodity, in terms of margins, is that we now also have to separate margins, depending on whether the commodity goes to domestic markets, exported or imported. Margins on exports, however, do no need to be distinguished as an activity. It is only necessary to estimate a fraction of total margins once margins on imports have been previously deducted. That is, from total margins in domestic production we estimated a fraction of transport margins and allocated them to the column of export for each commodity. Such fractions were estimated according to the proportion actually exported. We must mention that we are also assuming that there are no trade margins on exports. That is, it was assumed that exporters sell commodities direct to the rest of the

[11] Recall that imports are valued at *cif* prices.

[12] Of total imports 51.63 percent is made by production activities

world so that they pay only for transportation costs, not commerce costs.

Perhaps the best way to explain how Table 4.6 is to be interpreted is to choose one activity-commodity and, by example, explain the mechanism. Take the commodity petroleum and petrochemicals. The cost structure of public and private activities petroleum and petrochemicals are shown in columns 6 and 32. They are exactly the same as in Table 4.3. The supply at producer prices of domestic origin is shown in columns 61 and 62. We recall from Table 4.3 that of total supply of petroleum and petrochemicals 175,150 is supplied by the public sector while the private sector supplies only 2,830. The same remains true in Table 4.6 although now it shows how much of the gross output goes abroad in the form of exports: 40,297 as exports of petroleum and petrochemicals from the public sector and 407 exported by the private activity (column 62).

Thus column 61 describes the supply devoted to domestic markets whereas column 62 denotes exports. Reading downwards in column 61 if we add margins and commodity taxes, we arrive at the supply from domestic origin to the domestic market at market prices. As we mentioned, public and private exports of petroleum and petrochemicals at producer prices are 40,704, as recorded in column 62 and made up of 40,297 of exports of the public sector plus 407 coming from private producers. They are not yet, however, ready to be exported because it is still necessary to add transport margins and taxes on exports in order to arrive at the figure at market prices. This figure is 181,478, which is the total in column 62 and recorded in row 62 intersecting with column (105) (rest of the world), as exports at market prices ready to be exported.

Imports of petroleum and petrochemicals are recorded in the intersection of column 63 with row 105, amounting to 23,558 at *cif* values. In order to get market prices of imports we should add transport margins which in our example are 1,745 (343 of public transport and 1,402 of private transport) so that imports at market prices are 26,433 as total of column 63, which is also recorded in the intersection with column 64 and row 63. Thus, we have in column 64 domestic supply and imports, both at market prices, recorded as total supply (217,690). It is important to note that it was also necessary to separate taxes on production to the domestic markets from

export taxes, for each commodity in which export taxes existed.

As can be seen, in expanding our accounting framework additional information was needed. First, it was necessary to determine, for each commodity, the proportions of public and private exports. Such proportions were obtained from a publication of the Foreign Trade Bank (see Instituto Mexicano de Comercio Exterior [1982]), which shows in great detail the relative proportions of exports by public and private sectors at *f.o.b.* prices. We applied these proportions to our data at producer prices. Table 4.7 shows exports of both public and private sectors as contained in our make matrix.

Table 4.7*
Exports at Producer Prices

Commodity	Public	%	Private	%	Total
Agriculture	65	0.50	13180	99.50	13245
Mining	2222	10.65	18645	89.35	20867
Petrol. & petroch.	40297	99.00	407	1.00	40704
Food process.	4925	21.47	18023	78.53	22948
Textiles	1581	17.84	7284	82.16	8865
Chemicals	2105	28.82	5199	71.18	7304
Capital goods	1621	7.68	19508	92.32	21129
Other manufc.	1953	7.54	23949	92.46	25902
Construction	-	-	-	-	-
Electricity	2044	100.00	-	-	2044
Trade & transp.	-	-	9267	100.00	9267
Other services	-	-	35131	100.00	35131
TOTAL	56813	-	150593	-	207406

* (Source: Table 4.6)

It is clear that the main exports of the public sector are petroleum and petrochemicals, which account for 70.9 percent of total exports from public activities. Taxes are not added in Table 4.7 and that is why exports of petroleum appear to be relatively low, but if we add taxes we can see that petroleum and petrochemicals are the main export of the economy as a whole. It also ought to be noticed that the public sector devotes its production mainly to the domestic markets. Indeed, if we ignore petroleum it turns out that the public sector exports only 9 percent of its production. It should then be clear that the private sector is the main exporter of the economy, con-

centrating in manufactures.

Finally, the second type of information needed was related to taxes, in order to fit our four type disaggregation for commodities as between domestic, exports, imports and composite. In particular, it was necessary to distinguish between export taxes and taxes on output going to the domestic market. The figures for export taxes were obtained from a publication of the Ministry of Finance (see Secretaria de Hacienda y Credito Publico [1986], Estadisticas Hacendarias del Sector Publico, 1965-1982), and allocated to the commodities agriculture and petroleum and petrochemicals.

4.6 Summary and Conclusions

The SAM set out in the previous sections of this chapter puts together very important aspects of the Mexican economy; the interindustry relations and the public/private dichotomy. In the first instance, it enables us to obtain a general view of the structure of the production side of the Mexican economy. While we emphasised the methodology for putting the data together there still remains much descriptive analysis to be done, and further extensions can easily be made in order to get a higher level of disaggregation. However, our concern in this study is to go beyond the descriptive analysis and to trace the potential impact on the price system arising from policy changes, notably pricing policies and economic performance of PEs, but also commercial policy. It is in this dimension where the advantages of our accounting framework acquire full meaning, particularly when compared with I-O tables. Several aspects ought to be noted.

First, we incorporate into the analysis the public/private dichotomy of the economy thus introducing one of the multiple forms of dualism that characterise many developing countries. In particular, for modelling the price system, this characteristic becomes relevant when the public sector pricing policy is substantially different from the private sector.

Second, in constructing our SAM we recognise that distribution plays an important role in

determining the prices that consumers pay for goods. Such recognition encouraged us to value commodity balances at market prices which, as we have seen, are the relevant prices for modelling the behaviour of economic agents. Most studies based on traditional I-O models simply do not deal with this problem. And third, our data framework, because of its SAM approach, contains most of the relevant information that can influence the price formation process. From this perspective, when it comes to modelling, the analysis is enhanced since several elements can be brought into the picture at the same time.

There are less obvious advantages of our accounting framework which will become evident once we discuss the modelling of the price system. We shall defer the discussion of these characteristics to the next chapter. Meanwhile, to conclude this chapter it will be convenient to underline the novelty of our SAM when compared to previous data bases used for the analysis of the price system in the Mexican economy.

First, even though our base year is 1980, it is nevertheless the only SAM built with information of this year, since the latest I-O table published is precisely 1980. Indeed, even though Saade [1986], for instance, makes his analysis for 1983, he actually uses an updated version of the published I-O table for 1975. Second, no SAM constructed for Mexico has so far dealt fully, as we do, with the treatment of trade and transport margins. And, thirdly, with the exception of the SAM constructed by Pleskovic and Trevino [1985] no SAM constructed for Mexico has properly dealt with the public/private dichotomy, which indeed has a great relevance in view of the significant intervention of the public sector in the Mexican economy.

Perhaps our great limitation is that we do not address the institutional dimension of the economy. This has more to do with our purpose of modelling the price system. Nonetheless, extensions are both possible and desirable. Indeed, having our accounting framework as a basis one can, relatively easily, disaggregate the institutional side of the economy and address many different issues among which, perhaps the most relevant, would be the evaluation of the macroeconomic effects that the overall economic performance of the public sector can have (see Pyatt [1987]).

CHAPTER FIVE

THE PRICE SYSTEM. ANALYTICAL FRAMEWORK

5.1 Introduction

In the past chapter we went into the details of the Mexican production structure by looking at the consolidated SAM for I-O analysis for Mexico. While we focused on the methodology and the sources of information very little was said about modelling of economic behaviour. This chapter focuses primarily on issues related to the modelling of the price system. Since the empirical analysis of the price structure has traditionally been addressed on a fix-price fashion by using I-O models, we shall therefore review the general characteristics of I-O models, and then present our own model. It will be seen that while our model remains within the fix-price approach it nevertheless incorporates some characteristics in the spirit of general equilibrium which, so far, have not usually been dealt with by others.

For presentation purposes the exposition of the chapter is organised as follows. In Section 5.2 we make some general comments on the main recommendations given by the theory of optimal taxation regarding its effects in terms of domestic distortions. It will be suggested that public pricing policy and inefficiency of public production generate similar distorting effects in the price structure as indirect taxes and hence, for purposes of evaluating their effects on relative prices, they can be treated as a form of indirect taxation. Section 5.3 concentrates on the general characteristics of fix-price type models stressing both their limitations and advantages. In particular, we also discuss the framework in which price formation has traditionally been addressed when it comes to empirical analysis, namely the I-O approach. Here special emphasis will be put on the main limitations of this approach. In Section 5.4 we set out our own model in its fix-price version which, in the subsequent two chapters, will be applied in the context of the Mexican

economy. We shall see that compared to I-O models, our approach incorporates some additional characteristics in the spirit of general equilibrium while retaining the appeal of the fix-price approach. Finally, Section 5.5 contains a summary of the chapter and some concluding remarks.

5.2 Price Distortions. Some Comments

In addition to revenue collection, indirect taxes exert important effects upon the behaviour of economic agents by affecting both production and consumption decisions and hence, through the consequent reallocation of resources, they ultimately affect social welfare. In a world where lump-sum taxation is either limited or impossible, it is inevitable that the presence of taxes generate distorting effects in an economy. The theory of optimal taxation, having recognised the necessity of taxation, has concentrated on establishing rules under which a maximum revenue can be raised while minimising the distorting effects.

The general principle of the theory of optimal taxation stresses the need to tax those goods whose elasticity of demand with respect to their own price is lower so that the resulting reallocation of resources is minimal.[1] This is indeed the message of the very well known Ramsey rule (Ramsey [1927]).[2] Likewise, when the presence of public production is recognised it is argued that, as a general principle, it is desirable that public production ought to be efficient and taxes on intermediates should be avoided. The argument is that, if PEs do not operate on their production possibility frontier and/or intermediates are taxed, then different industries would face different relative prices and hence marginal rates of transformation between inputs for the industries would differ. It follows such a situation is inefficient since a suitable reallocation of resources will always make it possible to increase the output of one industry without decreasing the outputs of the remainder (see Diamond and Mirrlees [1971]). Like indirect taxes, public pricing policy produces similar distorting effects whenever prices of goods produced by the public sector differ from their corresponding marginal costs. Thus, as a general rule the theory of optimal taxation

[1] Under the simplifying assumption that cross elasticities of demand are zero

[2] See also Chapter Three

suggests that indirect taxes (deviations of price from marginal cost) should be placed on final consumer goods and not intermediates unless, for whatever reason, taxing a particular good is not possible, in which case one would want to tax its intermediates.

The argument is equally valid when applied to imports. As suggested in Chapter Three, the theory of domestic distortions recommends that tariffs on intermediates should be avoided and that only imports of final consumer goods ought to be taxed, if one wants to minimise the distorting effects. The classical exception to this rule in the case of an open economy comes from the traditional infant industry argument by which tariffs on intermediates are justified when a particular new industry needs temporary protection to fully develop and reach a competitive level. But, even then, the theory of optimal taxation has demonstrated that it is possible to obtain a "less-worse" outcome if such an industry is protected by intervening directly in the source of the disadvantage of the industry in question, so that secondary distortions are avoided (see Corden [1984]).

While the theory may have clear results one finds that, in reality, countries do impose tariffs on intermediates and PEs very frequently set prices away from marginal costs. Whether, for instance, the rationale for imposing tariffs ultimately obeys historical reasons[3] and/or governments do have objectives other than efficiency when setting prices is a normative question for which no definite answer exists. We have seen in Chapter Three, for instance, that many circumstances may exist under which PEs would price away from marginal costs. However, our interest lies in the positive side of the issue. That is, having recognised that there are a wide variety of reasons -justified or not- why prices deviate from marginal costs and tariffs are placed on intermediates, we are concerned with the fact that relative prices and consequently the allocation of resources in the economy would be affected, hence creating room for inefficiency.

The empirical evaluation of such effects has traditionally been addressed with the use of I-O models. Thus, for instance, during the seventies trade theory focused heavily on the estimation of

[3] Favouring privileged groups (see Bliss [1987]).

ERP in an attempt to evaluate the effects on the pull of resources created by a particular protection structure. Such estimations, as it is well known, are traditionally carried out in a I-O framework.[4] More recently, a second body of literature concerned with tax reform issues has used I-O models extensively to develop an analysis of indirect tax incidence by tracing the effects that indirect tax changes have in the structure of relative prices. Ahmad and Stern [1987], for instance, developed such an analysis to evaluate the price effects resulting from tax reforms in India and Pakistan, and went on to evaluate the effects in terms of social welfare. Likewise, we have seen in Chapter Three that Sende [1986] used the I-O framework to trace the effects on the relative price structure of the Mexican economy arising from reforms on the indirect tax system as well as from public prices.[5]

Following similar lines, our model attempts to evaluate the effects on the price structure generated by public pricing policy and performance as well as by commercial policy, and then to analyse the effects that changes in relative prices have on the reallocation of resources by looking at the changes that take place on value added in the different production activities. In doing so, we shall treat deviations of prices from marginal costs and inefficiency of PEs as indirect taxes, as far as their effects on the price system are concerned.

Before going into the details of our model, however, it is convenient to put our approach in perspective. Therefore, in what follows we will discuss the general characteristics of fix-price models, emphasising both their limitations as well as their advantages, and then examine in more detail the way in which I-O models address the analysis of the price structure. We will then be in a position to set out our model and explain in detail how it goes beyond the traditional I-O models retaining, nonetheless, the appeal of the fix-price approach.

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[4] There is an extensive literature upon this topic. For an empirical survey see Cardoso [1975].

[5] See also Melvin [1979] for another application.

5.3 The Price System

5.3.1 General Characteristics of Fix-Price Models

In the previous chapter we went into the details of how our consolidated SAM for I-O analysis was built. It was said that, as a data framework, it describes every transaction that took place in the Mexican economy during 1980. So far, however, nothing has been mentioned about the behaviour of the economic agents that led to such a state of the economy. Doing so requires us to model the economy, that is, it is necessary to make some theoretical postulates about how economic agents behave. In terms of our SAM, as represented in Table 4.6, we need a second SAM, which instead of being filled with numbers, should be filled with functional relations or algebraic expressions describing how each transaction is determined.

Following Drud et al (1985)[6] let us represent our SAM as a transaction matrix, T, whose elements in its non-zero cells are represented as t_{ij}, where i refers to the row and j indicates the column. In the last chapter it was also said that our SAM is square and balanced. That is, for each row there is a corresponding column, and the total of each column (total expenditure) must necessarily match the total of the corresponding row (total income). Thus, if we add rows across T we get a column vector, Y, of total income which, in effect, contains the total income received by each account in our SAM. By the same token, adding columns generates a row vector, Y', of total expenditures.

If in addition we define P as a vector of prices of commodities and outputs of activities, W as a vector of factor prices (labour and capital), and θ as a set of parameters defining indirect tax rates and the exchange rate, we can then specify that for each t_{ij}, element of T, it holds that

$$t_{ij} = t_{ij}\ (Y : P, W, \theta) \qquad (5.1)$$

[6] That is, the so-called transaction values approach (TV). See also Pyatt (1988).

that is, each t_{ij} element of T is expressed as a function of income and prices.

Equation (5.1) is a very general representation of our model. To develop it we can note that the modelling of our data framework requires three main sets of equations: (a) those referring to the demand side, (b) those describing the supply side and (c) a third set of equations known as closure rules.

The demand side is described by the vector Y which, as we saw, is obtained by row summation across T. Such a vector can be expressed as

$$Y = n(Y\ ;P,W,\beta) + x(P,W,\beta) \tag{5.2}$$

where n is the column vector of row sums of all t_{ij} which depend on Y, that is, endogenous variables, whereas x is the column vector of row sums of all t_{ij} which are independent of Y, that is, these last t_{ij} are treated as exogenous. This set of equations constitute the demand side since they describe sources of income and how they are determined. Thinking in terms of Table 4.6, Y would describe *inter alia* incomes arising from the demand for commodities.

Turning now to the column summation in our data framework leads to more interesting results as far as price formation is concerned. In so doing, let us think of the column elements of our SAM as components of the total cost of activities. Let us also recall that the total of each column must match the total of each row, the latter being total revenue. In other words, total cost must equal total revenue. Now, since total revenue is equal to price multiplied by quantity it follows that average cost (total cost divided by quantity) must equal price (total revenue divided by quantity).

$$P = P(Y\ ;P,W,\beta) \tag{5.3}$$

Thus, equation (5.3) represents our second set of equations describing the supply side of our economy. As can be seen, prices depend on each other, on the prices of factors of production, on income levels, and on the value of the set of parameters defining exchange rate and indirect taxes.

The way in which price formation ought to be modelled depends ultimately on the purposes of the modeller. Equation (5.3), however, offers two broad possibilities. First, if prices are affected by the scale of production, that is, Y, then we have a flex-price model where commodity prices depend not only on each other but also on the prices of factors of production, W, on the exchange rate and indirect taxes, θ, and in the most general case, on the scale of output and, therefore, on the income levels of particular activities.

Alternatively, a special case arises if we postulate that our economy shows constant returns to scale and then assume that factor prices, W, and the value of the exchange rate and indirect taxes, θ, are given. In this event the price level is independent of the scale of production so that commodity prices would only be determined by the prices of other commodities. This special case defines our second type of models namely, fix-price models. The simplifications that follow from the adoption of a fix as opposed to a flex price model will be discussed below. Before that, however, and for the sake of completeness, it ought to be noted that equations (5.2) and (5.3) are not sufficient to close our model.

To see this point more clearly, it should be remembered that equations (5.2) and (5.3) yield $[P]+[Y]-1$ independent equations[7] whereas the number of variables is $[P]+[Y]+[W]+1$, (P, Y, W, and θ). A third set of equations is therefore necessary to close the system. This last set of equations are known as closure rules, and basically their purpose is to specify how each factor market and the capital account of the economy is closed. The issue of closure rules in a flex-price model will not be discussed here, since it goes beyond the scope of this thesis.[8] It will suffice to point out the simplifications that follow from the use of a fix-price model.

Firstly, the assumption that prices are invariant to the scale of activity has to rely on the assumption of constant returns to scale. Secondly, as it was explained above, if commodity prices are to be independent of the level of activity, it is necessary to assume that factor prices are

[7] The total number of equations is $[P]+[Y]$ but one of them in (5.2) is linearly dependent of the remaining ones since it is necessary to ensure that the adding-up conditions are satisfied.

[8] For a discussion of closure rules in a SAM context see Dervi et al [1982]. See also Robinson [1986].

fixed. That is, we need to interpret results as conditional on given values of W and, as will be seen below, of θ. Alternatively, we can postulate that there exists excess capacity in all sectors. In particular, it is necessary to assume permanent unemployment in the labour market so that wages, and hence unitary costs, are unaffected by the level of activity. In this event, wages should move only in response to the average product of labour i.e. productivity, and not marginal costs. In any event, the important thing is to ensure that net output prices are independent of the scale of production. Thirdly, a fix-price model assumes that the exchange rate is fixed so that any change in the economic activity level will adjust through changes in the deficit (surplus) of the balance of payments. Otherwise, if the exchange rate is variable, an increase in the level of production, say, would lead to an increase in the demand for imports, pushing up costs, therefore violating the assumption that prices do not vary with the activity level. Accordingly, the use of a fix-price model implies a fix exchange rate. Thus, again, we should interpret results as conditional on an assumed value of θ (and W). Alternatively, it can be assumed that foreign borrowing is always available to cover any resulting deficit in the balance of payments so that a fixed exchange rate can be sustained.

The points mentioned above constitute the simplifications that follow from the use of a fix-price model. Whether or not they represent severe limitations would most certainly depend on the particular context to which the model is applied. The benefits, and indeed the power of the fix-price approach, however, are considerable.

On the one hand, to the extent that prices are determined without reference to the demand side, the analysis of the price system can be explored in greater detail, focusing on the main variables that play a determinant role. It is true to say that, ultimately, the price system is also influenced by demand considerations and, from that point of view, the analysis calls for a flex-price model. Yet, flex-price models require far more behavioural assumptions as well as the estimation of more parameters, for which the lack of information usually leads to the imposition of strong exogenous specifications, leading sometimes to losing the grasp as to what actually determine results. From this perspective, then, fix-price models are indeed a very valuable tool of

analysis which, rather than being seen as an alternative to flex-price models should be seen as the first step in trying to understand how the economy works.

On the other hand, equation (5.3) in its fix-price version is capable of addressing a great variety of issues related to the price system, going beyond the traditional I-O models but, at the same time, keeping within the relative simplicity of a fix-price approach, namely, that prices are determined without reference to the demand side.

Indeed, equation (5.3) offers a wide range of possible specifications. It can, for instance, be reduced to the Leontief version in which case all intermediates are assumed to combine in fixed proportions. At the other extreme, instead of being considered perfect complements, inputs can be allowed to be perfect substitutes. More realistically, however, it can be postulated that inputs combine with some limited degree of substitution. In particular, it can be postulated -and we shall do so- that for some of the so-called traded commodities there exist two possible sources of supply, domestic production and imports, and then specify some degree of substitution between these two sources, thus recognising the fact that, in reality, producers usually do have such a possibility when making their cost minimising decision.[9]

The efficiency in the use of resources is, for instance, one of the several possible issues to be explored. In particular, an interesting point is to look at the effects that improving efficiency levels within the public sector has on the price system. By the same token, alternative public pricing policy scenarios can be simulated allowing, for instance, for the prices of some commodities produced by the public sector to have a fix or regulated price.

Another issue that can be addressed by equation (5.3), and we will do so, concerns the evaluation of protection levels arising from a particular commercial policy.

A third set of possibilities offered by equation (5.3) is the analysis of tax reform. Indeed, the

[9] Of course, in the absence of trade barriers.

effects that reforming the indirect tax system has on the price structure can be dealt with perfectly with our analytical framework.

All in all, a fix-price approach for the analysis of the price system offers a wide range of possible issues to be addressed which, so far, have not been fully explored by the traditional I-O framework. We have pointed out some of them so as to get a flavour of the direction we shall follow. We need, however, to be more specific. Therefore, in what follows we will briefly review the way in which the standard I-O approach has dealt with some of these issues and how some of its limitations can be overcome.

5.3.2 The Price System in the I-O Framework.

We saw in Chapter Three that the empirical analysis of the price system has traditionally been addressed with the use of I-O models. By reviewing the study developed by Seade [1986] the general methodology was explained. In this section, therefore, we shall restrict ourselves to the most relevant points of such a methodology and then move on to discuss some of the limitations of the I-O models which, as will be seen, can actually be overcome with our own model.

Equation (5.3) is a very general representation of the price system. A more specific form can be obtained if we postulate that raw materials combine in fixed proportions, which, in turn, also combine in fixed proportions with value added or net output. Equation (5.3) can then be expressed as

$$p_j = \sum_i a_{ij} p_i + v_j \tag{5.4}$$

for all j

where p_j is the unitary price of commodity j, p_i is the unitary price of commodity i, a_{ij} is the amount of commodity i required to produce one unit of commodity j, and v_j represents the payments to factors of production involved in one unit of good j, i.e. the net output price of j.

Equation (5.4) is then a particular representation of the price system, which is conditional on assumed levels for the net output prices, v_j.

We saw in Chapter Two when reviewing the empirical literature on the analysis of the price system that if we make explicit the presence of imports, as an additional raw material, and also recognise the presence in the system of domestic indirect taxes and tariffs, then, using matrix notation and representing row vectors with a prime, the price system can be represented in the following manner

$$p' = (p' + t')A + (p^{m'} + t^{m'})M + v' \tag{5.5}$$

where p is a vector of domestic prices, t and t^m vectors of domestic indirect taxes and import duties (rates) respectively, and A and M the domestic and import I-O matrices whose typical elements are the coefficients a_{ij} and m_{ij} respectively.

Now, if we distinguish between consumer prices, q, and producer prices, p, so that

$$q = p + t \tag{5.6}$$

then, as we saw in Chapter Three, our price equation can be expressed as

$$q' = [v'(I - A)^{-1} + p^{m'}M(I - A)^{-1}] + [t'(I - A)^{-1} + t^{m'}M(I - A)^{-1}] \tag{5.7}$$

where two main components are distinguished: (a) the first element on the r.h.s. showing the basic price or resource cost of commodities, and (b) the second term showing the total indirect tax embodied per unit of domestically produced commodities.

Equation (5.7) has been extensively used to calculate price raising effects from commodity taxation[10] and indeed, as we saw in Chapter Two, it can be extended to analyse price raising effects from public sector pricing policy provided t is interpreted as the deviation of price from

[10] See Ahmad and Stern [1987] for an application to India and Pakistan.

marginal cost in public firms.

We have focused here mainly on the analysis of tax incidence by explicitly recognising the presence of indirect taxes as part of the cost of production activities. The same approach as described above, however, has often been used to evaluate price effects arising from other sources such as changes in prices of factors of production, or indeed, as will be seen later in Chapter Seven, the I-O approach has extensively been used for evaluating ERP.[11]

The assumptions underlying these calculations may not hold rigidly in practice but, nevertheless, this type of analysis is useful in that it indicates where pressure on costs leading to price increases is likely to be felt. Yet, not all the limitations imposed by the I-O approach are inevitable. Some of them can in fact be overcome and still the advantages of the fix-price approach to modeling can be retained. Let us comment on some of these limitations.

First, as noted above, the assumption that raw materials combine in fixed proportions implies that producers are unable to shift towards cheaper sources when relative prices change. The argument, although intuitively obvious, can be illustrated with the help of Figure 5.1

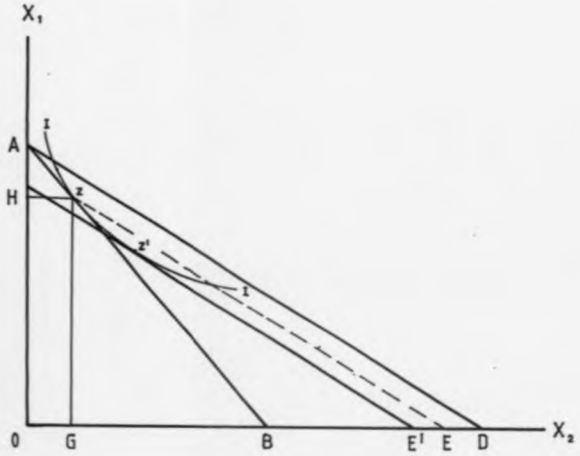
Consider a good j which is produced by a Leontief combination of value added and two raw materials, x_1 and x_2. XY in Figure 5.1 describes different combinations of x_1 and x_2, which combined in fixed coefficients with value added, v, yields one unit of j. The original or base price ratio is given by the slope of the line AB. Thus, the initial equilibrium is given by the point z where OH units of x_1 and OG units of x_2 are used. In terms of x_2 the input cost per unit of output is measured by the distance OB.

Now, assume that a tax magnitude BD/OB is imposed on x_1. The new price ratio is now given by the slope of the line AD. If substitution between x_1 and x_2 does not exist (that is, if they are assumed to be perfect complements) the final equilibrium point will be given by z where the

[11] See UNIDO [1973] for some possible applications of the I-O models in the analysis of price raising effects.

Figure 5·1

INPUT SUBSTITUTABILITY



same quantities of x_1 and x_2, as before, are used to produce one unit of j. As a consequence of the tax, the cost will rise to OE, so that the cost (price) raising effect of the tax is BE/OB.

Assume now that it is possible for the producer to substitute, by some limited degree, between x_1 and x_2. In this case the final equilibrium point is given by z' where the new price ratio line is tangent to the isoquant II. It can be seen that now the cost has risen only to OE'. Therefore, the cost increase in the case of flexible coefficients is BE'/OB, which is lower than the cost increase in the case of fixed coefficients, BE/OB.[12]

Note that although we used as an example a domestic indirect tax, the argument is equally valid for tariffs, provided x_1 or x_2 is an importable, or, an exportable, or it can also be assumed that the changes in relative costs are originated by an adjustment on the relative prices of publicly produced commodities. Whatever the source of change in input prices, the important point for our purposes is that as long as some degree of substitution in the use of raw materials is present, production cost would change less and so would commodity prices. In particular, as will be explained in the next section, we shall postulate that, for the group of traded commodities, two possible sources of supply exist -domestic production and imports. In this event, in the absence of trade restrictions, one would expect that producers would have the possibility of substituting between these two sources when making their cost minimising decision.

A second and no less important limitation of the I-O approach, as described above, arises from the fact that commodity transactions in I-O tables are usually valued at producer prices, that is, without incorporating trade and transport margins. We have already made reference to this point in the previous chapter, and indeed, the argument in favour of building I-O tables valued at market prices has been explored in depth elsewhere.[13] We need only to point out that the valuation of commodity transactions at market prices is necessary if one wants to model accurately economic behaviour since it is market prices that economic agents respond to. It is this point

[12] Adapted from Carden [1971]. See also Armington [1969].
[13] See Pyatt [1985].

which dictates the use of market prices for the present purposes.

Thirdly, and similarly related to I-O tables as a data base for modelling purposes, the standard convention in building I-O tables is to classify production activities according to the principal product criteria. As such then, the I-O structure of an economy can be viewed as an interdependence between demand for different commodities. This approach to grouping activities, although useful for several purposes, neglects several forms of dualism commonly present in developing economies, such as the formal and informal sectors, or indeed, as we do here, the public / private dichotomy of the economy.

As we saw in the previous chapter, our SAM, while still retaining the principal product criteria, it nevertheless incorporates a second criterion based on the from of organisation of production activities, namely, public or private. The I-O structure of the economy must now be conceived not only as an interdependence of commodity demands as before, but also as an interdependence of public and private activities.

These three points constitute our main extensions to the traditional I-O approach in our attempt to analyse the relative price structure. In addition, it it will be seen in subsequent chapters that some additional characteristics can be modelled, notably the fact that some commodity prices can be allowed to be regulated. It is therefore not necessary in our approach to assume that all production sectors follow the cost-plus pricing rule, which assumes that changes in activity costs are fully transferred forward to the corresponding commodity price. This assumption is typical in I-O models (except Hughes [1986]).

5.4 Modelling The Price System

In the past section we outlined the main characteristics of fix-price models emphasising both their limitations and advantages. In particular, it was said that the traditional I-O models have been extensively used for analysing issues related to the price system. It was also mentioned that even

though I-O models may be useful for the analysis of the price system, they carry some limitations in addition to those imposed by the fix-price nature of the approach, namely (a) the fixed coefficients assumption, (b) the estimation of price effects at producer and not at market prices, and (c) the fact that production activities are classified exclusively according to the principal product criteria.

The aim of this section is, therefore, to present a different formulation of the modelling of the price system such that, whilst the fix-price approach is maintained, the points mentioned above will be incorporated into the analysis. Hence, we will model a more flexible scenario, in which substitution possibilities are introduced at several stages. Similarly, alternative pricing scenarios are allowed for different production activities, thus allowing for the prices of some publicly produced commodities to be fixed. Finally, to the extent that commodity balances are valued at market prices in our data framework, the results of our model will be more realistic since we will obtain a picture of price effects at market prices.

As pointed out before, our model benefits considerably from the SAM approach, which not only enhances the modelling capabilities but, more specifically, allows us to consider explicitly the public/private dichotomy of the Mexican economy which would have otherwise been ignored by the I-O approach.

Finally, it should be said that in this section the emphasis is upon the modelling of public sector pricing policy and performance. The idea is to explain in detail how we have specified the structure of the price system. However, many more issues can be addressed, some of which have already been outlined. In particular, as will be seen in Chapter Seven, a slightly different approach of the model is used to evaluate effective protection levels.

5.4.1 The Model

In setting up the modeling of the price system for the Mexican economy we used as a data frame-

work our consolidated SAM for I-O analysis as represented in Table 4.6 in the past chapter. Rather than explaining again the details of how the SAM is structured, we will only describe the main characteristics that are relevant for the purposes of setting out the model.

We should recall that, in our SAM, twelve commodities were identified. With the exception of construction which is only produced by the private sector, and electricity which is a public monopoly, all the commodities in the system have two domestic sources of supply -public and private. Also, for the purpose of dealing properly with margins, the activities public and private transport were further split up into transport for goods of domestic origin and transport for imported commodities. Accordingly, we ended up with twenty six production activities, thirteen of which were public and thirteen private.[14]

Thus, since our framework distinguishes between activities and commodities, the model is divided into two main components, namely, activity costs and supply of commodities. In terms of our data framework in Table 4.6 these two components correspond to absorption and make matrices respectively. Accordingly, the model will be presented in two main blocks. The first block refers to the modeling of activity costs, both public and private, whereas the second block refers to the modeling of supply of commodities.

Table 5.1 sets out the model. To make the exposition clearer let us also use Figure 5.2, which shows diagrammatically how the price system is being structured.

The first block is given by equations (1.a) and (1.b), showing how the cost structure of activities is formed. Gross output price of public and private activities, c_a and c_j are formed by a Leontief combination of net output prices, v_a and v_j, and intermediates, which we assume to combine in fixed proportions.[15] It can be seen that production activities buy raw materials from com-

[14] See Appendix A for the details of activity and commodity disaggregation.

[15] It will be seen in Chapter Seven that for purposes of estimating ERP allowing for substitutability in the use of raw materials it will be necessary to assume that intermediates combine in a constant elasticity of substitution (CES) form.

Table 5.1

Price Formation. Model Specification

$$c_i = v_i + \sum a_{ij} P_j \qquad (1.a)$$

$$c_j = v_j + \sum a_{ij} P_i \qquad (1.b)$$

$$PD_i^I = c_i^I + PD_i^{I'} \qquad (2.a)$$

$$PD_j^I = c_j^I + PD_j^{I'} \qquad (2.b)$$

$$PD_i = 1/\gamma\left[\beta^{\lambda} PD_i^{(1-\lambda_i)} + (1-\beta)^{\lambda} PD_j^{(1-\lambda_i)}\right]^{1/(1-\lambda_i)} \qquad (3)$$

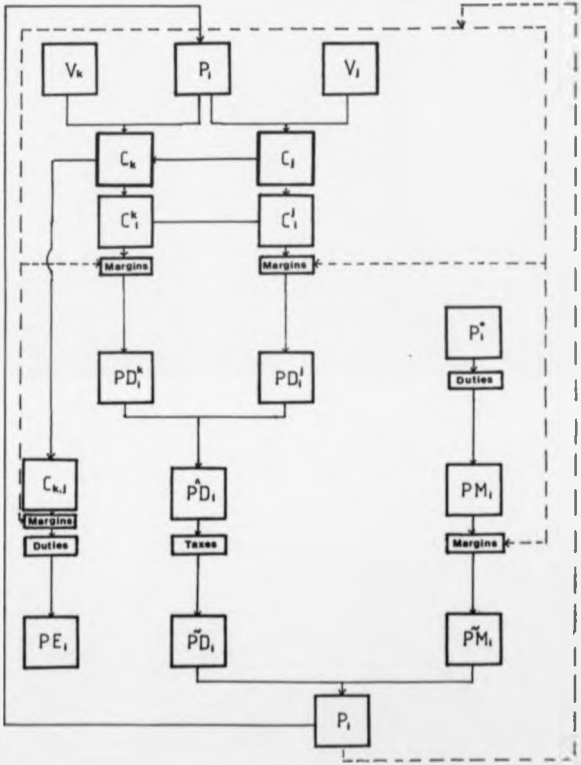
$$PD_i = PD_i(1 + t_i) \qquad (4)$$

$$PM_i = P_i^*(1 + t^m) \qquad (5)$$

$$PM_i = PM_i + PM_i^I \qquad (6)$$

$$P_i = 1/\eta\left[\delta^{\alpha} PM_i^{(1-\alpha_i)} + (1-\delta)^{\alpha} PD_i^{(1-\alpha_i)}\right]^{1/(1-\alpha_i)} \qquad (7)$$

Figure 5·2
PRICE FORMATION



where k denotes public activities, and j refers to private activities, and the remaining notation is as follows

c_k = Gross output price of public activity k.

c_j = Gross output price of private activity j.

v_k = Net output price of public activity k.

v_j = Net output price of private activity j.

a_{ik} = Input-output coefficients for public activities.

a_{ij} = Input output coefficients for private activities.

c_i^p = Producer price of publicly produced commodities.

c_i^r = Producer price of privately produced commodities.

PD_i^p = Cost price (inclusive of margins) of publicly produced commodity i.

PD_i^r = Cost price (inclusive of margins) of privately produced commodity i.

$PD_i^{T,p}$ = Cost price of the share of the production of public trade and transport allocated to domestic commodity i.

$PD_i^{T,r}$ = Cost price of the share of the production of private trade and transport allocated to domestic commodity i.

$P\hat{D}_i$ = Domestic price of the composite public/private, i, inclusive of trade and transport margins.

t_i = Domestic indirect tax on commodity i (rate).

$P\hat{D}_i$ = Domestic market price of commodity i (after taxes).

t_i^m = Import duty on commodity i (rate).

P_i^* = World price of commodity i.

PM_i = Landed price of imports of commodity i.

PM_i^T = Cost price of the share of the production of transport allocated to imports of commo-

dity i.

PM_i = Market price of imports of commodity i.

P_i = Market price of composite (domestic and imported) commodity i.

and β, μ, δ, and γ are constants.

modity markets at market prices, that is, inclusive of indirect taxes as well as of trade and transport margins. Also, it is important to stress that value added or net output prices, v_s and v_j, will be exogenous to our model, since prices of factors of production (labour and capital) are assumed to be given. Hence prices are determined only by the supply side of the economy.

In terms of Figure 5.2, this first block of equations is represented by the first and second levels, reading downwards, where v_s and v_j combine with P_i (market prices of intermediates) to generate domestic gross output prices, c_s and c_j, of public and private activities, respectively. This first set of equations, then, describe the cost structure of production activities which, as previously noted, correspond to the combination of value added with the elements of the absorption matrix in our SAM. We shall come back to this first block of equations in more detail below, when outlining the sort of policy experiments we intend to carry out. In the meantime let us move on and explain the next part of the model, which refers to the modeling of supply of commodities. Two sources of supply are identified -domestic production and imports. Let us start with domestic production.

The first thing to notice is that in our framework domestic production of traded goods can have two possible destinations -domestic or international markets. It is important therefore to assume that domestic and exported commodities are the same so that the price of commodity i is the same irrespective of whether it is exported or sold in the domestic markets. This assumption is necessary if we want to ensure that prices do not depend upon the allocation of output between domestic or export markets, but only upon activity costs. Notice that despite this assumption, for the sake of completeness, Figure 5.2 shows domestic and export prices of commodity i separately.

We can now concentrate on the price formation process of commodities sold in the domestic markets. The description of this process starts with equations (2.a) and (2.b). These equations describe how factor cost prices of public and private supply of commodity i, PD_i^s and PD_i^j are determined by the the combination of the corresponding prices (producer) of domestic supply (c_i^s

and c_i) and the cost of trade and transport margins allocated to each commodity, PD_i^T.

The nature of equations (2.a) and (2.b) can be better understood if we recall from Table 4.6 that the outputs of the sectors trade and transport were distributed along the make matrix. That is, we shall assume that the activities trade and transport produce a homogeneous commodity which is placed into the different commodity markets. Formally, it can be assumed that the supply of trade and transport, Q_T, is placed into the different commodity markets, i, according to a constant elasticity of transformation (CET) function

$$Q_T = \sum_i \xi_i Q_{Ti} \tag{5.8}$$

where ξ is a share parameter, Q_{Ti} represents the amounts of margins (trade and transport) allocated to market i, and the elasticity of transformation, ψ, is given by $1/(1-\phi_T)$. Then, if P_T is the price of output of trade and transport it can be shown that maximising the revenue of the activities trade and transport, $\sum_i P_i Q_{Ti}$, yields the following result (see Appendix B for the derivation process)

$$P_T^{(1-\psi)} = \sum_i \xi_i P P_i^{(1-\psi)} \tag{5.9}$$

We shall therefore assume an infinite elasticity of transformation so that the output of trade and transport, and hence its price, is the same irrespective of the commodity market in which it is placed. In Figure 5.2 this process is described in the second and third levels.

Equation (3) combines publicly and privately produced commodities at factor cost prices by means of a constant elasticity of substitution (CES) function, thus forming a composite commodity whose price is PD_i. As can be seen, it is formed by a combination of public and private supply of commodity i, with the elasticity of substitution given by the value of λ, whereas β and μ are share and scale parameters, respectively.

It should perhaps be mentioned in advance that, with the exception of the commodity capital goods, no degree of substitutability between public and private supply was allowed. The reason is that, as suggested in Chapter Two, the public sector in Mexico has performed as a complementary sector to private activities. We will explain this point in more detail in the next chapter. However, and more generally, if one has the belief or evidence that public and private supply of commodities are made up of similar commodities, then this can be modeled by giving some positive values to the parameter λ, thus allowing for substitutability to take place.

Domestic indirect taxes t_i (rate) are added in equation (4), which describes market prices of domestic supply of commodity i, $P\hat{D}_i$. The importance of adding indirect taxes (and trade and transport margins as suggested by equations [2.a] and [2.b]) so as to arrive at market prices has been stressed before. As already noted, market prices are the relevant ones when it comes to modeling economic behaviour. In Figure 5.2, market prices of domestic supply, $P\hat{D}_i$, appear in the fifth level, once the tax component has been added.

Thus far we have described the price formation process regarding domestic supply. However, total supply is also made up of imports. Equations (5) and (6) describe the treatment given to imports.

Equation (5) describes landed prices of imports of commodity i, PM_i, once import duties, d^m_i, (rate) have been added to the world price of the commodity, P^*_i. Equation (6), in the same manner as with domestic production, shows how margins on imports, PM_i^T, are added to landed prices of imports, PM_i, in order to obtain imports valued at market prices, $P\hat{M}_i$. This process of import price formation is described in the right hand side of Figure 5.2, beginning with *cif* prices of imports given by the world price of the commodity i, P^*_i, at the third level. The addition of duties leads to landed prices of imports, PM_i, in the fourth level, whereas in the fifth level margins have been added to arrive at domestic market prices of goods of foreign origin, $P\hat{M}_i$.

We are now in a position to bring together as a composite commodity domestic supply and

imports, both at market prices. This is described by equation (7) where these two sources combine in a constant elasticity of substitution (CES)[16] form, where the elasticity of substitution is given by the value of σ, and δ and γ denote share and scale parameters respectively. Depending on the value of σ, imports and domestic supply will combine in different ways. If σ is close to zero, there is almost no scope for substitution between these two sources when relative prices change. In the extreme case, when σ equals zero, we are in the Leontief world where imports are perfect complements to domestic production, and hence changes in relative prices will not affect the proportions in which the two sources combine. Alternatively, the greater σ the more substitutable domestic production and imports will be. At the opposite extreme, when σ tends to infinity there is perfect substitutability. The actual values of σ in any particular context will depend on how homogeneous domestic production and imports are as well as on quality differences, thus varying from country to country. We will discuss this point for the Mexican context in the next chapter.

The process of composite price formation just described above is shown in the last level, at the bottom of Figure 5.2, where P_i is made by the combination of PD_i and PM_i. The circular flow of the system is indicated by the continuous lines which describe how the price of the composite commodity, P_i, feeds back into the cost of production activities, while the discontinuous lines show how margins affect prices, both domestic and foreign.

5.4.2 Policy Experiments

It has been mentioned before that as far as the effects on the price system are concerned, deviations of price from marginal cost in public firms can be viewed as a form of indirect taxation; if price is above marginal cost, the effects are similar to that of an indirect tax, whereas if price is below marginal cost, the effects on prices are equivalent to a subsidy.

[16] As originally suggested by Armington [1969].

Accordingly, for purposes of simulating changes in public prices all we need is to simulate a tax (or a subsidy) on the part of the domestic commodity produced by the public sector, c_i^p in equation (2.a). As will be seen, it turns out that, in the Mexican economy, public prices are in fact heavily subsidised so that, in most cases, the price-cost margin will be negative. Naturally, it is necessary to know the direction and magnitude of the price cost margin. This point will be explained in the next chapter.

Meanwhile it should be noted that we are not changing the rate of indirect taxes t_i, but instead, imposing a tax θ on the supply of public activities, c_i^p. The reason for that, as can be seen from Figure 5.2, is that domestic indirect taxes are levied as a proportion of the aggregate of the commodity, that is, including both public and private supply, and not as a tax on the publicly produced commodity.[17]

As far as changes in efficiency levels in public production activities are concerned, we have followed the same principle as described above, that is, inefficiency in the public sector is viewed as a form of indirect taxation to the extent that the prices faced by consumers are higher than the prices that would prevail if the public firm were more efficient. To obtain some insight into this point, it will be useful to show in a more explicit way the value added or net output component of the cost structure of activities.

We have expressed equations (1.a) and (1.b) in a rather compact way, trying to emphasise that, for the present purposes, net output prices, v_j and v_n, are assumed to be exogenous. Nevertheless, v_n, for the public sector, can be expressed in a more explicit way as

$$v_n = \left[\frac{1+\theta}{1+\theta_n}\right]\left[\frac{\theta}{\theta_n}\right]\left[\sum_j v_j m_j\right] \tag{5.10}$$

[17] So far we have assumed in our model that all sectors follow the so-called cost-plus pricing rule, which means that any change in activity costs are fully transferred forward to commodity prices. In the next chapter, however, we will see that it can also be assumed that the prices of some commodities are regulated or fixed so that any increase in activity costs would now be transferred backwards, affecting factor rewards instead. In terms of our equations, we shall be assuming that the prices of some publicly produced commodities, c_i^p are regulated by the government, and hence increases in activity costs would only create a negative rent but would not affect the price of the corresponding commodity (see Chapter Six).

where θ is a tax rate, θ_0 is the same tax at time zero, ρ is a scale parameter, and v_{ai} is the coefficient for the use of factors of production, i, (labour and capital), whose prices, w_i, are assumed to be fixed.

Parameter ρ in equation (5.10) is usually interpreted as an efficiency index. An increase in ρ leads to an increase of net output for given amounts of factors of production. Also, since θ is a tax rate, it can therefore be interpreted as a value added tax. Now, an increase in the level of the tax ($\theta > \theta_0$) can be offset by an appropriate increase in production efficiency ($\rho > \rho_0$). From this perspective, any avoidable inefficiency in public firms can be conceptualized as a form of indirect tax, as far as its effects on the price system are concerned.

Keeping in mind this analogy, in order to simulate increases in efficiency levels (or reduction in levels of inefficiency) in our framework, it was only necessary to impose an appropriate subsidy (or tax) on the price of the publicly produced commodities in question. As can be seen, the procedure was essentially the same as for changes in public prices.

The framework as described above will be used in the next chapter to analyse public sector pricing policy and performance. Nonetheless, because of the fix-price nature of the model, net output prices are assumed to be fixed. Accordingly, in order to evaluate effective rates of protection in Chapter Seven, we will make use of an slightly modified version of the same model. For exposition purposes, however, we will explain such an approach in the corresponding chapter.

The last point to mention is that for purposes of implementing our policy experiments we used a software package known as HERCULES. This software package has been created to solve computable general equilibrium (CGE) models. For our purposes, however, the model was run as fix-price, that is, fixing the prices of factors of production, hence making price determination independent of the demand side.

5.5 Summary and Conclusions

It has been argued that fix-price models, despite their inherent limitations, constitute a good framework for a partial analysis of the price system. Specifically, it has been seen that traditionally issues related to the analysis of the price structure have been analysed in a I-O framework. Yet, it has also been pointed out that I-O models do entail some limitations which may have some implications when estimating price effects. Three points were suggested : (a) the fixed coefficients assumptions (b) the fact that price effects are evaluated based on producer prices as opposed to market prices, which are the relevant ones when modeling economic behaviour, and (c) the use of only one criterion for the classification of activities in I-O tables.

The ultimate aim of this chapter has been, therefore, to present an alternative model for the analysis of the price system, which, while remaining in the fix-price fashion, nevertheless introduces some characteristics in the spirit of general equilibrium. Specifically our model introduces substitution possibilities in the use of raw materials. While we allowed for substitution between domestic production and imports, the generality of the model, however, permits us the specification of substitutability with more inputs, if required. Since our data framework values commodity balances at market prices, our model benefits considerably as it estimates price effects at market prices.

We have put special emphasis on public pricing policy and performance. Nonetheless, the model can deal perfectly with other issues, such as the analysis of tax reform, thus offering a richer and more flexible analysis of the price system, since it tackles some aspects which the traditional I-O model has, thus far, not dealt with.

Also, as noted before, the model benefits from our SAM approach in that it enables us to carry out the analysis incorporating the public/private dichotomy, and more generally, in that it enhances the modeling capabilities at various points. These points will become evident in the course of the exposition of the following two

chapters.

CHAPTER SIX

PUBLIC SECTOR PRICING POLICY AND PERFORMANCE. ANALYSIS OF RESULTS

6.1 Introduction

In the preceding chapter the framework for the analysis of the price system was set up. Using our model, this chapter analyses in detail the effects that public sector pricing policy and performance have on the relative price structure of the Mexican economy. Several policy experiments are carried out simulating different pricing policy scenarios as well as changes in the efficiency levels of public sector activities. In a second stage, the resulting price structure is used to evaluate the effects on the reallocation of resources within the production structure by looking at the changes that take place in the value added of the production activities.

All the policy experiments developed here are carried out assuming various values of elasticities of substitution between domestic production and imports. Similarly, as will be explained in detail later, two alternative models have been built. In the first model it is assumed that all sectors follow the cost-plus pricing rule so that any change in the cost of activities is fully passed on to commodity prices. In the second model the prices of some publicly-produced commodities are assumed to be regulated, and hence changes in activity costs of the sectors whose commodity prices are fixed are pushed backwards, thus affecting factor rewards, instead of commodity prices.

The exposition is organised as follows. In Section 6.2 we present and make some comments on the values of trade elasticities used in carrying out the policy experiments. Some comments will also be made in relation to the degree of substitutability between public and private domestic supply in the Mexican context. In Section 6.3 some brief comments are made regarding the way

in which policy experiments are to be conducted and how the effects on value added are to be calculated. Section 6.4 explains how we approximate the necessary changes in public prices so as to simulate a non-distorted scenario. Section 6.5 is devoted to the presentation and analysis of the main results. It should be mentioned that given the importance of the energy sectors in the results -petroleum and electricity-, the analysis is split into two parts in order to asses the influence of the energy sectors on their own. Changes in efficiency levels and tariffs are also incorporated into the analysis. Finally, Section 6.6 summarises the main findings of the chapter and also contains some concluding remarks.

6.2 Elasticities of Substitution

6.2.1 Trade Elasticities

It is unfortunate that one very often has to make use of "educated guesses" when it comes to finding values of elasticities of substitution between domestic production and imports for a particular commodity. The reason, as is widely known, is the lack of sufficient data to obtain appropriate econometric estimations. Instead, one has usually to choose some boundary values based on some previous knowledge of the main characteristics of the economy in question. In addition to that, aggregation levels make such a task more difficult because, the more aggregated the definition of a commodity, the more likely it is that very different commodities are aggregated into a single "commodity". Since trade elasticity values are determined by the degree of homogeneity between domestic production and imports, it follows that high levels of aggregation would lead to loss of details as to how homogeneous domestic production and imports are, and hence, the choice of a particular value of elasticity of substitution becomes even more difficult.

Nonetheless, if one manages to capture adequately the main characteristics of the economy in question by choosing an appropriate structure of trade elasticities, such problems may not be very serious or, at least, their influence in the outcome can be minimised. Furthermore, it is always possible to modify values so as to get an idea of the degree of sensitivity of the results.

The actual values used for carrying out our policy experiments are presented in Table 6.1. Two sets of values are shown, low and high, the high values being three times greater than the low values. The aim of choosing these two sets of values is twofold. First, to check how sensitive the results are to the value of the parameters and, secondly, to see how they compare with the traditional case in which all trade elasticities are zero when assuming that imports are perfect complements to domestic production.

A first glance at Table 6.1 suggests an upper income developing economy where the consumer goods industry is relatively well advanced, the production of intermediates is fairly important and, although there exists some domestic production of capital goods, it is still heavily dependent from abroad, particularly in the use of sophisticated machinery and equipment.

Table 6.1
Trade Elasticity Values

COMMODITY	LOW	HIGH
Agriculture	2.0	6.0
Mining	1.5	4.5
Petroleum & petrochemicals	1.0	3.0
Food processing	1.5	4.5
Textiles	1.5	4.5
Chemicals	0.5	1.5
Capital goods	0.33	1.0
Other manufactures	1.0	3.0

To have a clearer idea in that respect it might be useful to look at some figures related to imports of commodities in Mexico. Table 6.2 shows the composition of imports according to the type of commodities and the proportion of imports to total supply, for each one of the commodities identified, for our base period, 1980.

Table 6.2[a] Imports, 1980		
COMMODITY	STRUCTURE OF IMPORTS (%)	PERCENT OF SUPPLY IMPORTED (VALUE)
Agriculture	9.8	7.4
Mining	1.9	10.5
Petroleum & petrochemicals	4.9	12.1
Food processing	6.3	4.4
Textiles	0.8	3.0
Chemicals	8.2	14.0
Capital goods	53.3	24.9
Other manufactures	14.4	6.7

[a] Source: Table 4.6 in Chapter Four.

Note: Column one does not add up to a hundred because there is a small fraction of non traded commodities that are not included.

As can be seen from column one, more than 50 percent of total imports consist of capital goods, followed by other manufactures, agriculture, and chemicals. It should be said that the fact that agriculture shows a relatively high share (9.8 percent) is due to temporary conditions rather than to the lack of domestic productive capacity. It can also be appreciated from column one, that most imports consist of manufactured products, especially capital goods, other manufactures, and chemicals, that is, capital goods and intermediates. Column two, on the other hand, shows imports as a proportion of total supply for each commodity. Again, capital goods and intermediates are the most import dependent sectors in the sense that a relatively large proportion of total supply has to be imported.

It should be noted that the trade elasticity value of the commodity petroleum and petrochemicals is not as high as one would expect from an oil producer country. The reason is that the imports of this commodity are made up of refined and petrochemical products, rather that crude oil and, although the domestic production of oil derivatives has steadily been growing over the

past decade, there are still several products that have to be imported. Perhaps it would have been more appropriate to separate crude oil from refined products in our data framework. However, since we have a single activity comprising both crude oil and refined products, it was decided to choose a relatively low trade elasticity value for this commodity.

Thus, as can be appreciated, the structure of trade elasticities in Table 6.1 portrays a developing country with some industrial base. That is, high values are assigned to agriculture, mining, and petroleum & petrochemicals, which tend to be more homogeneous products and for which the proportion of domestic production is fairly important. As far as manufactures is concerned, consumer goods do have relatively high values, particularly food processing and textiles, whose production is well advanced in Mexico. The lowest values, as already mentioned, correspond to intermediates and capital goods. This is shown by the trade elasticity values given to the commodities chemicals and capital goods, as well as to other manufactures, which include some intermediates.

6.2.2 Substitutability Between Public and Private Domestic Supply

A second set of parameters required by the model are the elasticities of substitution between public and private supply, since they form a composite commodity, constituting domestic supply. Such values ought to be determined by the degree of competition between the two sectors, if any. Thus, a high value would suggest that both sectors are involved in the production of very similar commodities whereas a low value would indicate a complementarity between the two sources of supply, public and private.

Insofar as the Mexican economy is concerned, it has been suggested in Chapter Two that the public sector has specialised in the provision of some essential raw materials, particularly in areas in which private investors have found the undertaking of the huge investments to be unprofitable with the uncertain returns that the provision of these raw materials sometimes require. In other cases, some activities are reserved by legislation to public exploitation because

they are considered "strategic" for the economy. Indeed, in Mexico, as in many developing countries, the state was given the role of promoting industrial growth, especially in the early stages of the industrialisation process.

In the light of these considerations and our more detailed discussion in Chapter Two, it can be postulated that public and private sectors have performed more as complementary rather than competing activities. We have therefore tried to capture this fact by assigning a value of zero to all the elasticities of substitution between public and private supply, with the exception of the commodity capital goods to which a value of 0.5 was assigned, thereby trying to reflect some low degree of competition in the production of iron & steel, as well as in the production of motor vehicles, and transport machinery & equipment.

6.3 Policy Experiments and Value Added Effects

As stated in the last chapter, deviations of prices from marginal costs and inefficiency of PEs are to be treated as implicit forms of indirect taxation, insofar as their effects on the price system are concerned. Thus, in order to simulate changes in public prices we simply imposed a tax on the public supply of the commodity in question if price was below marginal cost whereas if price was above marginal cost we simulated a subsidy (negative tax).

The details of how the actual price-cost margins were estimated in the context of the Mexican economy will be presented in the next section. Meanwhile it should be noted that, thus far, we have assumed that all production activities follow the so-called cost-plus pricing rule, which means that changes in activity costs are fully passed on to commodity prices.

If, however, the price of a particular commodity in the system is fixed, then changes in activity costs would not be transferred forward but backwards, hence affecting instead factor rewards. That is, if we assume, for instance, that the price of a publicly produced commodity is regulated then an increase in costs would not change the price of the commodity but, instead, the

the level of profits (or losses) would be affected, and, therefore, there would not be secondary effects in the price system.

For presentation purposes then, two models will be shown. In model 1 it will be assumed that all activities (public and private) follow the cost-plus pricing rule. A second model, which we shall call model 2, will be run under the assumption that the prices of electricity[1] and public supply of petroleum and petrochemicals are regulated, whereas the remaining activities will follow the cost-plus pricing rule.

The fact that these two commodity prices are assumed to be regulated satisfies the reality in Mexico, and some evidence in that respect has been provided in Chapter Two. More generally, however, one can postulate that other publicly produced commodities, although not fixed for long periods, may still be subject to regulation. That is mostly an empirical question which we shall not pursue further here since we only want to bring into the picture the main forces that influence the price system. Nonetheless, for sake of completeness, alongside with our two main models we develop a third model (model 3) in which it will be assumed that all public commodity prices are regulated. The results of this model will not be subject to detailed analysis, but are reported in Appendix C.

Notice that even if we assume that some publicly produced commodities face a controlled price it is still possible to simulate an increase in their prices. In this case, however, the change in the price of the commodity in question ought to be taken as an exogenous and once and for all change so that there would not be additional feedback effects, other than the original change. In other words, when a particular price is assumed to be regulated we can still simulate an adjustment in its price. In this case, however, the change in the price would be exogenously imposed (as a policy variable) and would not be affected by changes in the prices of other commodities in the system.

[1] Which is only produced by the public sector.

The remaining experiments should not pose any problem. As explained in the past chapter, changes in efficiency levels are to be treated as a form of indirect taxation, in exactly the same manner as we did with changes in public prices. Finally, we will also include in our package of experiments the effects that changes in tariffs have on the price structure. As will be seen, changes in tariffs and efficiency levels, in the Mexican context, will act in the opposite direction to the effects of public pricing policy.

So far we have outlined the main set of policy experiments to be conducted and how they will be carried out. We will obtain a very rich picture of how relative prices react to different forces, under a variety of scenarios. The resulting price structure, naturally, will influence the allocation of resources. The natural question is then how resources are expected to be reallocated. We will therefore present a further estimation of the effects on the pull of resources within the production structure by looking at the effects on value added for the different production activities. In calculating these effects, in each case, we took the resulting price solution vector and multiplied it by the cost of the twenty six production activities identified in our SAM, that is, the absorption matrix. In this manner we obtained a matrix of revalued activity costs. The next step was simply to calculate the differences between new and old costs for every production activity, both, public and private. As will be seen later, it turns out that in the Mexican economy all public activities set prices below marginal costs, hence subsidising the remaining production activities by providing them with cheap inputs. In this eventuality, the difference between new and old costs will provide a picture of the extent to which activities are being subsidised.

Since we want to have an insight as to how the system of subsidies inflates value added (presumably profits), we expressed the differences in costs as a proportion of value added. For private activities, then, we shall assume that such a difference represents the subsidy which, instead of leading to a reduction in commodity prices, leads to increases in value added. For public activities a similar reasoning applies except that, in this case, an adjustment had to be made since the initial increase in public prices (from the experiments) reduced the original deficit of PEs which, to some extent, compensates the increase in input costs. For public activities,

therefore, the net effects from changes in revenues and costs will represent the change in value added.

Notice that we are assuming that revenue of public activities is affected only by the increase in the price of domestic supply, not exports. That is, we shall assume that the public sector subsidises only domestic consumption, and therefore it is also necessary to assume that exports of public activities were subject to a tax (or subsidy if prices were above marginal costs) which is removed when public prices are raised.[2]

The resulting picture is interesting because it provides a mapping of where subsidies provided by PEs' low prices actually end up. Indeed, when PEs are producing consumer goods, it is straightforward to find out who benefits from such a policy of low public prices. However, when PEs are involved in the production of intermediates, the picture becomes obscure because distortions (and hence subsidies) are transmitted throughout the production structure.

6.4 Calculation of Public Prices Increases

It is unfortunate that very little and scattered information on PEs' performance is available, particularly when their presence plays an important role on the performance of many economies (see Floyd (1984)). Although to some extent our consolidated SAM for I-O analysis represents a step forward in that direction, there are still a whole range of aspects that deserve and require a more systematic approach. One of these aspects is, undoubtedly, more information on the structure of costs and revenues which will shed some light upon how "production function" elements within a PE are conformed.

In our particular case, in which we attempt to estimate the extent to which prices diverge from marginal costs, the task appears enormous in view of the meagre published data.

[2] Strictly speaking, when public prices are raised and export taxes removed, the revenue of the government falls whereas the revenue of PEs increases. It is therefore necessary to assume that funds are freely transferable between the government and PEs.

Nevertheless, such difficulties may to some extent be overcome if we try to get a rough approximation of the direction and magnitude of the price-cost margin of public entities (usually negative for the case of Mexico) by looking at some financial figures such as subsidy receipts, total revenues and total costs.

It is most fortunate that this sort of financial information for public firms in Mexico does exist for several years, among which is 1980, our base year (see Secretaria de Programacion y Presupuesto [1987], Finanzas Publicas, 1977-1985, Tomo IV, Situacion Financiera del Sector Paraestatal). Although not all PEs in Mexico are included in this publication, the so-called "budgetary controlled" are. These are the most important ones.

A first approximation to estimate this price-cost margin could have been simply to look at the subsidy receipts for each public firm, as a measure of their deficit. We did not do so, however, because it is quite a common practice for PEs to cover their deficits through borrowing and hence, looking at any one year figure, may not reveal their real subsidy requirements. Instead, following Seade [1986], we replaced the concept of subsidy by a more appropriate notion of 'implicit rate', which was estimated, for each public firm, as the difference between revenues (net of subsidies) and costs (net of tax payments), divided by net revenues.

This is not the ideal measure because it still fails to take into account flow cost elements that, while fixed in the short run, will change from time to time and will be reflected in subsidy requirements even though the price-cost margin remains unchanged. To take account of this would have required us to separate fixed from operational costs, for several years, and carry out a time series analysis. Unfortunately such detailed information is not available. Moreover, it is hard to believe it exists at all. Nonetheless, in view of the available information, our concept of an implicit subsidy rate seems a satisfactory approximation of the price-cost margin.

Notice also that the fact that the 1980 is taken as year of analysis introduces a potential problem since one would expect that, because of the overvaluation of the Mexican peso in this

year, imports were cheaper and, therefore, one would expect that for more recent years, the values of these indicator may have changed after the adjustments of the exchange rate in the eighties. This point is important in terms of the robustness of our results in time.

Therefore, for calculation purposes, we grouped each PE reported in our information source according to our own classification of activities and then estimated an implicit subsidy rate for each one of the public activities, as described above, with the exception of public petroleum and petrochemicals.

The activity petroleum and petrochemicals is operated by a single public monopoly (PEMEX),[1] and it would have been quite straightforward to estimate an implicit subsidy rate for the whole activity. However, that would have been unrepresentative since most of the revenues of PEMEX come from the exports of crude oil, whereas it is the domestic price-cost margin we are interested in. That is to say, looking at subsidy receipts for this public firm may be misleading because, due to the export revenues, no subsidies may show up, even though the domestic price is kept down artificially. Instead, we used as an indicator of the price cost-margin the nominal implicit level of protection as used in the next chapter. Such a nominal level of protection was estimated as the difference between domestic and foreign prices for a large group of commodities, including oil products, and then grouped according to the I-O classification (see Chapter Seven).

Indeed, this nominal level of protection is the most appropriate measure of the degree of subsidy given to this particular commodity because the main input cost to the activity -crude oil- is practically zero, and hence the true opportunity cost is represented by the world price of the commodity. Moreover, to the extent that the participation of the private sector in the activity is very small and the whole of the production of the sector is carried out by a single public firm, then there are no problems in using our measure of nominal level of protection as an indicator of

[1] PEMEX, Spanish acronym for the government oil monopoly. Stands for Mexican Petroleum

the price cost-margin of the public activity as a whole. The final figures obtained from the estimations of the price-cost margins for public activities are presented in Table 6.3

Table 6.3
Price-Cost Margins for Public Activities

ACTIVITY	RATE
Agriculture	-0.54
Mining	-0.15
Petroleum & petrochemicals	-0.67
Food processing	-0.55
Textiles	-0.15
Chemicals	-0.51
Capital Goods	-0.14
Other manufactures	-0.15
Electricity	-1.65
Other Services	-0.19
Transport & communications	-0.46
Trade	-0.91

Before going into the analysis of results, however, let us make some comments on the value of these implicit subsidy rates, since they will serve as a basis for several of the policy simulations carried out.

As can be seen from Table 6.3, in some cases the cost-price margin is very high, particularly for the energy sectors -petroleum and electricity. This is important because, as it will be seen, the results of our policy experiments will be determined, to a great extent, by the performance of these two sectors. Indeed, although our estimates of the price-cost margin may appear excessively high, particularly for electricity (-1.65), it should be said that the number we obtained looks sensible when compared with previous estimations. Gil (1985), for instance, estimated the price differential between marginal social opportunity costs and domestic prices for several user types of electricity. They range from: -83.6 percent for industrial electricity; -161.0 percent for commercial electricity; -273.7 percent for residential electricity; to -906.5 percent for rural electricity (estimates for 1980).

It should also be stressed that our two energy sectors -petroleum and electricity- are among the most heavily subsidised. Indeed, the prices of publicly supplied energy products underwent very few price adjustments during the seventies (see Philip [1984], see also Chapter Two). That is, in fact, the reason why in Model 2 we assume that these two energy sectors face a regulated price.

Other commodities such as agriculture and trade show also a very high price-cost margin. Nevertheless, their influence in the results is expected to be limited, given the small fraction by which they participate in the total level of production of the respective sectors, in which the private sector dominates by far. Perhaps more relevant are chemicals and transport whose price-cost margins are still high and hence we should expect some effects of importance, particularly as far as transport is concerned, given its influence in the distribution process. Food processing, although it shows a high price-cost margin would, not influence the results very significantly, since most of its production is composed of consumer goods.

Finally, the less subsidised commodities are textiles, capital goods, and other manufactures in the manufacturing area, as well as mining and other services. Here it is important to point out that capital goods and mining are relevant in the sense that the size of the public presence on the activities is significant; 12.5 and 10.2 respectively percent as a proportion of total domestic supply. In particular, it is interesting to notice that the lowest price-cost margin corresponds to the activity public capital goods, which looks sensible in view of our remarks in Section 6.2 regarding the presence of some degree of competition with the private sector.

Having made the comments above let us move on to the next section and have a look at the results of some policy simulations.

6.5 Analysis of Results

For presentation purposes we shall start from the more general set of policy experiments and then

break down the analysis to see separately the effects of the energy sectors on their own. In a second part we introduce the effects of changes in efficiency levels as well as tariffs. It should be said that we have tried to be very selective and comment only on the most representative set of policy experiments so as not to get lost in the details. Nevertheless, several related policy experiments, although not presented in this chapter, are referred to in Appendix C, where a wider variety of results are reported. We will make reference to them when appropriate during the course of the exposition.

6.5.1 Changes in all Public Prices

The first policy experiment consisted of simulating an increase in all public prices in such a way that in all public activities the price-cost margin disappears. The precise amount in which public prices were raised are given by the implicit subsidy rates, as presented in Table 6.3 in the last section. The results of this experiment are presented in Table 6.4 under the label of Model 1 which, as we explained, refers to a scenario where all sectors (public and private) are assumed to follow the cost-plus pricing rule.

The results of each policy experiment are presented under three different sets of trade elasticity values; all imports complementary to domestic production, low trade elasticities, and high trade elasticities. Columns one, two and three show how value added for public and private activities are affected by the new price structure. We also show the effects on value added of the aggregate (between public and private) of each production activity. Columns four, five and six show the price effects for the different commodities (market prices).

Let us begin by making some comments on the resulting structure of relative prices. The first point to notice is the sensitivity of prices to the value of trade elasticities. This is particularly true for commodities such as petroleum & petrochemicals and chemicals and, although less accentuated, the remaining commodity prices are also sensitive to changes in trade elasticity values. This result should not be surprising given that the increase in the price of petroleum is

Table 5.4

Model 1 : Effects of Increasing All Public Prices
(All Sectors Follow The Cost-Plus Pricing Rule

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS (COMPLEMENTARY)	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS (COMPLEMENTARY)	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	5.7	7.2	10.8			
2	Private Agriculture	-9.8	-9.3	-8.1			
3	Agriculture	-9.7	-9.1	-7.9	7.8	7.4	6.5
4	Public Mining	-13.0	-11.7	-8.6			
5	Private Mining	-27.1	-26.0	-23.5			
6	Mining	-25.7	-24.6	-22.0	16.8	16.0	14.2
7	Public Petroleum and Petrochem.	4.39	11.6	29.2			
8	Private Petroleum and Petrochem.	-43.6	-40.0	-31.4			
9	Petroleum & Petrochem.	3.4	10.6	27.9	117.2	106.0	78.8
10	Public Food Processing	113.6	115.7	120.6			
11	Private Food Processing	-30.5	-29.2	-26.1			
12	Food Processing	-21.2	-19.8	-16.7	15.9	15.4	14.2
13	Public Textiles	-33.0	-29.8	-22.3			
14	Private Textiles	-31.8	-30.1	-26.4			
15	Textiles	-31.8	-30.1	-26.3	14.0	13.3	11.6

Table 6.4 Contd.

Model 1 : Effects of Increasing All Public Prices
(All Sectors Follow The Cost-Plus Pricing Rule

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-116.0	-98.4	-56.5			
17	Private Chemicals	-84.8	-79.0	-65.2			
18	Chemicals	-86.1	-79.8	-64.9	29.8	27.7	23.1
19	Public Capital Goods	-8.8	-6.7	-1.7			
20	Private Capital Goods	-32.5	-31.3	-28.3			
21	Capital Goods	-29.2	-27.8	-24.6	10.8	10.3	9.4
22	Public Other Manufs.	-33.6	-30.3	-22.5			
23	Private Other Manufs.	-34.8	-33.3	-29.7			
24	Other Manufactures	-34.8	-33.3	-29.7	13.9	13.2	11.8
25	Electricity (Only Public)	103.9	111.5	129.9	414.6	400.1	367.9
26	Construction (Only Private)	-21.8	-20.7	18.2	10.3	9.8	8.5

Table 6.4 Contd.

Model 1 : Effects of Increasing All Public Prices
(All Sectors Follow The Cost-Plus Pricing Rule

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	34.8	37.2	43.1	*2	*2	*2
28	Private Transp. & Comm.	-15.4	-14.2	-11.4			
29	Transport & Comm.	-6.1	-4.7	-1.4	21.3	20.4	18.1
30	Public Trade	41.5	43.0	46.5			
31	Private Trade	-8.3	-8.0	-7.3			
32	Trade	-7.4	-7.1	-6.4	-	-	-
33	Public Other Services	16.0	16.3	17.0			
34	Private Other Services	-6.9	-6.7	-6.1			
35	Other Services	-0.009	1.2	1.8	14.2	14.0	13.3

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

substantial (67 percent). It will be seen below that most of the variability of price changes to trade elasticity values is in fact attributed to the commodity petroleum. Obviously, the variability of value added to trade elasticity values also shows a high response. It is interesting to note the strong variation in the value added of the activity petroleum & petrochemicals, which moves from 3.4 percent in the Leontief scenario to 27.9 percent in the case of high trade elasticities. This is also explained by the stronger impact in input prices when the scope for substitution reduces as trade elasticity values diminish. We shall return to this point later when discussing price effects under the assumption that changes in energy prices are not present.

Turning now to the price increases themselves, it can be appreciated that there are large effects in all the commodities. In looking at the increases in prices we ought to remember that two main forces are at work; on the one hand, the original increase in commodity prices which varies across commodities and, on the other hand, the subsequent increase in input prices. Let us choose the set of low trade elasticities for the purpose of making some comments.

The two most remarkable effects are in the energy commodities, petroleum and electricity, whose prices go up by a very large proportion; 106 percent for petroleum and 400.1 percent in the case of electricity. While these results are explained in part by the strong original increases in their price (see Table 6.3), the effects are very much reinforced by the close linkage between the two industries in terms of use of inputs, especially electricity which is a very intensive user of petroleum, and, to a less extent, the increases in other commodity prices.

Although not as sharp as in the energy sectors, the remaining commodity prices are also affected in a very significant way. Indeed, with the exception of agriculture and construction whose price raising effects are 7.4 and 9.8 respectively, the rest of the commodity prices go up by figures of two digits. Chemicals and transport are the highest, after the energy sectors, with increases of 27.7 and 20.4 percent. This is explained to some extent by the increase in the price of petroleum.

In general, it can be said that the price raising effects of increasing public prices to the point where prices equal average costs are very large. It seems then that the public sector pricing policy has led to a very distorted scenario where prices do not fully reflect opportunity costs. Naturally, such a situation has affected the allocation of resources in the economy. In particular, if one focuses on the allocation of resources within the production structure, one should expect that, given the magnitude of our price effects, large subsidies are actually channelled to the production activities by the provision of cheap publicly-produced commodities.

The actual way in which subsidies are distributed within the production sector is shown in columns one, two, and three (in Table 6.4), where the effects on value added are presented. Perhaps the most remarkable element to note in the picture of value added effects is the relatively favourable position of the manufacturing industry. It is more or less clear that the system of subsidies through the provision of cheap public products concentrates in manufacturing activities; other manufactures, capital goods and chemicals. Concentrating for the purpose of analysis on the set of low trade elasticity values, it can be seen, for instance, that increasing all public prices would reduce value added in other manufactures by 33.3 percent while chemicals would experience a reduction of 79.8 percent.

At the opposite extreme, it can be appreciated from Table 6.4 that agriculture, trade, and other services are the activities which benefit less from the policy of public prices. This point is important because it suggests that even though the main beneficiaries are manufacturing activities, they are not the most efficient industries in terms of their comparative advantage. Yet the public sector pricing policy has encouraged and promoted their growth through the system of subsidies at the expense of other activities, such as agriculture.

Indeed, given the magnitude in which value added is affected, one would tend to conclude that public price policy has created room for growing inefficiency. Moreover, given the fact that several of the most distorted prices in the system are prices of intermediates, it is hard to believe that the government is fully aware of where these subsidies end up, since distortions are

transmitted all over the production structure.

Table 6.4, as already mentioned, refers to a situation where all sectors follow the cost-plus pricing rule, that is, it is assumed cost changes are are transferred forward to the commodity price. As has already been argued, however, that may not be a very realistic assumption, particularly for some public activities such as electricity and petroleum in Mexico whose prices, even though they have been increased in recent years, usually remain regulated for certain periods, so that their price increases occur only as a once and for all rise. We have tried to capture this more realistic case in Model 2 in which it is assumed that all sectors follow the cost-plus pricing rule, except electricity and petroleum whose prices are assumed to be regulated. Table 6.5 shows the results of increasing all public prices in the same proportion as in our previous experiment.

Before moving on to the analysis of Table 6.5, however, it should be stressed that the reason why only petroleum and electricity prices are assumed to be regulated has to do with the Mexican reality where, on the one hand, these activities are among the most heavily subsidised, and, on the other hand, their prices have remained fixed for long periods, compared to other public produced commodities. The same assumption, nevertheless, can be imposed for the remaining public prices in the system. We therefore run then a third model, which we shall call Model 3 in which all public prices are assumed to be regulated. We shall not report the results of this third model in this chapter, so as not to get lost in the details, but in Appendix C the results of the same policy experiments are presented under this extreme assumption. Table C.1 in Appendix C shows the effects of increasing all public prices. It should be recalled that in Models 2 and 3 when we assume increases in the regulated prices, we are actually imposing these price changes exogenously, that is, as a policy variable, and therefore, when the regulated prices are adjusted, we are assuming that the price changes of the commodities subject to regulation are determined exclusively by the adjustment exogenously imposed. Hence, changes in costs of these activities would be transferred backwards since, by assumption, their prices are regulated.

Table 6.5

Model 2 : Effects of Increasing All Public Prices
(All Sectors Follow The Cost-Plus Pricing Rule, Except Oil and Electricity

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	20.1	20.2	20.6			
2	Private Agriculture	-4.9	-4.9	-4.7			
3	Agriculture	-4.7	-4.6	-4.5	4.3	4.2	4.1
4	Public Mining	5.5	5.6	5.8			
5	Private Mining	-11.9	-11.8	-11.7			
6	Mining	-10.1	-10.1	-9.9	8.2	8.1	7.9
7	Public Petroleum and Petrochem.	53.1	54.0	56.5			
8	Private Petroleum and Petrochem.	-19.4	-18.9	-17.7			
9	Petroleum & Petrochem.	51.6	52.5	55.0	52.8	51.2	47.0
10	Public Food Processing	135.4	135.6	136.2			
11	Private Food Processing	-16.8	-16.7	-16.3			
12	Food Processing	-7.0	-6.9	-6.5	11.2	11.2	11.0
13	Public Textiles	0.001	0.005	1.3			
14	Private Textiles	-15.2	-15.0	-14.6			
15	Textiles	-14.9	-14.7	-14.3	6.9	6.8	6.7

Table 6.5 Contd.

Model 2 : Effects of Increasing All Public Prices
(All Sectors Follow The Cost-Plus Pricing Rule, Except Oil and Electricity)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	25.3	27.3	32.8			
17	Private Chemicals	-38.3	-37.6	-35.9			
18	Chemicals	-35.7	-35.0	-33.0	15.0	14.7	14.0
19	Public Capital Goods	20.4	20.6	20.9			
20	Private Capital Goods	-15.7	-15.6	-15.4			
21	Capital Goods	-10.6	-10.5	-10.3	6.0	6.0	5.9
22	Public Other Manufs.	6.0	6.2	6.9			
23	Private Other Manufs.	-16.4	-16.3	-16.0			
24	Other Manufactures	-16.2	-16.1	-15.8	7.1	7.1	6.9
25	Electricity (Only Public)	165.0	165.9	168.2	164.4	164.3	164.1
26	Construction (Only Private)	-11.2	-11.0	-10.8	5.2	5.2	5.0

Table 6.5 Contd.

Model 2 : Effects of Increasing All Public Prices
(All Sectors Follow the Cost-Plus Pricing Rule, Except Oil and Electricity)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	51.3	51.6	52.5	*2	*2	*2
28	Private Transp. & Comm.	-7.4	-7.3	-6.9			
29	Transport & Comm.	3.3	3.4	3.9	15.0	14.8	14.3
30	Public Trade	63.0	63.0	63.2			
31	Private Trade	-4.2	-4.2	-4.1			
32	Trade	-3.0	-3.0	-3.0	-	-	-
33	Public Other Services	19.7	19.7	19.8			
34	Private Other Services	-3.7	-3.6	-3.6			
35	Other Services	4.3	4.3	4.4	11.1	11.1	11.0

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

Coming back to Table 6.5 and following the same order as with Table 6.4, let us begin by calling attention to the sensitivity of the results to the values of trade elasticities. As can be seen, even though all public prices are originally increased by the same proportion, the sensitivity of price variations to the values of trade elasticities becomes unimportant. Indeed, the changes in price-raising effects is negligible when one moves from one set of trade elasticity values to another. It seems then that most of the variability of prices with respect to the value of trade elasticities ought to be attributed to the commodity petroleum alone. The reason, of course, is that although the price of petroleum & petrochemicals goes up initially by the same proportion (67 percent) in both scenarios, in Model 2 there are no subsequent feedback processes through the industrial structure, since subsequent increases in the activity cost of petroleum are not transmitted to the commodity price.

The second notable feature of Table 6.5 compared with Table 6.4 is the sharp reduction in price-raising effects. In Model 2, although all public prices are initially raised by the same proportion as before, the final market price raising effects are reduced, roughly speaking by more than a half. Naturally, since the prices of electricity and petroleum are increased only once, the cost effects in the remaining production activities are not affected as sharply as in the case where the energy sectors also follow the cost plus pricing rule.

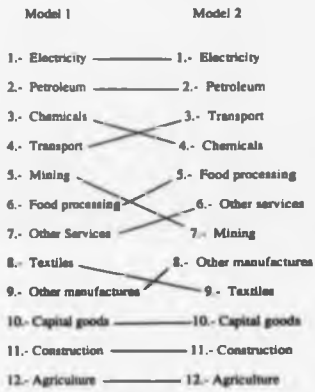
Accordingly, the effects on value added of the production activities are also reduced since activity costs are now less severely affected by the increases in public prices. Yet, in relative terms, it still remains true that the same industrial activities continue to be the main beneficiaries from the public pricing subsidy structure. Notice also that, in contrast to Model 1, in this second model the effects on value added for public activities becomes stronger because, even though revenues increase by the same proportion, costs are now affected on a smaller proportion. By the same token, value added of private activities is also less severely affected. In particular, the overall effects on value added of transport and other services become positive. The methodological consequences of this alternative model in an empirical evaluation of the effects of relative prices upon certain variables may be considerable.

Indeed, it is not only that the magnitudes of price effects change when all sectors follow the cost-plus pricing rule but, equally important, the ranking is affected. In order to gain some insight into this point we present Figure 6.1 in which commodities are ordered according to the magnitude by which their corresponding prices were affected, for the two alternative models.

Figure 6.1

Ranking of Price Rising Effects

Low Trade Elasticities



As can be seen, while for some commodities such as petroleum, electricity, capital goods, construction, and agriculture, the ranking of price effects is the same in the two models, the remaining price raising effects are changed in relative terms.

The consequences of these two effects are important to the extent that price effects are used as a basis for evaluating certain policy changes. Indeed, if, for instance, we used our price structure to evaluate the welfare effects by focusing on the consumption side as Ahmad and Stern [1987] and Seade [1986] did, for instance, we may well obtain quite different results when using Model 2, not only because of the reduction in the absolute value of price rising effects, but also because the relative changes described above would certainly lead to different consumption patterns which would be reflected in different welfare effects. Whether or not some prices are fixed is mainly an empirical question that has to be resolved on the basis of the particular context to which the framework is applied. But, to the extent that the empirical evidence suggests so one should be careful when using the traditional I-O approach.

So far we have concentrated upon the examination of price effects when all public prices are increased. It seems however that to a great extent our results are being determined by the two energy sectors, petroleum and electricity. It is interesting then, for analytical purposes, to see their effects separately so that we can assess with more certainty the influence of public activities, other than the energy sectors, and, by the same token, the degree of influence of the two energy sectors on their own.

6.5.2 Changes in All Public Prices, Separating Energy Price Effects.

6.5.2.1 Effects of Increasing Only the Prices in the Energy Sectors

The effects of isolating the energy price increases from increases in the remaining public activities are shown in Tables 6.6 and 6.7, which correspond to our two models One and Two, respectively. (The same effects for Model 3 are shown in Table C.2 in Appendix C).

Let us concentrate for the moment on Table 6.6, that is, when all sectors follow the cost-plus pricing rule. As can be seen, increasing energy prices account for a very important proportion of the total price raising effects, as compared to the case when all public prices are increased.

Table 6.6

Model 1 : Effects of Increasing Prices of Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	-23.6	-22.2	-18.8			
2	Private Agriculture	-8.0	-7.5	-6.4			
3	Agriculture	-8.2	-7.7	-6.5	5.6	5.2	4.4
4	Public Mining	-30.4	-29.1	-26.2			
5	Private Mining	-24.8	-23.8	-21.4			
6	Mining	-25.3	-24.3	-21.8	13.7	13.0	11.4
7	Public Petroleum and Petrochem.	6.7	13.9	31.2			
8	Private Petroleum and Petrochem.	-42.5	-39.0	-61.0			
9	Petroleum & Petrochem.	5.7	12.8	30.0	115.2	104.1	77.2
10	Public Food Processing	-35.0	-33.2	-28.8			
11	Private Food Processing	-21.9	-20.8	-18.0			
12	Food Processing	-22.8	-21.6	-18.7	6.8	6.4	5.5
13	Public Textiles	-54.2	-51.2	-44.2			
14	Private Textiles	-27.0	-25.5	-22.0			
15	Textiles	-27.5	-26.0	-22.5	11.4	10.8	9.2

Table 6.6 Contd.

Model 1 : Effects of Increasing Prices of Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES *1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-240.7	-223.7	-183.0			
17	Private Chemicals	-79.1	-73.5	-60.1			
18	Chemicals	-85.8	-79.7	-65.2	23.9	22.1	17.9
19	Public Capital Goods	-46.4	-44.4	-39.7			
20	Private Capital Goods	-27.3	-26.1	-23.4			
21	Capital Goods	-30.0	-28.7	-25.7	7.5	7.1	6.3
22	Public Other Manufs.	-64.9	-61.8	-54.4			
23	Private Other Manufs.	-30.0	-28.6	-25.2			
24	Other Manufactures	-30.3	-28.9	-25.5	10.8	10.2	8.5
25	Electricity (Only Public)	106.3	113.8	131.9	410.4	396.8	364.3
26	Construction (Only Private)	-17.4	-16.4	-14.0	8.2	7.7	6.6

Table 6.6 Contd.

Model 1 : Effects of Increasing Prices of Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES *1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	-28.7	-26.3	-20.6	*2	*2	*2
28	Private Transp. & Comm.	-13.8	-12.6	-9.9			
29	Transport & Comm.	-16.5	-15.1	-11.8	9.3	8.5	6.7
30	Public Trade	-34.9	-33.5	-30.1			
31	Private Trade	-6.7	-6.4	-5.7			
32	Trade	-7.1	-6.8	-6.2	-	-	-
33	Public Other Services	-5.7	-5.4	-4.8			
34	Private Other Services	-5.3	-5.0	-4.4			
35	Other Services	-5.4	-6.9	-4.6	4.5	4.3	3.8

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

Table 6.7

Model 2 : Effects of Increasing the Prices of Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity [Regulated]

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	9.9	-9.8	-9.4			
2	Private Agriculture	-3.3	-3.3	-3.2			
3	Agriculture	-3.4	-3.4	-3.2	2.3	2.3	2.2
4	Public Mining	-12.3	-12.2	-12.1			
5	Private Mining	-10.0	-10.0	-9.9			
6	Mining	-10.2	-10.2	-10.1	5.5	5.5	5.4
7	Public Petroleum and Petrochem.	54.2	55.1	58.7			
8	Private Petroleum and Petrochem.	-18.9	-18.4	-17.1			
9	Petroleum & Petrochem.	52.7	53.6	57.2	52.5	50.9	46.6
10	Public Food Processing	-14.5	-14.4	-14.0			
11	Private Food Processing	-9.1	-9.0	-8.7			
12	Food Processing	-9.4	-9.3	-9.1	2.8	2.8	2.7
13	Public Textiles	-22.5	-22.3	-21.6			
14	Private Textiles	-11.2	-11.1	-10.7			
15	Textiles	-11.4	-11.3	-10.9	4.7	4.7	4.5

Table 6.7 Contd.

Model 2 : Effects of Increasing the Prices of Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity (Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-104.0	-102.1	-96.7			
17	Private Chemicals	-34.2	-33.5	-31.8			
18	Chemicals	-37.1	-36.4	-34.4	10.3	10.1	9.5
19	Public Capital Goods	-18.9	-18.8	-18.5			
20	Private Capital Goods	-11.1	-11.0	-10.9			
21	Capital Goods	-12.2	-12.1	-11.9	3.0	3.0	2.9
22	Public Other Manufs.	-26.7	-26.5	-25.9			
23	Private Other Manufs.	-12.3	-12.2	-11.9			
24	Other Manufactures	-12.4	-12.3	-12.1	4.4	4.4	4.3
25	Electricity (Only Public)	165.9	166.8	169.2	164.4	164.3	164.1
26	Construction (Only Private)	-7.3	-7.2	-6.9	3.4	3.4	3.2

Table 6.7 Contd.

Model 2 : Effects of Increasing the Prices of Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity [Regulated]

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
ACTIVITIES		1	2	3	4	5	6
27	Public Transp. & Comm.	-12.7	-12.4	-11.6	*2	*2	*2
28	Private Transp. & Comm.	-6.1	-5.9	-5.5			
29	Transport & Comm.	-7.3	-7.1	-6.6	4.1	4.0	3.7
30	Public Trade	-14.1	-14.1	-13.9			
31	Private Trade	-2.7	-2.7	-2.6			
32	Trade	-2.9	-2.9	-2.8	-	-	-
33	Public Other Services	-2.3	-2.3	-2.2			
34	Private Other Services	-2.1	-2.1	-2.1			
35	Other Services	-2.2	-2.2	-2.1	1.8	1.8	1.8

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

In particular, there is very little difference in the price raising effects of electricity and petroleum; both go up almost by the same proportion (see Tables 6.6 and 6.4) as in the case where all public prices are modified. Roughly speaking, by comparing Tables 6.6 and 6.4, one can say that energy prices account for around two-thirds of the total price raising effects. That point, however, should be regarded with caution because, the less energy intensive the sectors are, the less important energy prices are in explaining commodity price increases. This is corroborated if one looks, for instance, at the price raising effects for other services and food processing, whose prices rise by 14 percent and 15.4 percent respectively, when all public prices are increased (low trade elasticities) (see Table 6.4) whereas the the increases are only 4.3 percent and 6.4 percent when only energy commodity prices are modified (see Table 6.6).

As far as the effects on value added are concerned we should remember that two opposite forces would be acting now. On the one hand, the effect on activity costs are going to be lower, since prices did not rise as much as when all public prices were increased, and hence value added would not fall that much. On the other hand, however, public value added would not rise as much as before because public commodity prices, other than energy, did not rise. Although there is no definite pattern to suggest in what direction value added moved in relation to the case when all public prices are raised, it remains true that the manufacturing sectors are still the main beneficiaries. Perhaps the only significant difference is that sectors producing non-traded commodities are now hit harder, particularly transport and other services, whose public participation is significant and hence, since their public prices share did not rise, value added goes down by a larger proportion.

For the sake of completeness we present the same experiment of increasing energy prices in Model 2 in Table 6.7. Apart from the comments made in the past sub-section there is not much to add; price effects are reduced and so are the effects on value added. Finally, to avoid getting lost in many tables, we report in Appendix C the effects of increasing only the price of petroleum (see Tables C.4, C.5 and C.6, for our three different models).

Table 6.8

Model 1 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	30.2	30.2	30.2			
2	Private Agriculture	-1.5	-1.5	-1.5			
3	Agriculture	-1.1	-1.1	-1.1	1.9	1.9	1.9
4	Public Mining	17.9	17.9	17.9			
5	Private Mining	-1.8	-1.8	-1.8			
6	Mining	-0.001	-0.001	-0.001	2.6	2.6	2.6
7	Public Petroleum and Petrochem.	-1.4	-1.4	-1.4			
8	Private Petroleum and Petrochem.	-0.6	-0.6	-0.6			
9	Petroleum & Petrochem.	-1.4	-1.4	-1.3	0.9	0.9	0.9
10	Public Food Processing	150.8	150.7	150.6			
11	Private Food Processing	-7.8	-7.7	-7.7			
12	Food Processing	-2.8	-2.8	-2.8	8.0	8.0	8.0
13	Public Textiles	23.3	23.3	23.3			
14	Private Textiles	-3.7	-3.7	-3.7			
15	Textiles	-3.1	-3.1	-3.1	2.0	2.0	2.0

Table 6.8 Contd.

Model 1 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	129.7	129.7	129.7			
17	Private Chemicals	-4.4	-4.4	-4.4			
18	Chemicals	1.4	1.4	1.4	4.1	4.1	4.1
19	Public Capital Goods	39.2	39.2	39.3			
20	Private Capital Goods	-4.7	-4.7	-4.6			
21	Capital Goods	1.5	1.5	1.5	2.9	2.9	2.9
22	Public Other Manufs.	33.1	33.1	33.1			
23	Private Other Manufs.	-4.2	-4.2	-4.2			
24	Other Manufactures	-3.6	-3.6	-3.6	2.6	2.6	2.6
25	Electricity (Only Public)	-1.3	-1.3	-1.3	0.7	0.7	0.7
26	Construction (Only Private)	-3.9	-3.9	-3.9	1.8	1.8	1.8

Table 6.8 Contd.

Model 1 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	64.0	64.0	64.0	*2	*2	*2
28	Private Transp. & Comm.	-1.4	-1.3	-1.3			
29	Transport & Comm.	10.6	10.6	10.6	10.2	10.2	10.2
30	Public Trade	77.4	77.4	77.4			
31	Private Trade	-1.4	-1.4	-1.4			
32	Trade	-0.006	-0.006	-0.006	-	-	-
33	Public Other Services	22.1	22.1	22.1			
34	Private Other Services	-1.5	-1.5	-1.5			
35	Other Services	6.6	6.6	6.6	9.0	9.0	9.0

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

Table 6.9

Model 2 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity [Regulated])

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	30.3	30.3	30.3			
2	Private Agriculture	-1.4	-1.4	-1.4			
3	Agriculture	-1.1	-1.1	-1.1	1.8	1.8	1.8
4	Public Mining	18.0	18.0	18.0			
5	Private Mining	-1.7	-1.7	-1.7			
6	Mining	0.002	0.002	0.002	2.4	2.4	2.4
7	Public Petroleum and Petrochem.	1.0	1.0	1.0			
8	Private Petroleum and Petrochem.	-0.4	-0.4	-0.4			
9	Petroleum & Petrochem.	1.0	1.0	1.9	0.2	0.2	0.2
10	Public Food Processing	150.7	150.7	150.6			
11	Private Food Processing	-7.3	-7.3	-7.2			
12	Food Processing	2.8	2.8	2.8	8.0	8.0	7.9
13	Public Textiles	23.5	23.5	23.5			
14	Private Textiles	-3.5	-3.5	-3.5			
15	Textiles	-3.0	-3.0	-3.0	1.9	1.9	1.9

Table 6.9 Contd.

Model 2 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity [Regulated])

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	130.6	130.6	130.6			
17	Private Chemicals	-3.7	-3.7	-3.7			
18	Chemicals	1.8	1.8	1.8	4.0	4.0	4.0
19	Public Capital Goods	39.7	39.7	39.7			
20	Private Capital Goods	-4.4	-4.4	-4.4			
21	Capital Goods	1.8	1.8	1.8	2.8	2.8	2.8
22	Public Other Manufs.	33.3	33.3	33.3			
23	Private Other Manufs.	-3.8	-3.8	-3.8			
24	Other Manufactures	-3.5	-3.5	-3.5	2.5	2.5	2.5
25	Electricity (Only Public)	-0.8	-0.8	-0.8	-	-	-
26	Construction (Only Private)	-3.7	-3.7	-3.6	1.7	1.7	1.7

Table 6.9 Contd.

Model 2 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity [Regulated])

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES *1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	64.2	64.2	64.2	*2	*2	*2
28	Private Transp. & Comm.	-1.3	-1.3	-1.3			
29	Transport & Comm.	10.7	10.7	10.7	10.2	10.1	10.0
30	Public Trade	77.4	77.4	77.4			
31	Private Trade	-1.4	-1.4	-1.4			
32	Trade	-0.0008	-0.0008	-0.0008	-	-	-
33	Public Other Services	22.1	22.2	22.1			
34	Private Other Services	-1.4	-1.4	-1.4			
35	Other Services	6.6	6.6	6.6	8.9	8.9	8.9

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

6.5.2.2 Effects of Increasing All Public Prices, Except Petroleum and Electricity

The other side of the coin is revealed in Tables 6.8 and 6.9 in which we present the results of increasing all public prices, except petroleum and electricity, again for our two different models. (Table C.3 shows the result for Model 3 in Appendix C).

Looking at Table 6.8 some interesting comments can be made. First of all, it calls attention to the sharp reduction in price raising effects compared to our previous experiment in which the prices of energy commodities are increased. Yet, price raising effects are significant for some commodities such as other services, transport, food processing and, to a lesser degree, chemicals. Obviously, since prices of intermediates are now not strongly affected, the original increase in public prices becomes the most important effect, rather than the subsequent increases brought about by changes in activity costs, as is the case where the prices of energy sectors are raised. This point is important because it suggests that the bulk of the distorting effects are created mostly by the energy sectors, whereas the remaining public activities may be affecting mainly prices of consumer goods directly, hence not transmitting distortions to the remaining activities.

Obviously, the effects on value added, for the reasons given above, are also not very significant, with the exception of the commodities whose prices are more affected. Indeed, ruling out energy price increases leads to a situation where the system of subsidies provided by cheap public prices becomes direct in the sense that there is no transmission to be traced so that subsidies are now "easy" to follow. In other words, it seems that the main beneficiaries of subsidising public prices, other than energy sectors, are final consumers

Table 6.9 shows the results of the same experiment, that is, increasing all public prices, except petroleum and electricity, but under the assumption that the prices of these two commodities are regulated. It is interesting to note that in both models the values of trade elasticities are, for most commodities, irrelevant since price raising effects remain invariant. Clearly, the reason is that the public sector concentrates on the production of non traded commodities, mainly final

consumer goods and, therefore, the effects on the costs of activities producing traded goods are on a very low scale. Moreover, it can be seen that there are no significant differences between Model 1 and Model 2. That is, the fact that energy commodity prices are regulated becomes irrelevant. This point corroborates our previous remarks in the sense that transmissions throughout the system do not play an important role any more. In other words, to the extent that the most affected prices are those of final consumer goods, the fact that prices of intermediates such as energy are regulated becomes irrelevant because the main force affecting commodity prices is now the original increase in the commodity price itself.

Taking stock of the discussion so far, it can be said that the main source of distortions in the price system comes from the subsidies granted by keeping down energy prices, mainly petroleum and electricity. In particular, the commodity petroleum plays an additional important role to the extent that it makes trade elasticity values become relevant. Likewise, the assumption of regulated prices in the system has shown to be important in the Mexican context. It was seen that when the prices of petroleum and electricity are regulated, the ranking of price effects is affected when compared to the price effects arising from the traditional scenario in which all production activities are assumed to follow the cost-plus pricing rule.

Thus far we have concentrated on the effects created by the modification of public prices. However, the picture is still incomplete. Other forces may well play an important role in influencing the price structure. We shall focus in the next part on the effects of changes in the efficiency levels of PEs as well as the effects of tariffs and how these forces modify, to some extent, not only the structure of prices but also the distribution of subsidies within the production structure.

It should be noticed that we have left out of the picture changes in the domestic indirect tax system. We did so because our focus of attention is on public pricing policy and performance. Nonetheless, the analysis of tax reform can be easily introduced into our framework of analysis, as will be seen in the next chapter.

6.5.3 Changes in Efficiency Levels

It is often argued that, in addition to pricing policies, PEs frequently introduce another source of distortion, namely inefficiency. Indeed, as we saw in Chapter Three, the theoretical work developed during the eighties has perhaps put more emphasis on the issue of performance, rather than on the normative question of pricing policies. It has also been argued that, as far as its effects on the price system are concerned, inefficiency of PEs is equivalent to indirect taxation: consumers have to pay a higher price and, naturally, when PEs are producing intermediates, distortions are transmitted to the remaining commodities in the system.

In view of the importance of this issue we have attempted to introduce the effects that changes in the efficiency (inefficiency) levels of PEs have on relative prices. Unfortunately, no details are available for the Mexican economy so indicate the extent to which PEs are performing inefficiently, if they are at all. The common view, however, is that some PEs in Mexico have a very bad record as far as their economic performance is concerned, which is not only explained by the deliberate policy of keeping public prices down, but also by inefficiency (see Rey [1987]). This is particularly true for public activities that are, in one way or another, producing commodities which are commonly marketed and, to some extent, more exposed to external competition, such as airlines, steel companies, telephones, etc., since these public firms usually keep prices more in line with the prevailing price in the market. Therefore, to some extent, it is more reasonable to postulate that their bad economic performance is due to inefficiency. Yet, as pointed out in Chapter Three, one has to bear in mind that direct comparisons of economic performance between public and private firms may not be very revealing of the degree of inefficiency when objectives are different.

Keeping in mind these considerations, and in view of the lack of information, we have attempted to simulate an imaginary change in the efficiency parameter of all public activities. While such simulation is arbitrary since it has no empirical support, it nevertheless will show the direction and magnitude that real changes may have on the relative prices.[4]

[4] It should be recalled that in order to simulate changes in the efficiency parameter we simply imposed an

Table 6.10 shows the results of simulating an increase in the efficiency parameter in all public activities by 20 percent. To avoid repetition we will only comment on the results of Model 1, since the results of Model 2, with the differences already established, are similar. Nonetheless, we report in Appendix C the results for Model 2 (see Tables C.7 and C.8).

Looking at Table 6.10, it can be appreciated that, while for some commodities the price effects are very low, for some other commodities such as petroleum, electricity, chemicals, other services, and transport, the reduction in prices are of some significance. Obviously, with the exception of chemicals whose price is affected mainly by the reduction in the price of petroleum, the determinant element here is the proportion with which the public sector participates in the aggregate of the activity. This explains why the most significant reductions in prices occur in those activities where the public presence is important.

On the other hand, it is interesting to see the effects on value added of the production activities. No doubt they are of some significance for sectors such as petroleum, electricity, chemicals and, to a lesser degree, capital goods, other manufactures, construction, transport, and mining. In all the referred cases the results suggest that value added of the activities is being implicitly taxed as a result of inefficiency levels in the public sector.

The picture offered in Table 6.10 is, however, partial. If we want to know the net effects of increasing both public prices and efficiency levels, we have to simulate a new policy experiment where both effects are brought jointly, since their separate effects are not additive.

The results of this experiments appear in Table 6.11 where the joint effects of increasing all public prices by their equivalent price cost-margin and increasing the efficiency parameter in all public activities are presented. In general, since the dominant effect is given by the increase in public prices, the results are very similar to our previous experiment in which all public prices were increased. Therefore, we shall only comment on the additional effects originated by the

equivalent subsidy on the supply at producer prices of public services.

Table 6.10

Model 1 : Effects of Increasing The Efficiency Parameter in all Public Activities by 20 Percent
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	2.5	2.5	2.5			
2	Private Agriculture	0.8	0.8	0.8			
3	Agriculture	0.8	0.8	0.8	-0.7	-0.7	-0.7
4	Public Mining	2.8	2.8	2.7			
5	Private Mining	2.3	2.2	2.2			
6	Mining	2.3	2.2	2.2	-2.7	-2.6	-2.5
7	Public Petroleum and Petrochem.	9.9	9.8	9.8			
8	Private Petroleum and Petrochem.	4.8	4.8	4.8			
9	Petroleum & Petrochem.	9.8	9.7	9.7	-14.8	-14.7	-14.7
10	Public Food Processing	4.2	4.2	4.2			
11	Private Food Processing	2.6	2.6	2.6			
12	Food Processing	2.7	2.7	2.7	-1.2	-1.2	-1.2
13	Public Textiles	5.6	5.6	5.6			
14	Private Textiles	2.8	2.8	2.8			
15	Textiles	2.8	2.8	2.8	-1.5	-1.5	-1.5

Table 6.10 Contd.

Model 1 : Effects of Increasing the Efficiency Parameter in all Public Activities by 20 Percent
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	24.4	24.3	24.2			
17	Private Chemicals	8.0	8.0	7.9			
18	Chemicals	8.7	8.6	8.6	-2.8	-2.8	-2.8
19	Public Capital Goods	5.7	5.6	5.6			
20	Private Capital Goods	3.3	3.3	3.3			
21	Capital Goods	3.6	3.6	3.6	-1.5	-1.5	-1.5
22	Public Other Manufs.	6.4	6.4	6.4			
23	Private Other Manufs.	2.9	2.9	2.9			
24	Other Manufactures	3.0	3.0	3.0	-1.3	-1.3	-1.3
25	Electricity (Only Public)	10.1	10.1	10.0	-15.3	-15.3	-15.3
26	Construction (Only Private)	2.8	2.8	2.8	-1.3	-1.3	-1.3

Table 6.10 Contd.

Model 1 : Effects of Increasing the Efficiency Parameter in all Public Activities by 20 Percent
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES *1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	4.5	4.5	4.4	*2	*2	*2
28	Private Transp. & Comm.	2.1	2.1	2.1			
29	Transport & Comm.	2.5	2.5	2.5	-3.1	-3.1	-3.1
30	Public Trade	5.8	5.8	5.8			
31	Private Trade	1.1	1.1	1.1			
32	Trade	1.2	1.2	1.2	-	-	-
33	Public Other Services	1.1	1.1	1.1			
34	Private Other Services	1.0	1.0	1.0			
35	Other Services	1.0	1.0	1.0	-5.6	-5.6	-5.6

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

Table 6.11

Model 1 : Joint Effects of Increasing All Public Prices and Increasing The Efficiency Parameter in All Public Activities by 20 Percent
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	11.5	-12.5	14.8			
2	Private Agriculture	-7.8	-7.5	-6.7			
3	Agriculture	-7.6	-7.3	-6.7	6.1	5.9	5.3
4	Public Mining	-6.3	-5.4	-3.4			
5	Private Mining	-21.6	-20.9	-19.3			
6	Mining	-20.1	-19.3	-17.7	12.6	12.1	11.0
7	Public Petroleum and Petrochem.	23.4	28.1	39.5			
8	Private Petroleum and Petrochem.	-34.2	-31.9	-26.3			
9	Petroleum & Petrochem.	22.2	26.9	38.1	90.9	83.6	66.1
10	Public Food Processing	123.3	124.6	127.8			
11	Private Food Processing	-24.4	-23.6	-21.6			
12	Food Processing	-14.9	-14.0	-12.0	13.1	12.8	12.0
13	Public Textiles	-20.1	-18.0	-13.1			
14	Private Textiles	-25.3	-24.3	-21.8			
15	Textiles	-25.2	-24.1	-21.7	11.0	10.6	9.5

Table 6.11 Contd.

Joint Effects of Increasing All Public Prices and Increasing the Efficiency Parameter in all Public Activities by 20 Percent
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-63.3	-51.8	-24.7			
17	Private Chemicals	-67.5	-63.7	-54.8			
18	Chemicals	-67.3	-63.2	-53.5	23.9	22.5	19.5
19	Public Capital Goods	3.26	4.6	7.8			
20	Private Capital Goods	-25.4	-24.6	-22.7			
21	Capital Goods	-21.3	-20.4	-18.3	8.1	7.8	7.2
22	Public Other Manufs.	-18.2	-16.1	-11.0			
23	Private Other Manufs.	-27.3	-26.7	-24.4			
24	Other Manufactures	-27.6	-26.6	-24.3	10.8	10.5	9.5
25	Electricity (Only Public)	125.9	130.9	142.8	345.1	336.2	315.0
26	Construction (Only Private)	-16.5	-15.8	-14.2	7.8	7.4	6.7

Table 6.11 Contd.

Model 1 : Joint Effects of Increasing all Public Prices and Increasing the Efficiency Parameter in all Public Activities by 20 Percent
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	42.7	44.3	47.4	*2	*2	*2
28	Private Transp. & Comm.	-11.6	-10.8	-9.0			
29	Transport & Comm.	-1.6	-0.007	1.3	15.7	15.1	13.7
30	Public Trade	52.8	53.8	56.1			
31	Private Trade	-6.1	-5.9	-5.5			
32	Trade	-5.1	-4.9	-4.4	-	-	-
33	Public Other Services	18.1	18.3	18.7			
34	Private Other Services	-5.0	-4.8	-4.4			
35	Other Services	2.9	3.1	3.5	6.7	6.5	6.1

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

introduction of changes in efficiency levels.

In comparing Tables 6.11 with Table 6.4 it can be appreciated that the price raising effects are mitigated when changes in efficiency levels are considered. Indeed, for some commodities such as petroleum, electricity, other services, and even agriculture, prices do rise significantly less as a result of improvements in the economic performance of public activities. Accordingly, the effects on value added are also of some significance. In particular, it should be seen that the activities which are hit hardest from inefficiency in public activities are the manufacturing sectors which, as we remember, are also the activities that benefit more from the system of subsidies.

The interesting feature of our results in Table 6.11 is that they provide a picture of the net effects that a system of subsidies (pricing below marginal costs) and a system of implicit taxation (inefficiency) have on the allocation of resources within the production structure. This appears neatly when comparing the effects on value added of the different production activities. It can be seen that the manufacturing activities (mainly capital goods, chemicals and other manufactures) still seem to be the main beneficiaries.

It is indeed unfortunate that no data exists to suggest the degree of inefficiency -if any- within public activities because, otherwise, it would have been possible to consider real levels of inefficiency -just as we did for public price-cost margins- and then to obtain a more realistic picture of the net effects of both elements. We have then, for the time being, to be content with our own simulation experiment.

6.5.4 The Additional Effects of Tariffs

We will talk in the next chapter about the effects that trade policy exert on the allocation of resources. We will do so by estimating effective rates of protection. In this chapter, instead, we have focused on the domestic side by analysing public pricing policy and performance. While that form of separation is convenient for the purpose of analysis, it is more likely that, in reality, a

policy package such as the ones aiming at structural changes would implement the two set of policies together. This has in fact been the case for the Mexican economy where, during the eighties, an important programme of structural adjustment has been taking place, both at the domestic level by correcting public prices, as well as in changes in trade policy, in an ultimate attempt to liberalise the economy from the distortion accumulated in the past two decades.

In this last part of the chapter we have tried, therefore, to present a final result where the three main set of policies are put together; correction of public prices, increase in efficiency levels, and the removal of tariffs. Table 6.12 shows the results of removing tariffs. As can be appreciated, price and value added effects are very low, with the exception of capital goods, whose price goes down by 2.5 percent for the case of low trade elasticities, and to a lesser degree, chemicals and other manufactures. The relatively low effects of removing tariffs should not come as a surprise in view of the remarks made in Chapter Two, in which it was argued that tariffs have not been the main instrument of trade policy.

Despite the small impact created by the removal of tariffs, we present in Table 6.13 the compound effects of increasing all public prices, increasing the efficiency parameter in all public activities by 20 percent, and removing tariffs. As suggested, the additional effects brought about by the removal of tariffs are not very significant, with the exception of other manufactures, capital goods, and chemicals for which, although not very sharp, a greater response in terms of price effects is observed. This is obviously because these commodities have the highest levels of tariffs.

Thus, while public prices ought to be seen as a system of subsidies to the production activities, their effects are counterbalanced or mitigated by an alternative system of taxation arising from public sector inefficiency and tariffs. As a result of the removal of tariffs, the net effects on prices and value added are reduced. In particular, since the highest level of tariffs is concentrated on chemicals, capital goods, and other manufactures, these activities are the most affected by the removal of tariffs, which can be corroborated by looking at the value added effects of the three

Table 6.12

Model 1 : Effects of Removing Tariffs
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	0.8	0.9	1.0			
2	Private Agriculture	0.2	0.3	0.3			
3	Agriculture	0.3	0.3	-0.2	-0.3	-0.3	4.1
4	Public Mining	0.4	0.4	0.6			
5	Private Mining	0.3	0.4	0.5			
6	Mining	0.3	0.4	0.5	-0.3	-0.4	-0.6
7	Public Petroleum and Petrochem.	0.7	0.7	0.9			
8	Private Petroleum and Petrochem.	0.3	0.3	0.4			
9	Petroleum & Petrochem.	0.7	0.7	0.9	-0.8	-0.9	-1.2
10	Public Food Processing	1.5	1.6	1.9			
11	Private Food Processing	0.9	1.9	1.2			
12	Food Processing	1.0	1.0	1.2	-0.7	-0.7	-0.9
13	Public Textiles	2.2	2.4	2.7			
14	Private Textiles	1.1	1.2	1.3			
15	Textiles	1.1	1.2	1.4	-0.8	-0.9	-1.1

Table 6.12 Contd.

Model 1 : Effects of Removing Tariffs
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	4.3	4.6	5.3			
17	Private Chemicals	1.4	1.5	1.7			
18	Chemicals	1.5	1.6	1.8	-1.5	-1.6	-1.7
19	Public Capital Goods	4.6	4.7	5.0			
20	Private Capital Goods	2.7	2.8	2.9			
21	Capital Goods	3.0	3.1	3.2	-2.5	-2.5	-2.6
22	Public Other Manufs.	2.7	2.8	3.2			
23	Private Other Manufs.	1.2	1.3	1.5			
24	Other Manufactures	1.2	1.3	1.5	-1.3	-1.4	-1.7
25	Electricity (Only Public)	0.7	0.7	0.9	-0.3	-0.4	-0.5
26	Construction (Only Private)	1.9	1.9	2.1	-0.8	-0.9	-1.0

Table 6.12 Contd.

Model 1 : Effects of Removing Tariffs
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES *1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	0.8	0.8	0.9	*2	*2	*2
28	Private Transp. & Comm.	0.4	0.4	0.4			
29	Transport & Comm.	0.5	0.5	0.5	-0.2	-0.2	-0.3
30	Public Trade	0.6	0.6	0.7			
31	Private Trade	0.1	0.1	0.1			
32	Trade	0.1	0.1	0.1	-	-	-
33	Public Other Services	0.1	0.2	0.2			
34	Private Other Services	0.1	0.1	0.2			
35	Other Services	0.1	0.1	0.2	-0.1	-0.1	-0.1

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

Table 6.13

Model 1 : Joint Effects of Increasing All Public Prices, Increasing the Efficiency Parameter of all Public Activities by 20 percent, and Removing Tariffs
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	12.5	13.7	16.4			
2	Private Agriculture	-7.5	-7.1	-6.2			
3	Agriculture	-7.3	-6.9	-5.9	5.9	5.6	4.9
4	Public Mining	-5.7	-4.7	-2.5			
5	Private Mining	-21.1	-20.3	-18.5			
6	Mining	-19.6	-18.8	-16.9	12.2	11.7	10.3
7	Public Petroleum and Petrochem.	24.4	29.6	42.1			
8	Private Petroleum and Petrochem.	-33.7	-31.1	-25.0			
9	Petroleum & Petrochem.	23.2	28.4	40.7	90.0	81.7	62.4
10	Public Food Processing	125.0	126.7	130.6			
11	Private Food Processing	-23.3	-22.3	-19.8			
12	Food Processing	-13.8	-12.7	-10.1	12.4	11.9	10.7
13	Public Textiles	-17.6	-15.0	-9.2			
14	Private Textiles	-24.1	-22.8	-19.8			
15	Textiles	-23.9	-22.6	-19.6	10.2	10.0	8.0

Table 6.13 Contd.

Model 1 : Joint Effects of Increasing All Public Prices, Increasing the Efficiency Parameters of All Public Activities by 20 Percent, and Removing Tariffs
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-57.9	-45.1	-14.6			
17	Private Chemicals	-65.7	-61.5	-51.5			
18	Chemicals	-65.4	-60.8	-49.9	22.2	21.0	17.0
19	Public Capital Goods	8.1	9.8	13.7			
20	Private Capital Goods	-22.5	-21.5	-19.2			
21	Capital Goods	-18.1	-17.0	-14.5	5.6	5.1	4.4
22	Public Other Manufs.	-15.2	-12.6	-6.3			
23	Private Other Manufs.	-26.3	-25.1	-22.2			
24	Other Manufactures	-26.2	-25.0	-22.1	9.4	9.0	7.4
25	Electricity (Only Public)	127.0	132.5	145.5	343.2	333.4	310.1
26	Construction (Only Private)	-14.5	-13.6	-11.6	6.9	6.4	5.5

Table 6.13 Contd.

Model 1 : Joint Effects of Increasing All Public Prices, Increasing the Efficiency Parameter of All Public Activities by 20 Percent, and Removing Tariffs
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	43.7	45.4	49.7	*2	*2	*2
28	Private Transp. & Comm.	-11.1	-10.3	-8.2			
29	Transport & Comm.	-1.0	-0.0007	2.3	15.4	14.8	13.1
30	Public Trade	53.6	54.8	57.4			
31	Private Trade	-6.0	-5.7	-5.2			
32	Trade	-4.9	-4.7	-4.2	-	-	-
33	Public Other Services	18.3	18.6	19.1			
34	Private Other Services	-4.8	-4.6	-4.1			
35	Other Services	3.1	3.3	3.8	6.6	6.3	5.9

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport', for final consumption, mainly transport for passengers.

mentioned activities.

6.6 Summary and Conclusions

Several important conclusions can be drawn from the analysis developed in this chapter. The most remarkable point is perhaps the large extent to which production activities are being subsidised by the system of artificially low public prices. Indeed, our policy experiments suggest a very distorted price scenario where the elimination of the price-cost margin of public firms leads to huge increases in commodity prices. It follows that a correction of public prices as endeavoured in the structural adjustment programmes will have strong implications for both micro and macroeconomic resource allocation which ought to be carefully addressed.

We focused on the effects that such measures would have on the value added of production activities. The results provide an interesting picture of how subsidies through low public prices are actually distributed within the production structure. In particular, it was suggested that such a system of subsidies benefits mainly the manufacturing industry, and more specifically, those industries producing intermediates and capital goods which, paradoxically, are not those industries where the comparative advantage is higher.

An interesting finding is that the bulk of the distortions are explained by the two energy sectors alone (petroleum and electricity), whereas the remaining public price increases affect mostly the price of the commodity produced by the activity itself and hence there are not many distortions transmitted throughout the interindustry linkages. For policy implementation purposes this finding is important because the two energy sectors are dominated by two big public firms. That is, despite the fact that the number of PEs is said to be quite high, we have seen that, to a great extent, two single monopolies are causing most of the distortions in relative prices. That is not to say that other public firms necessarily price at marginal costs but, in this case, it is relatively clear who benefits from such policy of low prices. In terms of the privatisation programme that has been taking place in Mexico in recent years, this result suggests that it should not be difficult to

assess who will benefit and who will lose.

Another important conclusion that emerges from our analysis is that inefficiency within the public sector and the structure of tariffs represent forces that affect the system of implicit subsidies provided by PEs, in the opposite direction. While a measure of the degree of inefficiency of PEs in Mexico is not available, empirical evidence suggests the presence of poor economic performance of several PEs. This surely acts in the opposite direction, thus performing as a system of implicit taxation. Ultimately, of course, the net effects of all these forces should also incorporate the effects of reforms in the indirect tax system. We have not attempted to do so because it goes beyond our purposes, but the analysis of tax reform can be perfectly carried out within our analytical framework.

Of no less importance are the methodological changes introduced in our analytical framework, particularly when compared with the traditional I-O approach. Three points deserve to be mentioned. First, to the extent that substitutability between domestic production and imports has been introduced into our analysis, the results are richer than the traditional analysis carried out in the I-O framework, in which all inputs, including imports, are assumed to combine in fixed proportions. Whilst no econometric estimations of elasticities of substitution are available, it is always possible to estimate different results under alternative scenarios. Second, it has been suggested and shown for the case of Mexico that price effects may be overestimated whenever a commodity is regulated, because in that case activity cost changes would not be transmitted to the commodity price, hence stopping the process that feeds the interindustry structure. Indeed, the extent of the overestimation may be substantial when such a commodity is an intermediate of very generalised use as an input in other production activities. And third, to the extent that we have used a SAM approach for putting our database together, the analysis facilitates a great deal since it enable us to consider several forces acting together, such as public pricing policy, efficiency issues and commodity taxation. Specifically, our model benefits from the public/private distinction introduced in our data framework, which permit us to model more accurately the behaviour of the public sector.

Last but not least, and at the risk of being repetitive, to the extent that we valued commodity balances at market prices, the results of our model are richer. This is because we are overcoming one of the limitations of I-O models, namely, that price effects are underestimated since such models take producer prices as a basis for valuation, even though market prices are the relevant ones when it comes to the modeling of economic behaviour.

We have tried to outline the menu of possibilities to be explored by carrying out some representative policy experiments. A far more detailed analysis can be developed at a more detailed sectoral level which, no doubt, would produce a richer picture of the main forces that affect the relative price structure.

It ought to be also stressed that the extent to which the I-O approach may generate biased results should not be discarded lightly, especially because their results are widely used for policy purposes. We have seen, for instance, that the failure to recognise both substitutability and regulated prices may lead to very different results in terms of value added effects. For the same reason, if one used the results of price effects on the consumption side, one may also reach different conclusions.

Obviously, our analysis has in itself several limitations that arise both from data limitations as well as from the fix-price nature of the model. We shall comment on these limitations in the conclusions of the thesis. Here it will suffice to point out that, to the extent that we introduce a more plausible set of assumptions when modeling the price system, a more reliable basis for policy making purposes will exist.

CHAPTER SEVEN

STRUCTURE OF PROTECTION

7.1 Introduction

In the previous chapter we focused our attention on the effects that public sector pricing policy and performance have on relative prices and the consequent reallocation of resources. It was suggested that, to a great extent, the distortions in prices from public sector intervention came from the energy sectors, namely petroleum and electricity. As pointed out in chapter two, however, commercial policy has similarly played a very important role in the conformation of the relative price structure and hence in the allocation of resources in the Mexican economy.

The purpose of this chapter is therefore to investigate the effects that commercial policy has had on the allocation of resources. In doing so, the role of the private sector of the economy will also be incorporated into the analysis since, as will be seen, the main objective of commercial policy has been to protect and encourage the growth of the industrial sector, which has been primarily operated by private agents. The discussion on commercial policy will be based on the estimation and analysis of effective rates of protection (ERP), as an indicator of the pull of resources.

The presentation will be developed in two parts. First, by making use of the same version of the model as in the previous chapter, we will look at the effects that removing the protection structure has on relative prices. It will be explained in a second part, however, that in order to obtain an insight as to how resources are reallocated we need to estimate the associated changes in value added or net output prices, if something is to be said about the way in which the system of protection influences the allocation of resources within the production structure of the economy. Accordingly, the second part is devoted to the estimation and analysis of ERP derived from our model.

It will be seen that our approach generalises the analysis of ERP in the sense that the traditional estimates build on a particular version of our model, viz the case in which market shares between domestic production and imports are constant, and inputs combine in fixed proportions. The formulation of ERP to be proposed here generalises the traditional one by moving away from the extreme assumption that imported and domestic goods are perfect substitutes and must therefore necessarily have the same price. It will be also seen that our SAM approach enables us to estimate ERP not only taking into account protection accorded through commercial policy, i.e. tariff and non tariff restrictions, but also the effects of domestic indirect taxes.

For presentation purposes the discussion is organised as follows. Section 7.2 explains how our SAM was modified in order to take into account the presence of non tariff instruments. Section 7.3 comments on the effects on relative prices arising from a removal of the protection structure. In Section 7.4 the concept of ERP is briefly reviewed and then we explain how the concept is derived from our model. Section 7.5 presents the estimations of ERP both when only tariffs and export subsidies are removed and when, in addition, the effects of removing indirect taxes are incorporated. We will also present in this section the estimation of the bias against exports created by the prevailing protection structure. Finally, Section 7.6 summarises the main findings of the chapter and offers some concluding remarks.

7.2 Non Tariff Restrictions

In the final part of the previous chapter the effects of removing tariffs on relative prices were analysed. It was argued there that, just as an additional form of indirect taxation, tariffs represent also a source of distortions in the price structure. We saw, however, that the actual distorting effects resulting from the removal of tariffs in the Mexican economy were on a very small scale.

Such a result should not come as a surprise in the light of our previous remarks in Chapter Two regarding the importance of non tariff instruments as a means of protection in the Mexican economy. We saw there that commercial policy has heavily relied on import permits, rather than

tariffs, hence making the latter instrument superfluous to a great extent, insofar as the effects on protection are concerned. It seems inevitable then that a realistic analysis of commercial policy in Mexico calls for non-tariff instruments to be incorporated, since tariffs alone are a poor indicator of the real levels of protection. Therefore, before entering into the discussion of commercial policy, it will be convenient to give a brief explanation of the modifications carried out in our SAM in order to incorporate the effects on the price system brought about by the existence of quantity controls on imports.

As we recall from Chapter Four, our SAM shows tariff collections as a proportion of imports, for each traded commodity identified in our accounting framework. Therefore, to include the presence of non-tariff instruments in our data framework we raised the original levels of tariff collections in order to make them equivalent to the effects on import prices created by both tariffs and quantity controls. This task was greatly simplified by the availability of estimates of "nominal implicit protection rates", which were obtained by actually comparing domestic and foreign prices[1] for a large group of commodities and then grouped according to the I-O table classification, for several years, among which is 1980, our year of analysis (see Comercio Exterior [1987]). Thus, these rates of nominal implicit protection indicate the differential in prices between domestically produced and foreign commodities.[2]

Our only task was therefore to regroup these levels of protection according to the level of aggregation of our own classification once, of course, they were previously weighted by their share in production, and then the original levels of tariff collections in our SAM were raised so as to make them equivalent to the levels of nominal implicit protection. For our SAM to remain bal-

[1] It was mostly a comparison between domestic and USA prices, since the bulk of Mexico's foreign trade is made with this country.

[2] Formally, if p_i is the internal price in pesos of commodity i, p_i^* is the external price in dollars of a similar commodity abroad, and r is the exchange rate, then the nominal implicit protection NIP_i is

$$NIP_i = \frac{p_i - p_i^* r}{p_i^* r}$$

where the external price, p_i^* is adjusted by transport costs so that domestic consumers compare prices at home, and p_i does not include domestic indirect taxes (see Kate and Mateo [1989], p. 313).

anced, however, it was necessary to carry out two changes. First we had to raise the levels of tax collections since the revenues of the government are now higher. And secondly, since the value of composite (traded) commodities was raised, it was also necessary to raise, by the same proportion, the value of final demand for these commodities. Notice that this amounts to assuming that the final consumption of these commodities is being subsidized.

Table 7.1 presents in column one these nominal levels of protection, which are those we will be using in our calculations. Column two shows the levels of nominal tariff protection, as given in our data framework. As can be appreciated, the comparison of the two columns shows how important non tariff instruments are as a means of protection in Mexico.

Table 7.1
Nominal Levels of Protection (%)

Commodity	Price Differential	Tariff
Agriculture	12.0	1.4
Mining	-22.0	1.6
Petroleum & petrochemicals	-67.0	4.8
Food processing	10.0	11.8
Textiles	9.0	14.6
Chemicals	22.0	9.2
Capital goods	27.0	8.8
Other manufactures	25.0	18.1

Note that for two commodities, mining, and petroleum and petrochemicals, the nominal protection levels are negative, reflecting the fact that those commodities, particularly petroleum and petrochemicals, face a regulated domestic price, far below the corresponding world price. It is indeed most fortunate that these estimations of nominal levels of protection are available because in using them we are not only considering protection provided by tariffs, but also by quantitative restrictions. Moreover, this measure of nominal protection actually takes into

account all forms of domestic protection, including subsidies.

The theoretical justification for undertaking the referred change to our accounting framework is to be found in the Marshallian equivalence proposition, which asserts that tariffs and quotas are basically equivalent in their real effects. That is, if a quota were to be replaced by a tariff the "real effects" on the economy would be the same and the government would now pick up the import premium as a tariff revenue (see Bhagwati [1978]). For our purposes, therefore, import quotas can be thought of as an implicit form of indirect taxation. It has to be said, however, that this analysis is valid only provided that competition prevails before and after the imposition of the quota. In fact, it assumes that import licences are transferable between firms and that there is a market in licences. Beyond this point, the analogy can no longer be sustained. If, for instance, the imposition of quotas leads to the formation of a monopolistic market structure in the way licences are assigned, then it is likely that imports will fall below the quota level imposed and hence profits would rise above what they would have been if only tariffs existed (see Dervis et. al. [1982]).[3] To take these elements into account it would have been required to explicitly recognise rent seeking behaviour in our model, which goes far beyond the scope of this thesis. For the present purposes in which we restrict our analysis to the price system, however, the analogy between quantity controls on imports and tariffs is not a very restrictive assumption. We shall therefore retain this assumption throughout this chapter.

7.3 Removal of Protection Levels

We are now in a better position to assess with more accuracy the effects of removing protection. Thus, using the same version of the model as presented in the previous chapter (model 1), in which all sectors follow the cost-plus pricing rule, our starting point will be the evaluation of price effects resulting from the removal of nominal levels of implicit protection

[3] To see the conditions under which the so-called equivalence proposition holds see Bhagwati [1978].

Following the same order as in the past chapter, two sets of results are presented. The first set, in Table 7.2, shows the price effects brought about by removing protection levels for all traded commodities, with the exception of mining and petroleum & petrochemicals. The second set of results, presented in Table 7.3, shows price effects when protection levels are removed for all traded commodities, which, in the case of mining and petroleum & petrochemicals, means that their prices went up (subsidies were removed) by the proportion given by the price differential, as given by our nominal implicit rates of protection. Let us begin with Table 7.2.

Table 7.2
Price Effects of Removing Protection Levels
(Subsidies to Petroleum and Mining Not Removed)

Commodity	All Imports Complementary	Low Trade Elasticities	High Trade Elasticities
Agriculture	-1.3	-1.4	-1.6
Mining	-0.6	-0.6	-0.6
Petroleum & petrochemicals	-1.0	-1.0	-1.1
Food processing	-1.2	-1.2	-1.4
Textiles	-1.4	-1.4	-1.6
Chemicals	-3.5	-3.6	-3.8
Capital goods	-7.1	-7.3	-7.6
Other manufactures	-2.1	-2.3	-2.7
Construction	-2.2	-2.3	-2.4
Electricity	-0.6	-0.6	-0.6
Trade and transport*	-0.6	-0.6	-0.7
Other services	-0.3	-0.4	-0.4

* It only refers to transport for passengers.
See Table 6.1 for the values of trade elasticities.

As can be seen, compared to the experiment carried out in the previous chapter in which only tariff collections were removed, price effects are more pronounced in this new scenario. If we focus on the set of low trade elasticities for the purpose of making some comments, it can be appreciated that the commodity prices most affected are those of capital goods and chemicals, whose prices fall by 7.3 and 3.6 percent respectively. These are followed, in order of magnitude, by other manufactures (-2.3 %), construction (-2.3 %), textiles (-1.4 %), and agriculture (-1.4 %).

With the exception of construction whose price is affected by the reduction in the price of capital goods, the most affected commodity prices are naturally those of traded commodities and, within this group, it is clear that the most affected prices correspond to intermediates and capital goods, whereas consumer goods, such as textiles and food processing, show very little variation. Although this result is expected because of the structure of nominal implicit protection levels, it is important to note that it contrasts sharply with the recommendations of the theory of domestic distortions in the sense that tariffs (and for that matter, quantitative restrictions on imports) should not be placed on intermediates, if distorting effects are to be minimised. As far as the responsiveness of price effects to trade elasticity values is concerned, the results show very little degree of variation. In part, this is explained by the fact that the most protected commodities, such as capital goods, have also the lowest degrees of trade substitutability. Additionally, it seems that tariffs (explicit and implicit) do not represent a very important share in production activity costs, and hence, in some cases, there is little variation in relative prices.

Turning to our second experiment, where subsidies to petroleum and mining were also removed (Table 7.3), it can be seen that there is a substantial change in price effects compared with Table 7.2.

Table 7.3
Price Effects of Removing Protection Levels
(Subsidies to Petroleum and Mining Removed)

Commodity	All Imports Complementary	Low Trade Elasticities	High Trade Elasticities
Agriculture	0.8	0.5	-0.3
Mining	27.2	26.1	23.3
Petroleum & petrochemicals	95.0	86.4	65.2
Food processing	0.9	0.6	-0.1
Textiles	2.3	1.8	0.7
Chemicals	8.7	7.2	4.1
Capital goods	-4.8	-5.2	-6.0
Other manufactures	0.8	0.4	-0.7
Construction	1.5	1.2	0.3
Electricity	30.7	27.9	21.0
Trade and transport*	5.7	5.1	3.7
Other services	0.8	0.7	0.4

* It only refers to transport for passengers

Perhaps the most remarkable point is that, with the exception of capital goods, whose price falls by 4.8 percent, all the remaining commodity prices go up. This is clearly due to the fact that the increase in domestic prices of mining, and petroleum & petrochemicals outweighs the reduction in activity costs brought about by the abolition of the protection levels. In particular, the price of petroleum & petrochemicals increases substantially (86.4 percent for the set of low trade elasticities), which generates cost increases in the remaining production activities. It ought to be noted that, for the same reason, in this new scenario the prices of non traded commodities such as electricity and transport (energy intensive) are severely affected.

Finally, as in the previous chapter, when the price of petroleum & petrochemicals changes substantially the sensitivity of price effects to trade elasticity values becomes relevant. It can be appreciated, for instance, that price raising effects are considerably lower in the case of high trade elasticities than in the scenario in which imports and domestic production combine in fixed proportions.

The results presented thus far are interesting since they suggest how cost and hence prices are likely to react if the protection structure were abolished. Yet, nothing has been said about the

way in which the structure of protection influences the allocation of resources in the economy.

Given the fix-price nature of our model, we are not in a position to get an insight into this matter since, by assumption, we are ruling out changes in net output or value added prices. We therefore need a measure to determine the extent to which profitability in the domestic production activities is affected by the prevailing structure of protection. One such measure is the effective rate of protection (ERP) which, essentially, is an indicator of the way in which value added of production activities is influenced by the protection structure. In terms of our model, if we want to estimate ERP we will have to formulate a different question. That is, instead of asking what prices would be if protection were abolished, we now have to ask how net output prices would change as a result of the abolition of protection. The traditional answer to this question assumes that domestically produced traded goods are perfect substitutes for international goods, which is a special case of our more general model.

In what follows, we will briefly review the concept of ERP and its underlying assumptions, and then we shall move on to explain how the concept can be reconciled with our model.

7.4 The Concept of ERP and its Derivation

7.4.1 The Concept of ERP

The ERP measures the extent to which domestic sectors producing traded commodities benefit from a particular protection structure, expressed in terms of tariffs. It focuses on how value added in domestic production activities is affected by a prevailing tariff structure by trying to measure what value added would be if tariffs were abolished.

The concept of ERP derives from the fact that a tariff on imports of a particular commodity represents a subsidy to a domestic activity because it allows domestic producers to charge more than the world price for the protected commodity. However, the tariff also represents a tax on other activities to the extent that their input prices are higher than free trade prices. It follows that

the net effect tells us whether or not an activity has benefited from a particular tariff structure; a positive ERP should accordingly indicate that the tariff system allows value added to be greater than it would be in a free trade situation, whereas a negative ERP would suggest that a system of protection penalises the activity by reducing its value added. Likewise, a ranking of ERP would be an indicator of which activities would be hardest hit if a movement occurred towards free trade. Thus, as opposed to nominal tariffs which only focus on output prices and government revenue, effective rates have a direct bearing on the allocation of resources.

In a more formal way, assume for the moment that only traded goods exist in our economy (we shall later relax this assumption). Assume also constant returns to scale and that import prices are not influenced by the amount of imports the economy demands. If raw materials combine in fixed proportions, which, in turn also combine in fixed proportions with value added, then we can express world value added or net output price, V_j^*, as

$$V_j^* = P_j - \sum_i a_{ij} P_i \tag{7.1}$$

where P_j and P_i refer to the prices of commodities j and i, respectively.

Now, if t^m is the percentage excess of domestic over world prices, then domestic net output price, V_j, is

$$V_j = P_j\,(1 + t_j^m) - \sum_i a_{ij} P_i\,(1 + t_i^m) \tag{7.2}$$

Thus, the ERP for activity j, τ_j is defined as

$$\tau_j = \frac{V_j - V_j^*}{V_j^*} = \frac{V_j}{V_j^*} - 1 \tag{7.3}$$

and, from (7.1), (7.2), and (7.3)

$$\tau_j = \frac{P_j\,(1 + t_j^m) - \sum_i a_{ij} P_i\,(1 + t_i^m)}{P_j - \sum_i a_{ij} P_i} - 1 \tag{7.4}$$

That is, the ERP is defined as the rate at which value added obtainable at free trade prices diverges from the existing value added under protection, for activities producing traded commodities.

Expression (7.4) constitutes the traditional definition of ERP. For calculation purposes, however, the denominator of (7.4) is not easily observable and has therefore to be estimated indirectly, usually with the help of an I-O table. The standard procedure is to assume that domestic prices are equal to foreign prices plus the tariff component (and equivalent effect of quantitative restrictions sometimes), and hence world values are estimated by deflating domestic values by the relevant price ratios. In this event, (7.4) can be re-expressed as

$$\tau_j = \frac{PD_j - \sum_i a_{ij} PD_i}{\frac{PD_j}{(1+t_j^m)} - \sum_i a_{ij} \frac{PD_i}{(1+t_i^m)}} - 1 \qquad (7.5)$$

where t^m indicates the corresponding tariff rate, a_{ij} is the I-O coefficient indicating the amount of commodity i spent on one unit of commodity j, and the observed domestic prices in the I-O table, PD, are assumed to be

$$PD_i = P_i(1 + t_i^m) \qquad (7.6)$$

where P_i now represents landed prices of imports.

Expression (7.5) has been widely used to calculate ERP when the commodity j is an importable. If such a commodity is an exportable the conventional analysis of ERP assumes that a tariff on commodity j must be accompanied by a equivalent subsidy on the export side so as to ensure that domestic producers do not shift towards domestic markets when the tariff is imposed. Therefore, a movement towards free trade in this context assumes the abolition of both tariffs on importables as well as subsidies to exportables and, vice-versa, if the imports of j are being subsidised, the corresponding exports have to be taxed so as to maintain parity of prices between domestic and export markets (see Corden [1971]). It follows that equation (7.5) can now be

extended to exportables, also, provided t_j is interpreted as a subsidy (or tax) on exports of commodity j.

An important point to notice is that, for this analysis to be valid, it is necessary to adopt the small country assumption on the export side. This is because a removal of tariffs would have the effect of increasing domestic demand since domestic prices are now lower, and hence the supply devoted to exports would have fallen. It is therefore necessary to ensure that changes in the volume of exports would not affect the world price of the commodity in question, if we still want to remain within the fix-price approach. Accordingly, exports will be assumed to face an infinite elasticity of demand i.e. international prices are exogenous.

Finally, there is a third group of commodities for which a price behaviour assumption is necessary, namely, non traded goods. It is clear that equation (7.6) is no longer useful, for these commodities are not subject to tariffs since, by definition, they are not traded in international markets. Nevertheless, their prices are also expected to vary when the protection system is removed. In this respect there exist several assumptions in the literature of ERP as to how their prices would react. For exposition purposes, however, we prefer to postpone the explanation of these assumptions to the next sub-section, in which we derive the concept of ERP from our own model.

Meanwhile, to conclude this part of the exposition is is perhaps useful, in order to clarify fully the concept of ERP, to make explicit mention of its underlying assumptions, some of which have already been noted.

First, as suggested by equation (7.6), it is assumed that tariffs represent the difference between domestic and foreign prices. That is, domestic producers are allowed to charge a higher price than the commodity world price in a proportion equivalent to the tariff component. This assumption permits us to interpret ERP as the increase in value added associated with the tariff. Notice that for this assumption to be valid it is necessary to rely on the assumption that imported

and domestic traded goods are prefect substitutes.

Secondly, production functions are assumed to exhibit constant returns to scale so that value added per unit of output is invariant to the scale of production.

Thirdly, it is necessary to assume that production and trade take place both before and after tariffs are removed. The purpose of this assumption is to guarantee that the calculated rates measure the increase in value added due to the tariff. Imagine for a moment that, in the absence of tariffs, a particular commodity is not produced at home due, for instance, to excessive costs. Now, if tariffs are imposed the production of this commodity may eventually become profitable but, surely, part of the increase in value added would only play the role of making the industry competitive. Beyond this point, the increase in value added is the one associated with the tariff. It follows that if this assumption is not sustained for an industry, then the estimated ERP would be an overestimation of the real increase in value added associated with the tariff.

The fourth assumption concerns the elasticities of foreign demand for exports, supply of imports, and supply of non traded commodities, all of which are assumed to be infinite so that any source of change in prices, other than tariffs, are eliminated.

The final assumption is that production coefficients are fixed, which means that substitution between inputs is ruled out.[4] Here it should be noted that, as opposed to our first assumption, when commodities are revalued imports are assumed to be perfect complements to domestic production. This is because, by assumption, those potential imports which are perfect substitutes for domestic goods never enter the domestic market.

[4] For a discussion of these assumptions see Markusen and Melvin [1988]. Also, there has been a long and protracted debate on the problems associated with the estimations of ERP. Some classical references are Finger [1975], Anderson and Naya [1969], Corden [1971], James [1971], and Orcbal and Johnson [1967], among others.

7.4.2 ERP In The Model

In order to derive the concept of ERP from our model it will be convenient, for expository purposes, to present a simplified version of our model so as to focus on the essential elements. In particular, the public/private dichotomy of our accounting framework and the presence of margins and domestic indirect taxes will be ignored. Nevertheless, it will be seen later that the introduction of these elements poses no major problems. Instead of the public private dichotomy, we shall make explicit the distinction between traded and non traded commodities, since it becomes an important characteristic when deriving the concept of ERP.

Such a simplified version of our model can be set out in the following manner. Let, for traded commodities j,

PD_j = price of composite (domestic-imported) commodity j sold on the domestic market

V_j = net output price of activity j

PM_j = import prices after tax (inclusive of tariffs) of commodity j

c_j = gross output price of activity j

The domestic price of commodity j can be expressed as a function of the price of imports as well as gross output price.

$$PD_j = f(PM_j, c_j) \tag{7.7}$$

Let also for non traded goods, n

P_n = price of non traded commodity n

V_n = net output price of activity n

c_n = gross output price of activity n

where c_n is proportional to P_n

Then, our price system can be expressed as

$$c_j = V_j + h_j(P_i) \tag{7.8.a}$$
$$c_n = V_n + h_n(P_i) \tag{7.8.b}$$

where $P_i = (PD_j, P_n)$

Now, in order to derive the ERP it is necessary to define how PD_j and P_n react when the protection structure is abolished. Some assumptions are therefore required.

The first assumption will be that market shares between domestic production and imports remain unchanged so that PD_j and c_j must change proportional to PM_j. Hence, when import prices change as a result of the removal of the protection structure, domestic prices will fall by the same proportion as import prices, so as to maintain fixed market shares.

Second, in order to avoid producers shifting output towards export markets (or vice versa) when a commodity is exportable, we shall assume that an export subsidy (or tax if domestic prices went up) is removed, then the selling price on the domestic market is reduced proportionally so that there is no change in the share of output which is exported. Thus, the argument is parallel to that above for imports.

Thirdly, it is also necessary to define how prices of non traded goods react as a result of the removal of protection levels. Here we can adopt any of the existing methods in the literature of ERP. They are, briefly, the following

a) Balassa's original method, which assumes that value added in activities producing non traded commodities changes in such a way that the prices of non tradables remain unchanged. In terms of our system of price equations it means that c_n (and hence P_n) does not change, since V_n accommodates

b) Balassa's modified method. It assumes that V_n are fixed so that cost increases are fully

forward transferred to commodity prices, P_s (see Balassa [1971]).

c) Corden method. The argument here is that the effects on non traded inputs (of removing tariffs) are basically the same as the effects on value added so that there is a good reason for treating them in the same way (see Corden [1971]). In terms of our price equation system this means that we ought to amend our original data base so that it includes non traded inputs in V_j.

d) Scott method, which assumes that nominal protection of non traded goods is equivalent to the mean nominal protection of traded commodities.

With these three assumptions an ERP can be calculated in a very straightforward way. Essentially, three steps are necessary. First it is necessary to simulate a removal of tariffs, keeping market shares between domestic production and imports constant so that the declines in the domestic prices of traded commodities is proportional to the fall in import prices. Second, it is necessary to adopt one of the existing methods for the treatment of non traded goods. Our choice will be the Balassa's modified method which, as we saw, assumes that net output prices of activities producing non traded goods are fixed so that cost increases (arising from the change in the prices of tradables) are fully passed on to the corresponding commodity prices. The justification for our adoption of this method will be given in the next sub-section. Here it should be noted that, given this choice, and given that in our accounting framework activities buy from commodity markets at market prices and not producer prices, it was necessary for us to calculate the resulting market prices of traded commodities. These are determined not only by the reduction in domestic prices brought about by the removal of tariffs, but also by the subsequent changes in the prices of trade and transport. The third step consisted simply of revaluating figures in our SAM. Domestic gross output of production activities are to be revalued by the proportions in which import prices decreased. Note that we have to revalue both domestic supply and exports since we are also assuming that export subsidies (and taxes) were removed. Raw materials, on the other hand, will be revalued by multiplying our solution vector of prices by the absorption matrix of the SAM,

regardless of whether they end up either as domestic or exported commodities. Finally, "free trade" value added is obtained as a residual between new gross output and new raw material costs.

Notice that in our model the notion of ERP has been generalised since we have moved away from the assumption that domestic and international goods are perfect substitutes which, as we saw, is the assumption underlying the estimates of ERP in the I-O framework. Indeed, in our model, given our Armington specification, these two alternative sources of supply can be allowed to combine with whatever degree of substitutability we postulate, provided we keep our assumption that market shares are fixed so as to ensure that relative prices remain unchanged. It has therefore been necessary for us to generalise the notion of ERP so that it remains meaningful as a concept when we move beyond the traditional model where input substitutability is ruled out to the more general case where substitutability is allowed for.

To conclude this section, it should be noted that our model enables us to estimate ERP incorporating substitutability in the use of raw materials, other than domestic production and imports (i.e. in our absorption matrix). To see this let us express the change in value added associated with the removal of tariffs, for activities producing traded goods, as

$$dV_j = dc_j - dh_j(P_i) \tag{7.9}$$

Now, if we assume that inputs combine in fixed proportions, then (7.9) reduces to

$$dV_j = dc_j - \sum_i h_{ij}\, dP_i \tag{7.10}$$

since, in this case, $h_j(P_i)$ is linear and therefore changes in input prices are additive. More generally, however, it can be assumed that raw materials combine in a constant elasticity of substitution (CES) form, hence allowing for the possibility of substitutability in the use of raw materials. In this event, value added is

$$V_j = c_j - \left[\sum_i a_{ij} P_i^{(\sigma(\sigma-1))}\right]^{(\sigma-1)/\sigma} \tag{7.11}$$

where σ defines the elasticity of substitution. Then, the change in value added takes the following form

$$dV_j = dc_j - [(\sigma-1)/\sigma]\left[\sum_i a_{ij} P_i^{(\sigma(\sigma-1))}\right]^{(\sigma-1)/\sigma-1} (\sigma/(\sigma-1)) \sum_i a_{ij} P_i^{(\sigma(\sigma-1))-1} \; dP_i \tag{7.12}$$

where dc_j, dP_i, and P_i are the same as before but, because of the possibility of substitutability, the change in the composite price of aggregated raw materials is now smaller and therefore the change in net output price dV_j, is greater than in the fixed coefficients case. Obviously, when no input substitutability is present ($\sigma = 0$), (7.12) collapses into (7.10) which, as we have seen, correspond to the traditional estimations of ERP.

7.4.3 Implementation

The simplification of our model as described above was useful because it enabled us to explain in a very simple framework how ERP are to be derived. In carrying out our actual calculations of ERP, however, we made use of our more complex model as specified in the last chapter. Therefore, before moving on to the analysis of results, it is convenient to make some comments regarding the details of the implementation, which arise from the use of our more complex specification of the price system. Several points should be made.

The first point is concerned with the identification of traded and non traded commodities, and their corresponding activities. As we remember from our data framework in Chapter Four, our SAM identifies twelve commodities. We therefore identified four non traded commodities, namely electricity, construction, trade and transport, and other services. The remaining commodities in the system were therefore classified as traded.

The corresponding classification of activities was therefore made on the basis of the com-

modity classification. Accordingly, sixteen activities producing traded goods were identified; two sources of supply, public and private, for each traded produced commodity, and hence the remaining ten activities were classified as producing non traded commodities (see Chapter Four). (See also Appendix A for the details referring to the aggregation levels).

The second point refers to the method followed for the treatment of prices of non traded commodities. As suggested before, we have chosen the modified Balassa's method whereby net output prices of activities producing non traded commodities are fixed so that cost changes in these activities are forward transferred to commodity prices. Such a choice was made on the grounds that the method may be more appropriate for a developing economy to the extent that it assumes unemployment of factors of production in the sectors of the economy producing non traded goods. Yet, it has to be recognised that there is no theoretical justification for not making the same assumption for activities producing traded goods (see Balassa [1971]). Nonetheless, as mentioned before, any of the alternative methods could have been used. Moreover, it has been shown that, for ERP calculated for the Mexican economy for the years 1960 and 1970, the differences between the Balassa's modified method and the Corden method were not very significant (see Kate and Wallace [1980]).

The last point to mention is related to the way in which values in our SAM were deflated in the presence of trade and transport margins, domestic indirect taxes, and the public/private dichotomy. Here, as already noted, it was necessary to distinguish between producer and market prices. Thus, gross output of production activities, both public and private, were revalued using our implicit nominal rates of protection. Raw materials, on the other hand were revaluated by the appropriate vector of market prices which incorporates not only changes in the prices of non traded commodities including trade and transport, but also domestic indirect taxes.[5] Notice here that our framework enables us to fully incorporate the effects of trade and transport margins on the calculations of ERP. Indeed, in the traditional estimates, because commodity transactions are

[5] It will be seen later that our framework enables us to estimate ERP removing, in addition to trade restrictions, domestic indirect taxes (see Sub-Section 7.5.2).

valued at producer prices or basic prices, a potential source of bias arises when there are differences in transport costs between domestic and imported goods (see Balassa [1971]).

7.5 Analysis of Results

7.5.1 Removing Tariffs and Export Subsidies

The results of our first set of calculations are presented in Table 7.4, which shows ERP and the associated vector of market price effects. We present ERP for both, public and private activities, as well as for the aggregate. Two set of results are in fact shown in Table 7.4. The first set in the first two columns shows ERP and price effects for the case in which subsidies to imports of mining and petroleum & petrochemicals were removed. It should be noted that in this first scenario tariffs and export subsidies were removed for all traded commodities, except for mining and petroleum & petrochemicals for which we removed subsidies to imports and taxes on exports. The second set of results in columns three and four shows ERP and price effects for the case in which subsidies to the two referred commodities were not removed but instead, only removed the original levels of tariff collections as shown in our non-modified SAM were removed.

While the first experiment is more complete in that it incorporates the effects of subsidising mining and petroleum, the second set of results is also interesting since it enable us to determine the extent to which our estimates of ERP are influenced by these subsidies, especially to petroleum. Let us start with the first set of results in columns one and two of Table 7.4.

As can be appreciated form the first column, there is a wide variation in the values of ERP. Beginning with the most unprotected sectors, and focusing on the ERP for the aggregate of the activities, it can be seen that two activities, petroleum & petrochemicals and mining, show negative values of -0.4491 and -0.2120 respectively, suggesting that if the economy moved towards free trade these two activities would see their value added increased by the referred proportions.

Table 7.4
Effective Rates of Protection
Removing Tariffs on Imports and Export Subsidies

Activity	Subsidies to Petroleum and Mining Removed		Subsidies to Petroleum and Mining Not removed	
	Effective Rate of Protection	Price Effect*	Effective Rate of Protection	Price Effect*
Public agriculture	0.2087	-	0.1526	-
Private agriculture	0.1599	-	0.1418	-
Agriculture	0.1604	-9.6	0.1419	-9.9
Public mining	-0.2180	-	-0.0029	-
Private mining	-0.2114	-	0.0004	-
Mining	-0.2120	21.4	0.00008	-1.6
Public petrol. & petroch.	-0.4496	-	-0.0453	-
Private petrol. & petroch.	-0.4271	-	0.0462	-
Petroleum & petrochemicals	-0.4491	65.4	0.0453	-4.4
Public food processing	0.2768	-	0.2272	-
Private food processing	0.2194	-	0.1913	-
Food processing	0.2229	-8.6	0.1935	-9.0
Public textiles	0.2838	-	0.2272	-
Private textiles	0.2231	-	0.2036	-
Textiles	0.2243	-12.4	0.2042	-12.8
Public chemicals	-	-	1.8194	-
Private chemicals	1.6277	-	0.5612	-
Chemicals	1.8831	-16.0	0.5906	-16.4
Public capital goods	1.8131	-	1.2683	-
Private capital goods	0.9650	-	0.7888	-
Capital goods	1.0530	-17.8	0.8442	-18.2
Public other manufactures	1.6355	-	1.1883	-
Private other manufactures	0.7293	-	0.6293	-
Other manufactures	0.7348	-16.5	0.6332	-16.9
Electricity	-	20.3	-	-2.4
Construction	-	-5.7	-	-7.7
Trade and Transport	-	2.3	-	-2.1
Other Services	-	-0.9	-	-1.5

* Refers to the market price of the corresponding commodity

One ought to be cautious, however, when interpreting these results. Indeed, while these two sectors may show a negative ERP, it should be noted that this result has perhaps more to do with the fact that these two commodities face a controlled price by the government than with actually low prices generated by the efficiency of the sectors. This is particularly true for the case of petroleum, whose price, as we saw in Chapter Two, has been kept fixed for long periods, in an attempt to provide cheap energy for the remaining production activities of the economy.

Agriculture is next in order, with an ERP of 0.1604. Given the fact that Mexico is an important producer of primary goods, the fact that this activity is less protected in the ranking is not a surprising result. Yet, at the same time this is an unexpected result since one would tend to think that, given the comparative advantage of the country, the level of protection ought to be lower, if not negative. It should be mentioned, however, that whilst this activity was characterised by negative levels of protection throughout the sixties and mid-seventies, from the end of the seventies and onwards, it started to enjoy some positive levels of protection, particularly because of the so-called "guarantee prices", in order to provide farmers with incentives (see Mateo et. al. [1984]). If we turn now to manufactures, it can be seen that the next two sectors whose levels of protection are relatively low are food processing and textiles, with ERP of 0.2229 and 0.2243, respectively. This result is expected since these two industries, being among the first to develop when the industrialisation process began in the forties, are relatively well developed, and indeed, it can be argued that they are no longer important targets for protection.

Finally, the most protected sectors are chemicals (1.8831),[4] capital goods (1.0530), and other manufactures (0.7348). These values are indeed extremely high and reveal the importance that has been attached to the promotion of growing industries producing intermediates and capital goods.

[4] The value of ERP for public chemicals is not reported because the remaining value added at world prices turns out to be negative, which is explained by the fact that the rise in the price of petroleum leads to a very strong increase in costs which outweighs the increase in the revenue of the activity. Clearly, the reason is that public chemicals is mainly composed of fertilisers, which is a very petroleum intensive commodity.

Insofar as price effects are concerned, it can be seen from column two that the change in the price of petroleum induces a strong change in the price of electricity (20.3 %). This point illustrates the necessity of incorporating the changes in the prices of non traded commodities, which in cases such as present one, may have strong secondary effects in the system and should therefore not be neglected, as it would have been if we had made use of the original Balassa's method, for instance.

It is interesting to look now at the ERP calculated when subsidies to mining and petroleum & petrochemicals are not removed, as shown in columns three and four of Table 7.4. Several important points deserve comment.

First, the obvious and immediate difference with respect to the previous experiment is that in this second scenario the levels of protection accorded to mining and petroleum & petrochemicals are very small (0.00008 and 0.0453 respectively).

The second and perhaps more interesting result comes from the analysis of the levels of protection of the remaining production activities. As can be seen, the ranking of ERP is not affected, with the exception of the activity chemicals whose ERP falls from 1.8831 to 0.5906. The important point, however, is that the protection granted by the provision of cheap energy works in the same direction as the protection accorded by commercial policy. That is, agriculture, food processing and textiles are affected very little whereas chemicals, capital goods and other manufactures are the most benefited sectors. Yet, it is still true that even if subsidies to mining and petroleum & petrochemicals are not removed the main beneficiaries from commercial policy continue to be the referred sectors.

Another important feature arises from the comparison of price effects between the two scenarios. It can be appreciated that price reductions are stronger in the case when subsidies are removed than when they are not. This is obviously due to the fact that the elimination of subsidies to petroleum induces a raise in the price of transport which, in turn, is reflected in higher

market prices throughout the system. This point serves to illustrate the importance of calculating market prices, as opposed to producer prices. Indeed, even though producer prices are affected by a similar proportion in our two set of calculations (with the obvious exception of mining and petroleum & petrochemicals), nevertheless market prices vary between the two scenarios.

Finally, it is important to notice that the weight of the ERP accorded to public activities in the value of ERP of the aggregate of each activity is in most cases negligible, with the clear exception of petroleum & petrochemicals and, to a lesser degree, capital goods. In other words, one can get a very accurate picture of the structure of ERP of the whole economy simply by looking at the values of ERP of private activities. The clear implication of this point is that commercial policy has been directed towards the private sector of the economy since public production, with the exception of petroleum, as we have seen in the past chapter, has concentrated in the production of non traded commodities.

In summary of the discussion so far, it can be said that the structure of protection has clearly favoured the industrial sector, particularly capital goods and intermediates, and such a structure of protection has been reinforced by the provision of cheap energy, which acts in the same direction in the sense that capital goods and intermediates are also the main beneficiaries. Once again, it should be emphasised that this structure of protection, while understandable from the point of view of the protectionist policy followed in the previous decades, contrasts very much with the recommendations of the theory of domestic distortions, which suggests that tariffs (and for that matter quantitative restrictions) on imports ought to be avoided in order to minimise the spread of distorting effects.

Before moving on to the next part an important remark is in order. It has been mentioned in the past section that our framework enables us to estimate ERP incorporating substitutability in the use of raw materials (in the absorption matrix). For presentation purposes, however, we preferred to show our numerical estimates of this particular case in Appendix D since the estimates of ERP are hardly affected, and therefore the analysis of results remains essentially the same.

7.5.2 Domestic Indirect Taxes and Production Subsidies

We have presented above estimates of ERP arising from the removal of tariffs and export subsidies. Although this is the standard approach in most calculations, the concept can indeed be extended to include the effects of domestic indirect taxes and production subsidies (see Corden [1971]). The rationale for extending the concept of ERP in this manner is that, even though domestic indirect taxes fall on consumption, not production, and, as such, they do not affect producer prices, nevertheless, to the extent that they affect the cost of inputs to domestic producers, they certainly affect the calculated ERP. In other words, the calculations of ERP as carried out above guarantee that domestic and imported products carry the same excise-tax burden at the border. However, since domestic indirect taxes raise the costs of inputs to domestic producers but not free market producers, it follows that the former are put at a competitive disadvantage (see Grubel and Johnson [1967]). Production subsidies on the final good, on the other hand, would have the same effect on production as a nominal tariff at the same rate.

While the issue is not recent in the literature of ERP[7] most calculations do not in fact incorporate this point since it requires more information than the one in I-O tables. Our SAM, however, enables us to calculate ERP in this way. All we need is to compute the new vector of prices arising from the removal, not only of tariffs and export subsidies, but also from removing domestic indirect taxes and production subsidies, keeping, of course, our assumption that market share between domestic production and imports are constant.

The results of our estimations are presented in Table 7.5. To avoid repetition we only present estimations of ERP for the case when subsidies to mining and petroleum & petrochemicals are removed since, as suggested before, these are "the correct" estimates of ERP.

As expected, the values of ERP are in all cases lower than our previous estimates when domestic indirect taxes were not removed. While the structure remains the same in the sense that

[7] It goes back to 1967. See Grubel and Johnson [1967].

Table 7.5
Effective Rates of Protection
Removing Trade Taxes, Domestic Indirect Taxes and Production Subsidies

Activity	Effective Rate of Protection	Price Effect*
Public agriculture	-	-
Private agriculture	0.1478	-
Agriculture	0.1673	-11.6
Public mining	-0.2516	-
Private mining	-0.2404	-
Mining	-0.2415	15.8
Public petroleum & petrochemicals	-0.5083	-
Private petroleum & petrochemicals	-0.4601	-
Petroleum & petrochemicals	-0.5074	32.1
Public food processing	-	-
Private food processing	0.1422	-
Food food processing	0.2335	-10.6
Public textiles	0.1525	-
Private textiles	0.1604	-
Textiles	0.1603	-15.3
Public chemicals	-	-
Private chemicals	0.8311	-
Chemicals	1.1474	-18.9
Public capital goods	1.2458	-
Private capital goods	0.7729	-
Capital goods	0.8276	-19.9
Public other manufactures	1.1026	-
Private other manufactures	0.5640	-
Other manufactures	0.5678	-21.5
Electricity	-	-21.1
Construction	-	-8.2
Trade and Transport	-	-6.4
Other Services	-	-4.0

* Refers to the market price of the corresponding commodity

the most protected activities continue to be chemicals, capital goods and other manufactures, the ranking has nevertheless been affected because now the activity textiles shows lower ERP than agriculture.

Notice that although revenues of producers were unaffected by the removal of domestic indirect taxes they were nevertheless modified by the removal of production subsidies. Nonetheless, since our SAM identifies production subsidies mainly to public activities (with the exception of private agriculture [see Table 4.7 in Chapter Four]), the effects of removing production subsidies were in aggregate almost negligible, not only because the amount of production subsidies are not very high but also because the weights of public ERP on the ERP of the aggregate activity are very low. Therefore, although ERP of public activities were substantially affected by the removal of production subsidies the effects on the aggregate of the activity were in all cases very low.

Turning now to market price effects, it can be seen that the results are as the expected in the sense that the reduction in prices from removing domestic distortions are now more accentuated. An interesting finding is that the price of petroleum increases now by 32.1 percent whereas in our previous estimates it rose by 65.4 percent. Obviously, to some extent, this helps to explain our remark above in the sense that the most overestimated ERP were those of chemicals, capital goods and other manufactures. More importantly, however, it shows that the effects of subsidising petroleum prices on the calculated ERP are not as high as initially suggested. Nevertheless, subsidies channelled through a low price of petroleum are still substantial.

All in all, it can be said that the estimates of ERP based exclusively on removing tariffs and export subsidies may lead to a substantial degree of overestimation of the "true" ERP obtained by the additional removal of indirect taxes and production subsidies. While we do not claim originality in carrying out these estimations, we nevertheless benefit very much from the SAM approach which permitted us to analyse in a single framework several sources of distortions of the price system.

7.5.3 Bias Against Exports

It has been argued that a protection system generates distortions in relative prices which ultimately affect the allocation of resources in the economy. One particular and common evaluation of such distorting effects is the so-called bias against exports, which tries to measure the incentive given by the protection structure to a particular industry to produce for domestic markets instead of exporting. To conclude this chapter, therefore, we present in what follows our estimation of this indicator.

The bias against exports is defined as the percentage difference between value added under protection and value added obtainable if output were exported. That is, if V is value added under protection, and V^x is value added obtainable if output were exported, then the bias against exports, X, is

$$X = \left[\frac{V}{V^x} - 1 \right] 100 \tag{7.13}$$

and, more explicitly, in terms of our price equations

$$X = \left[\frac{c_j - \sum_i a_{ij} P_i}{c_j^x - \sum_i a_{ij} P_i} - 1 \right] 100 \tag{7.14}$$

where c_j^x refers to total gross output price if total output of the activity j were exported, net of subsidies.

The calculation procedure simply consists of estimating the denominator of (7.14) by revaluing gross output using our nominal implicit levels of protection and obtaining value added as a residual from raw material costs under protection.

The estimations are presented in Table 7.6. As can be seen, the bias against exports is considerable for most of the production activities. In particular, the activities capital goods and other

Table 7.6
Bias Against Exports

Activity	Value Added Under Protection	Value Added Obtained Exporting	Bias Against Exports (%)
Public agriculture	3,746	2,801	33.73
Private agriculture	367,522	306,817	19.78
Agriculture	371,268	309,618	19.91
Public mining	5,793	7,996	-27.55
Private mining	52,651	71,136	-25.98
Mining	58,444	79,132	-26.14
Public petroleum & petrochemicals	97,902	215,252	-54.51
Private petroleum & petrochemicals	2,037	3,933	-48.20
Petroleum & petrochemicals	99,939	219,185	-54.40
Public food processing	11,663	5,640	106.79
Private food processing	169,645	106,926	58.65
Food processing	181,308	112,566	61.06
Public textiles	1,194	606	97.02
Private textiles	58,174	39,529	47.16
Textiles	59,368	40,135	47.92
Public chemicals	3,592	-233	-
Private chemicals	83,225	41,863	98.80
Chemicals	86,817	41,630	108.54
Public capital goods	31,296	2,765	1031.86
Private capital goods	188,956	66,133	185.72
Capital goods	220,252	68,898	219.67
Public other manufactures	3,276	483	578.26
Private other manufactures	349,506	164,572	112.37
Other manufactures	352,782	165,055	113.73

manufactures show the highest values, 195.10 and 105.63 percent, respectively. This is obviously explained by the high levels of protection that the outputs of these two activities enjoy. To a lesser degree, the same story applies in the case of chemicals. Next in order are the activities food processing and textiles which, in spite of being traditional activities with supposedly competitive capacity in the export markets, their bias against export are high: 55.42 percent for food processing, and 43.30 percent present in the case of textiles. Agriculture, despite being considered a traditional exporter shows nevertheless a positive value (18.24 %). Such a result may to some extent be explained by the existence of "guarantee prices", in order to provide producers with incentives to produce for domestic markets. Finally, mining and petroleum & petrochemicals show a negative value. Such a result should be cautiously interpreted because it is not very representative of the incentives given to producers, especially in the case of petroleum which is mainly produced by the public sector where, usually, additional elements other than profitability are involved.

All in all, however, it seems that the protection structure has created a very high bias against exports, even for those sectors which are supposed to be competitive in the international markets. Naturally, it would have been necessary to explore a more disaggregated picture to assess with greater certainty the degree of bias in those specific sectors for which exports are significant. Nonetheless, the protection system, as a whole, does seem to distort the incentives provided to exporters.

7.6 Summary and Conclusions

Several important considerations emerge from the analysis of ERP developed in this chapter, whose implications are relevant both from the point of view of economic policy as well as from the methodological perspective.

Starting with the point of view of economic policy, several remarks may be made. First and most important, it has been seen that the structure of prices created by the protection system has

led to a very distorted scenario. On the one hand, heavy subsidies are granted by keeping energy prices down. On the other hand, the imposition of trade barriers has maintained the prices of several commodities at a level far higher than the corresponding world prices. The implications of such an structure of protection in terms of the reallocation of resources is very evident when one looks at the values of ERP. In particular, it has been seen that the structure of protection favours the industrial sector, especially those industries producing intermediates and capital goods, even though these industries are not the most efficient from the point of view of their comparative advantages.

While this structure of protection can be explained in the light of the inward oriented policy followed during the decades of the sixties and seventies, it contrasts very much with the recommendations made by the theory of domestic distortions, particularly regarding the protection of intermediates, whose distorting effects are transmitted to the remaining industries through the input-output structure. It has been seen, for instance, that the protection structure has allowed domestic producers to maintain higher prices than the corresponding world prices, thus reducing incentives to produce for export markets.

The issue is important because since the beginning of the eighties a reverse movement has been taking place in Mexico in an attempt to remove distortions and open the economy, as a part of a more general programme of structural adjustment. Surely the total or partial removal of the protection system does have far reaching implications in terms of its presumably large macroeconomic effects. Undoubtedly, they deserve to be assessed carefully.

A second important point to note is that the nominal levels of tariffs do not reflect accurately the levels of protection accorded to production activities. This is for two main reasons. On the one hand, import permits have played an important role as instruments of protection and, on the other hand, nominal tariffs do not reflect the protection granted by the provision of cheap energy. On this particular point our findings corroborate what we previously suggested in the preceding chapter regarding the fact that the petroleum sector alone plays a very important role in

determining the protection accorded to the remaining sectors in the economy, both directly and indirectly by affecting non traded commodity prices, such as electricity.

More generally, and focusing on the public/private dichotomy of the Mexican economy, it can be said that commercial policy has benefited mainly the private sector of the economy, since the participation of the public sector in the production of traded commodities (with some exceptions such as petroleum and capital goods) is on a relatively small scale.

Needless to say, our results should be interpreted cautiously because their validity is only local in that the demand side of the economy does not play an active role. In particular, it should be remembered that in our calculations of ERP no account has been taken of the overvaluation of the exchange rate in a protected situation and of the adjustment that a movement towards a free trade position implies.

Insofar as the methodological considerations are concerned, it has been seen that in deriving the notion of ERP from our model we have generalised the concept since we moved away from the assumption that domestic and international goods are perfect substitutes, which is the underlying assumption of ERP estimated in the I-O framework.

Our model also benefits greatly from our SAM approach, not only because the modeling capabilities are enhanced but also because it enables us to bring into the picture several sources of distortion of the price system together. An example was given by estimating ERP not only removing tariffs and export subsidies, as most studies do, but also adding the effects of removing domestic indirect taxes.

Finally, and more related to the data used, our estimations of ERP are quite comprehensive in the sense that we are taking the actual differences between domestic and foreign prices as an indicator of the nominal levels of protection rather than the nominal tariff level which, in the Mexican context, are a poor indicator of the level of protection. Thus, our calculations do take into account both tariffs and non tariff protection.

CHAPTER EIGHT

CONCLUSIONS

In this study we have sought to analyse the effects on relative prices arising from public sector pricing policy and performance as well as commercial policy. While our approach retains the characteristic that prices are formed independently of the level of productive activity, we incorporated some features which have not been dealt with by other studies of the price system. Specifically, our methodology goes beyond the traditional analysis of the price system, usually based on I-O models, in several respects.

First, we have introduced the possibility of substitutability in the use of raw materials at various points. Thus, for instance, when modeling public sector pricing policy and performance we postulated some limited degree of substitutability between domestic production and imports for the so-called traded commodities, hence recognising the fact that, in the absence of trade restrictions, producers usually have the possibility of choosing between these two sources of supply when formulating their cost minimising decision. Also, it was shown that our model generalises the analysis of ERP in that the traditional estimates constitute only a particular case of our model.

Secondly, to the extent that we used a SAM in which commodity transactions are valued at market prices as a data framework, our analysis of price effects, as compared with the traditional analysis based on I-O models, is more accurate since the latter usually neglects the presence of trade and transport margins and indirect taxes. In doing that, we recognise the fact that market prices are the relevant ones when it comes to modeling economic behaviour.

Thirdly, we relaxed the conventional principal product criteria for classifying production activities. In our framework, in addition to this criteria, we classified activities according to their form of organisation, namely public and private. This permitted us to incorporate into the analysis a very important feature of many developing economies; the public private dichotomy. This is not the only form of dualism present in developing countries. However, given the objectives of the present study, the introduction of this second criteria enabled us to model more accurately the behaviour of the public sector, which is often different from the behaviour of the private sector of the economy.

Finally, it should be mentioned that our model benefitted considerably from our SAM approach in that the modelling of the price system is greatly facilitated by it since different sources of price distortions of the economy are put together in a systematic and consistent accounting framework.

In developing our model we treated deviations of price from average cost and inefficiency of PEs as implicit forms of indirect taxation, insofar as their effects on the price system are concerned. From this perspective our approach can be seen as part of the literature on tax reform.

An important contribution of the thesis derives from our choice of the topic, since very little empirical analysis on the effects that PEs have on relative prices exist, even though the economic theory on this issue has developed very fast. It has been mentioned that one possible reason for that is the fact that information on PEs is usually scattered and unorganised, if not non-existent at a more detailed level. From this perspective, then, the thesis has an important derived product since, in putting our data in a SAM format, we managed to organise and put together some relevant information related to the public sector of the Mexican economy which, hopefully, will be useful for future research work. Several important conclusions emerged from our analysis.

(1) We have seen that the inward-oriented policy adopted in the Mexican economy since the early fifties has led to a very distorted price scenario. In particular, commercial policy has

maintained domestic prices far higher than foreign prices, thus allowing domestic producers to enjoy extra profits as a means of promoting certain industries. Our calculations of ERP reveal that the sectors that have benefitted the most have been those producing intermediates and capital goods which, paradoxically, are not the most efficient in terms of their comparative advantage. This result contrasts with the recommendations of the theory of domestic distortions, which argues that tariffs (and also quantitative restrictions) on intermediates ought to be avoided, if distorting effects are to be minimised.

(2) Such a system of protection has been reinforced by the policy of keeping public prices down. Whereas all public activities seem to have followed such a policy, two sectors in particular -petroleum and electricity-, account for the bulk of the distortions in prices.

(3) The remaining public activities (other than petroleum and electricity), as noted, have also maintained low prices. Yet their effects on the whole structure of prices are on a much smaller scale since they tend to concentrate on the production of final consumer goods.

(4) Likewise, improving the economic performance of PEs by increasing their efficiency levels acts in the opposite direction to lowering prices and, therefore, inefficiency in PEs performs as an implicit indirect taxation system which, to some extent, mitigates the benefits granted through low public prices. The same can be said in regard to tariffs although their effects on costs are very low, since tariffs have not been the main instrument of protection.

(5) It has also been shown that, in the Mexican context, trade elasticities have some influence on the resulting price structure, particularly when petroleum prices change.

(6) We have seen that the assumption that some commodity prices are fixed may lead to substantially different results in terms of price effects, as compared with the traditional case in which all production sectors are assumed to follow the cost-plus pricing rule.

(7) All in all, it can be said that both public pricing policy and performance of PEs as well as commercial policy have led to a very distorted structure of prices in the Mexican economy. Our estimations of value added effects suggest that the corrections of such distortions would have significant effects on both the microeconomic resource allocation and macroeconomic aggregates. The issue is indeed important in view of the major structural reforms that in recent years have been taking place in the Mexican economy. On the one hand after the adhesion of Mexico to the GATT a major trade liberalisation programme has been implemented. On the other hand, significant reductions in the public sector deficit have been achieved through a revision of public prices, privatisation of several PEs, and fiscal reform.

We have focused our attention on distortions in relative prices arising from public pricing policy and performance of PEs as well as commercial policy. As usual, the cost of putting a limit to the scope of the analysis leads inevitably to some omissions which, often, are relevant. In the present case there are many, some of which could indeed have been covered within our own approach.

Perhaps the two most significant omissions are indirect taxes and public sector wage policy. The former has been partially tackled when dealing with ERP in Chapter Seven. More generally, however, the whole issue of tax reform can be easily incorporated into our analysis. The second omission, public sector wage policy, is also relevant to the extent that it may influence the level of public prices. Indeed, the popular contention is that PEs' wages tend to be above market wages and thus they represent an additional element of distortions in relative prices. The incorporation of these two issues into our analysis, however, should not pose a major problem. All we need is to obtain relevant information on the structure of public wages in the economy and a sense of the likely direction and magnitude of taxation changes.

No doubt extensions to the present study are both possible and desirable. Two of them derive from the omissions referred to above. In particular, it would seem that the modelling of

public wages is a necessary extension if the main sources of distortions in relative prices from PEs are to be analysed. Within our fix-price approach another possibility is to get a higher level of commodity/activity disaggregation in the petroleum sector which, as we have seen, produces large effects on relative prices.

Turning now to the limitations of our approach, undoubtedly the most important one derives from the fix-price nature of our model, which assumes that prices are formed independently of the level of productive activity. Whether or not such an assumption can be sustained in the context of the Mexican economy will surely remain a debatable point. Ultimately, however, one should recognise that prices are also influenced by demand considerations and more generally by the level of economic activity. Our results, then, should be interpreted only as locally valid and, therefore, ought to be taken merely as rough indicators.

From this perspective, it seems that a natural extension to the present study calls for a flex-price model. Such an analytical framework would enable us to get some insight into such key questions as the public sector borrowing requirements and domestic resource mobilisation, elements which are determined by and at the same time influence public prices. From there, a whole range of aspects related to macroeconomic effects need to be addressed. Having said that, it should not be forgotten that such a limitation is also a strength since it abstracts from other issues.

It would seem, then, that the empirical analysis of the effects of public sector intervention is far from exhausted and, therefore, a partial analysis of the price system ought to be seen only as an starting point. The hope is, however, that this study represents a step forward in that direction.

Appendix A

Appendix A

Mapping of the 72 sectors of the I-O table to our level of disaggregation.

AGRICULTURE

Agriculture
Livestock
Forestry
Hunting & fishing

MINING

Coal mining
Iron ore
Non-ferrous minerals
Quarrying
Other non-metallic minerals

PETROLEUM AND PETROCHEMICALS

Petroleum extraction
Oil refining and products
Basic petrochemical

FOOD PROCESSING

Milk products and meats
Canned fruits and vegetables
Wheat milling
Maize milling
Coffee
Sugar
Edible oils and fats
Animal food
Miscellaneous food products

TEXTILES

Soft textiles
Hard textiles
Other textiles

CHEMICALS

Basic chemicals
Fertilisers
Synthetic rubber & fib
Pharmaceutical products
Soaps, cosmetics & sim
Other chemical products

CAPITAL GOODS

Iron & steel
Non-ferrous metals
Metal furniture
Structural metal products
Other metal products
Non-electric machinery & equipment
Electric machinery & equipment
Batteries, elect. cab.
Motor vehicles
Motor vehic. eng. & parts
Transport material and equip.

OTHER MANUFACTURES

Alcoholic beverages
Beer
Soft beverages
Tobacco
Clothing
Leather & products
Sawmilling
Other wood prods. & cork
Paper and products
Printing & publishing
Rubber products
Plastics
Glass products
Cement
Non-metallic mineral prods.
Electric household goods
Electronic equipment
Miscellaneous manufc. ind.

CONSTRUCTION

Construction

ELECTRICITY

Electricity

TRANSPORT AND COMMUNICATIONS

Transport
Communications

OTHER SERVICES

Restaurants and hotels
Financial services
Real-estate renting
Professional services
Education
Medical health
Entertainment services
Other services

TRADE

Trade

Appendix B

Appendix B

The problem for the producers of trade and transport is to maximise total revenue, $\sum_i P_i Q_{Ti}$, subject to (5.8). That is, if, as before, T refers to the activities trade and transport, and i indicates commodity markets, then the maximisation problem can be expressed as

$$\sum_i P_i Q_{Ti} + \omega(Q_T^{\phi} - \sum_i \zeta_i Q_{Ti}) \tag{5.1.a}$$

Taking derivatives with respect to Q_{Ti}

$$P_i = \omega \phi \zeta_i Q_T^{(\phi-1)} \tag{5.2.a}$$

multiplying by Q_{Ti}, and remembering that total revenue of the producers is $P_T Q_T$

$$\sum_i Q_{Ti} P_T = \omega \phi \sum_i \zeta_i Q_T = \omega \phi Q_T^{\phi} = P_T Q_T \tag{5.3.a}$$

then from (5.2.a)

$$P_i = (P_T Q_T / Q_T^{\phi}) \phi \zeta_i Q_T^{(\phi-1)} \tag{5.4.a}$$

and

$$P_i = \zeta_i P_T (Q_{Ti} / Q_T)^{\phi-1}$$

therefore

$$\sum_i \zeta_i \left[\frac{P_i}{P_T \zeta_i} \right]^{\psi/T} = \sum_i \zeta_i (Q_{Ti} / Q_T)^{\phi} = 1 \tag{5.5.a}$$

finally, solving for P_T, and remembering that $\psi = 1/(1-\phi)$

$$P_T^{(1-\psi)} = \sum_i \zeta_i P_i^{(1-\psi)} \tag{5.6.a}$$

Appendix C

Table C.1

Model 3 : Effects of Increasing all Public Prices
(All Public Prices are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	21.4	21.5	21.9			
2	Private Agriculture	-4.5	-4.4	-4.3			
3	Agriculture	-4.2	-4.2	-4.0	3.5	3.5	3.4
4	Public Mining	6.3	6.4	6.5			
5	Private Mining	-11.2	-11.2	-11.1			
6	Mining	-9.5	-9.4	-9.3	7.0	6.9	6.8
7	Public Petroleum and Petrochem.	53.3	54.2	56.7			
8	Private Petroleum and Petrochem.	-19.2	-18.8	-17.6			
9	Petroleum & Petrochem.	51.8	52.7	55.2	52.7	51.2	47.0
10	Public Food Processing	138.8	139.0	139.4			
11	Private Food Processing	-14.7	-14.6	-14.3			
12	Food Processing	-4.8	-4.7	-4.4	11.2	11.2	11.0
13	Public Textiles	3.3	3.6	4.2			
14	Private Textiles	-13.6	-13.5	-13.1			
15	Textiles	-13.2	-13.1	-12.8	6.1	6.1	5.6

Table C.1 Contd.

Model 3 : Effects of Increasing All Public Prices
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	30.0	31.9	37.1			
17	Private Chemicals	-36.8	-36.2	-34.4			
18	Chemicals	-34.0	-33.3	-31.5	12.5	12.3	11.7
19	Public Capital Goods	22.2	22.3	22.6			
20	Private Capital Goods	-14.2	-14.2	-14.0			
21	Capital Goods	-9.1	-9.0	-8.8	4.9	4.9	4.8
22	Public Other Manufs.	8.3	8.6	9.1			
23	Private Other Manufs.	-15.4	-15.3	-15.0			
24	Other Manufactures	-15.1	-15.0	-14.8	6.6	6.6	6.5
25	Electricity (Only Public)	165.1	166.0	168.3	165.1	165.0	164.8
26	Construction (Only Private)	-10.1	-10.0	-9.8	4.7	4.7	4.6

Table C.1 Contd.

Model 3 : Effects of Increasing All Public Prices
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	51.9	52.2	53.0	*2	*2	*2
28	Private Transp. & Comm.	-7.2	-7.0	-6.6			
29	Transport & Comm.	3.6	3.8	4.2	14.8	14.6	14.1
30	Public Trade	64.3	64.3	64.5			
31	Private Trade	-3.9	-3.9	-3.3			
32	Trade	-2.7	-2.7	-2.7	-	-	-
33	Public Other Services	19.9	19.9	20.0			
34	Private Other Services	-3.4	-3.3	-3.9			
35	Other Services	4.6	4.6	4.6	9.6	9.6	9.6

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport'.

Table C.2

Model 3 : Effects of Increasing the Prices of Petroleum and Electricity
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	-9.9	-9.5	-9.1			
2	Private Agriculture	-3.2	-3.2	-3.1			
3	Agriculture	-3.3	-3.3	-3.1	2.2	2.2	2.1
4	Public Mining	-11.8	-11.7	-11.6			
5	Private Mining	-9.6	-9.6	-9.5			
6	Mining	-9.8	-9.8	-9.7	4.7	4.7	4.6
7	Public Petroleum and Petrochem.	54.3	55.2	57.8			
8	Private Petroleum and Petrochem.	-18.8	-18.3	-17.1			
9	Petroleum & Petrochem.	52.8	53.7	56.3	52.5	50.9	46.6
10	Public Food Processing	-14.0	-13.9	-13.5			
11	Private Food Processing	-8.8	-8.7	-8.4			
12	Food Processing	-9.1	-9.0	-8.7	2.6	2.5	2.4
13	Public Textiles	-21.5	-21.2	-20.6			
14	Private Textiles	-10.7	-10.6	-10.2			
15	Textiles	-10.9	-10.8	-10.5	4.4	4.4	4.2

Table C.2 Contd.

Model 3 : Effects of Increasing the Prices of Petroleum and Electricity
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-102.5	-100.6	-95.3			
17	Private Chemicals	-33.7	-33.0	-31.3			
18	Chemicals	-36.5	-35.8	-33.9	9.4	9.2	8.7
19	Public Capital Goods	-17.4	-17.3	-17.1			
20	Private Capital Goods	-10.2	-10.1	-10.0			
21	Capital Goods	-11.2	-11.2	-11.0	2.4	2.3	2.3
22	Public Other Manufs.	-25.8	-25.6	-25.1			
23	Private Other Manufs.	-11.9	-11.8	-11.6			
24	Other Manufactures	-12.0	-11.9	-11.7	4.2	4.2	4.1
25	Electricity (Only Public)	166.0	166.8	169.2	165.1	165.0	164.8
26	Construction (Only Private)	-6.7	-6.6	-6.4	3.1	3.1	3.0

Table C.2 Contd.

Model 3 : Effects of Increasing the Prices of Petroleum and Electricity
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
ACTIVITIES		1	2	3	4	5	6
27	Public Transp. & Comm.	-12.4	-21.1	-11.3	*2	*2	*2
28	Private Transp. & Comm.	-5.9	-5.8	-5.4			
29	Transport & Comm.	-7.1	-6.9	-6.5	4.0	3.9	3.6
30	Public Trade	-13.6	-13.5	-13.4			
31	Private Trade	-2.6	-2.6	-2.5			
32	Trade	-2.8	-2.7	-2.7	-	-	-
33	Public Other Services	-2.2	-2.1	-2.1			
34	Private Other Services	-2.0	-2.0	-1.9			
35	Other Services	-2.1	-2.0	-2.0	1.1	1.1	1.1

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport'.

Table C.3

Model 3 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Public Prices are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	31.1	31.1	31.1			
2	Private Agriculture	-1.1	-1.1	-1.1			
3	Agriculture	-0.008	-0.008	-0.008	1.2	1.2	1.2
4	Public Mining	18.2	18.2	18.2			
5	Private Mining	-1.5	-1.5	-1.5			
6	Mining	0.003	0.003	0.003	2.2	2.2	2.2
7	Public Petroleum and Petrochem.	-0.9	-0.9	-0.9			
8	Private Petroleum and Petrochem.	-0.4	-0.4	-0.4			
9	Petroleum & Petrochem.	-0.9	-0.9	-0.9	0.2	0.2	0.2
10	Public Food Processing	153.1	153.1	153.1			
11	Private Food Processing	-5.7	-5.7	-5.7			
12	Food Processing	4.4	4.4	4.4	6.7	6.7	6.7
13	Public Textiles	24.9	24.9	24.9			
14	Private Textiles	-2.8	-2.8	-2.8			
15	Textiles	-2.3	-2.3	-2.3	1.6	1.6	1.6

Table C.3 Contd.

Model 3 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Public Prices are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	132.7	132.7	132.7			
17	Private Chemicals	-3.0	-3.0	-3.0			
18	Chemicals	2.5	2.5	2.5	2.9	2.9	2.9
19	Public Capital Goods	39.7	39.7	39.7			
20	Private Capital Goods	-3.9	-3.9	-3.9			
21	Capital Goods	2.2	2.2	2.2	2.5	2.5	2.5
22	Public Other Manufs.	34.4	34.4	34.4			
23	Private Other Manufs.	-3.3	-3.3	-3.3			
24	Other Manufactures	-3.0	-3.0	-3.0	2.3	2.3	2.3
25	Electricity (Only Public)	-0.8	-0.8	-0.8	164.4	164.3	164.1
26	Construction (Only Private)	-3.3	-3.3	-3.3	1.5	1.5	1.5

Table C.3 Contd.

Model 3 : Effects of Increasing All Public Prices, Except Petroleum and Electricity
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
ACTIVITIES		1	2	3	4	5	6
27	Public Transp. & Comm.	64.4	64.4	64.4	*2	*2	*2
28	Private Transp. & Comm.	-1.2	-1.2	-1.2			
29	Transport & Comm.	10.8	10.8	10.8	10.1	10.0	9.9
30	Public Trade	78.0	78.0	78.0			
31	Private Trade	-1.3	-1.3	-1.3			
32	Trade	0.0002	0.0002	0.002	-	-	-
33	Public Other Services	22.3	22.3	22.3			
34	Private Other Services	-1.3	-1.3	-1.3			
35	Other Services	6.7	6.7	6.7	8.3	8.3	8.3

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport'.

Table C.4

Model 1 : Effects of Increasing The Price of Petroleum
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	-8.3	-7.7	-6.0			
2	Private Agriculture	-2.8	-2.6	-2.0			
3	Agriculture	-2.9	-2.6	-2.0	1.9	1.7	1.4
4	Public Mining	-4.0	-3.7	-2.9			
5	Private Mining	-3.3	-3.0	-2.4			
6	Mining	-3.4	-3.1	-2.4	1.9	1.7	1.4
7	Public Petroleum and Petrochem.	35.1	39.7	51.0			
8	Private Petroleum and Petrochem.	-28.0	-25.7	-20.2			
9	Petroleum & Petrochem.	33.8	38.3	49.5	94.0	86.5	67.9
10	Public Food Processing	-9.6	-8.8	-6.9			
11	Private Food Processing	-6.0	-5.5	-4.3			
12	Food Processing	-6.2	-5.7	-4.5	1.9	1.8	1.4
13	Public Textiles	-15.4	-14.1	-11.0			
14	Private Textiles	-7.6	-7.0	-5.4			
15	Textiles	-7.7	-7.1	-5.5	3.4	3.1	2.5

Table C.4 Contd.

Model 1 : Effects of Increasing The Price of Petroleum
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-119.9	-110.2	-86.5			
17	Private Chemicals	-39.5	-36.3	-28.4			
18	Chemicals	-42.8	-39.3	-30.8	11.6	10.7	8.3
19	Public Capital Goods	-7.4	-6.8	-5.3			
20	Private Capital Goods	-4.3	-3.9	-3.1			
21	Capital Goods	-4.7	-4.3	-3.4	1.4	1.3	1.0
22	Public Other Manufs.	-14.3	-13.1	-10.3			
23	Private Other Manufs.	-6.5	-6.0	-4.7			
24	Other Manufactures	-6.6	-6.0	-4.7	2.5	2.3	1.8
25	Electricity (Only Public)	-55.0	-50.6	-39.7	30.6	28.2	22.1
26	Construction (Only Private)	-5.6	-5.1	-4.0	2.6	2.4	1.9

Table C.4 Contd.

Model 1 : Effects of Increasing The Price of Petroleum
(All Sectors Follow the Cost-Plus Pricing Rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	-18.6	-17.1	-13.4	*2	*2	*2
28	Private Transp. & Comm.	-8.9	-8.2	-6.5			
29	Transport & Comm.	-10.7	-9.9	-7.7	6.0	5.6	4.4
30	Public Trade	-5.2	-4.8	-3.7			
31	Private Trade	-1.0	-0.9	-0.7			
32	Trade	-1.8	-1.5	-0.9	-	-	-
33	Public Other Services	-1.1	-1.0	-0.8			
34	Private Other Services	-1.1	-1.0	-0.7			
35	Other Services	-1.1	-1.0	-0.008	1.1	1.0	0.8

*1 This price effect refers to the commodity produced by the activity.
*2 This price effect refers to the commodity 'trade and transport'.

Table C.5

Model 2 : Effects of Increasing The Price of Petroleum
(All Sectors Follow The Cost-Plus Pricing Rule, Except Petroleum and Electricity [Regulated])

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	-4.0	-3.9	-3.5			
2	Private Agriculture	-1.3	-1.3	-1.2			
3	Agriculture	-1.4	-1.3	-1.2	0.9	0.9	0.8
4	Public Mining	-1.1	-1.0	-0.9			
5	Private Mining	-0.9	-0.8	-0.8			
6	Mining	-0.9	-0.9	-0.8	0.5	0.5	0.5
7	Public Petroleum and Petrochem.	61.1	62.1	64.6			
8	Private Petroleum and Petrochem.	-15.2	-14.7	-13.5			
9	Petroleum & Petrochem.	59.6	60.5	63.0	52.3	50.7	46.4
10	Public Food Processing	-4.3	-4.1	-3.8			
11	Private Food Processing	-2.6	-2.6	-2.3			
12	Food Processing	-2.8	-2.7	-2.4	0.8	0.8	0.7
13	Public Textiles	-7.0	-6.7	-6.1			
14	Private Textiles	-3.4	-3.3	-3.0			
15	Textiles	-3.5	-3.3	-3.0	1.6	1.5	1.4

Table 6.5 Contd.

Model 2 : Effects of Increasing The Price of Petroleum
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity (Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-62.4	-60.5	-55.4			
17	Private Chemicals	-20.5	-19.9	-18.2			
18	Chemicals	-22.3	-21.6	-19.7	6.0	5.8	5.3
19	Public Capital Goods	-2.4	-2.3	-2.1			
20	Private Capital Goods	-1.4	-1.3	-1.2			
21	Capital Goods	-1.5	-1.5	-1.3	0.5	0.5	0.5
22	Public Other Manufs.	-5.7	-5.6	-5.1			
23	Private Other Manufs.	-2.6	-2.5	-2.3			
24	Other Manufactures	-2.6	-2.5	-2.3	1.0	1.0	0.9
25	Electricity (Only Public)	-28.8	-28.0	-27.6	-	-	-
26	Construction (Only Private)	-2.6	-2.5	-2.3	1.2	1.2	1.1

Table C.5 Contd.

Model 2 : Effects of Increasing The Price of Petroleum
(All Sectors Follow the Cost-Plus Pricing Rule, Except Petroleum and Electricity [Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	-10.1	-9.8	-8.9	*2	*2	*2
28	Private Transp. & Comm.	-4.8	-4.7	-4.3			
29	Transport & Comm.	-5.8	-5.6	-5.1	3.2	3.1	2.9
30	Public Trade	-1.6	-1.5	-1.4			
31	Private Trade	-0.3	-0.2	-0.2			
32	Trade	-0.3	-0.3	-0.2	-	-	-
33	Public Other Services	-0.4	-0.4	-0.4			
34	Private Other Services	-0.4	-0.4	-0.3			
35	Other Services	-0.4	-0.4	-0.3	0.4	0.4	0.4

*1/ This price effect refers to the commodity produced by the activity.
*2/ This price effect refers to the commodity 'trade and transport'. 'Communications', as a commodity is allocated to 'other services'.

Table C.6

Model 3 : Effects of Increasing The Price of Petroleum
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	-3.9	-3.8	-3.4			
2	Private Agriculture	-1.3	-1.2	-1.1			
3	Agriculture	-1.3	-1.3	-1.2	0.9	0.8	0.7
4	Public Mining	-1.0	-1.0	-0.9			
5	Private Mining	-0.8	-0.8	-0.7			
6	Mining	-0.8	-0.8	-0.7	0.4	0.4	0.4
7	Public Petroleum and Petrochem.	61.2	62.1	64.7			
8	Private Petroleum and Petrochem.	-15.1	-14.7	-13.5			
9	Petroleum & Petrochem.	59.6	60.5	63.1	52.3	50.7	46.4
10	Public Food Processing	-4.1	-4.0	-3.6			
11	Private Food Processing	-2.5	-2.5	-2.2			
12	Food Processing	-2.6	-2.6	-2.3	0.8	0.7	0.7
13	Public Textiles	-6.4	-6.2	-5.7			
14	Private Textiles	-3.1	-3.0	-2.8			
15	Textiles	-3.2	-3.1	-2.8	1.4	1.4	1.3

Table C.6 Contd.

Model 3 : Effects of Increasing the Price of Petroleum
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	-61.6	-59.8	-54.7			
17	Private Chemicals	-20.3	-19.7	-18.0			
18	Chemicals	-22.0	-21.3	-19.5	5.5	5.4	4.9
19	Public Capital Goods	-2.1	-2.1	-1.9			
20	Private Capital Goods	-1.2	-1.2	-1.1			
21	Capital Goods	-1.3	-1.3	-1.2	0.5	0.5	0.5
22	Public Other Manufs.	-5.4	-5.3	-4.8			
23	Private Other Manufs.	-2.4	-2.4	-2.2			
24	Other Manufactures	-2.5	-2.4	-2.2	0.9	0.9	0.8
25	Electricity (Only Public)	-28.8	-28.0	-25.6	-	-	-
26	Construction (Only Private)	-2.5	-2.4	-2.2	1.1	1.1	1.0

Table E.6 Contd.

Model 3 : Effects of Increasing The Price of Petroleum
(All Public Prices Are Regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	-10.0	-9.7	-8.9	*2	*2	*2
28	Private Transp. & Comm.	-4.8	-4.7	-4.3			
29	Transport & Comm.	-5.8	-5.6	-5.1	3.2	3.1	2.9
30	Public Trade	-1.4	-1.4	-1.2			
31	Private Trade	-0.2	-0.2	-0.2			
32	Trade	-0.3	-0.2	-0.2	-	-	-
33	Public Other Services	-0.4	-0.4	-0.3			
34	Private Other Services	-0.3	-0.3	-0.3			
35	Other Services	-0.4	-0.3	-0.3	0.3	0.3	0.2

*1/ This price effect refers to the commodity produced by the activity.
*2/ This price effect refers to the commodity 'trade and transport'. 'Communications', as a commodity is allocated to 'other services'.

Table E.7

Model 2 : Effects of Increasing the Efficiency Parameter in all Public Activities*λ by 20 Percent
(Model where all sectors, except petroleum and electricity follow the cost-plus pricing rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	0.8	0.8	0.8			
2	Private Agriculture	0.2	0.2	0.2			
3	Agriculture	0.2	0.2	0.2	-0.3	-0.3	-0.3
4	Public Mining	1.1	1.1	1.1			
5	Private Mining	0.9	0.9	0.9			
6	Mining	0.9	0.9	0.9	-1.4	-1.4	-1.4
7	Public Petroleum and Petrochem.	0.4	0.4	0.4			
8	Private Petroleum and Petrochem.	0.2	0.2	0.2			
9	Petroleum & Petrochem.	0.4	0.4	0.4	-0.8	-0.8	-0.8
10	Public Food Processing	1.8	1.8	1.8			
11	Private Food Processing	1.1	1.1	1.1			
12	Food Processing	1.2	1.2	1.2	-0.7	-0.7	-0.7
13	Public Textiles	1.9	1.9	1.9			
14	Private Textiles	0.9	0.9	0.9			
15	Textiles	0.9	0.9	0.9	-0.5	-0.5	-0.5

Table C.7 Contd.

Model 2 : Effects of Increasing the Efficiency Parameter in all Public Activities*A by 20 Percent
(Model where all sectors, except petroleum and electricity follow the cost-plus pricing rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	2.5	2.6	2.6			
17	Private Chemicals	0.8	0.8	0.8			
18	Chemicals	0.9	0.9	0.9	-0.5	-0.5	-0.5
19	Public Capital Goods	3 1	3.1	3.1			
20	Private Capital Goods	1.8	1.8	1.8			
21	Capital Goods	2.0	2.0	2.0	-1.0	-1.0	-1.0
22	Public Other Manufs.	2.6	2.6	2.6			
23	Private Other Manufs.	1.2	1.2	1.2			
24	Other Manufactures	1.2	1.2	1.2	-0.6	-0.6	-0.6
25	Electricity (Only Public)	0.4	0.4	0.4	-	-	-
26	Construction (Only Private)	1.5	1.5	1.5	-0.7	-0.7	-0.7

Table C.7 Contd.

Model 2 : Effects of Increasing the Efficiency Parameter in all Public Activities*A by 20 Percent
(Model where all sectors, except petroleum and electricity follow the cost-plus pricing rule)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	1.3	1.3	1.3	*2	*2	*2
28	Private Transp. & Comm.	0.6	0.6	0.6			
29	Transport & Comm.	0.8	0.8	0.8	-2.1	-2.1	-2.1
30	Public Trade	4.1	4.1	4.1			
31	Private Trade	0.8	0.8	0.8			
32	Trade	0.8	0.8	0.8	-	-	-
33	Public Other Services	0.8	0.8	0.8			
34	Private Other Services	0.7	0.7	0.7			
35	Other Services	0.7	0.7	0.7	-5.3	-5.3	-5.3

*1/ This price effect refers to the commodity produced by the activity.
*2/ This price effect refers to the commodity 'trade and transport'. 'Communications', as a commodity is allocated to 'other services'.
*A Except petroleum and electricity.

Table C.8

Model 2 : Joint Effects of Increasing the Efficiency Parameter in all Public Activities (except petroleum and electricity)
Increasing All Public Prices
(Model where all sectors follow the cost-plus pricing rule, except petroleum and electricity (regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
1	Public Agriculture	21.2	21.4	21.8			
2	Private Agriculture	-4.5	-4.5	-4 3			
3	Agriculture	-4.3	-4.2	-4.1	3.8	3.7	3.6
4	Public Mining	6.9	7.0	7.1			
5	Private Mining	-10.8	-10.7	-10.6			
6	Mining	-9.0	-8.9	-8.8	6.5	6.5	6.3
7	Public Petroleum and Petrochem.	53.7	54.6	57.2			
8	Private Petroleum and Petrochem.	-19.1	-18.6	-17.4			
9	Petroleum & Petrochem.	52.2	53.1	55.6	52.6	51.1	46.9
10	Public Food Processing	138.3	138.5	139.0			
11	Private Food Processing	-15.0	-14.9	-14.6			
12	Food Processing	-5.1	-5.0	-4.7	9.9	9.8	9.6
13	Public Textiles	2.7	3.0	3.8			
14	Private Textiles	-13.9	-13.7	-13.4			
15	Textiles	-13.6	-13.4	-13.0	6.2	6.1	5.9

Table C.8 Contd.

Model 2 : Joint Effects of Increasing the Efficiency Parameter in all Public Activities (except petroleum and electricity)
Increasing All Public Prices
(Model where all sectors follow the cost-plus pricing rule, except petroleum and electricity [regulated)

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
16	Public Chemicals	28.8	30.9	36.3			
17	Private Chemicals	-37.2	-36.5	-34.7			
18	Chemicals	-34.4	-33.7	-31.8	14.2	13.9	13.2
19	Public Capital Goods	23.5	23.6	23.9			
20	Private Capital Goods	-13.5	-13.4	-13.2			
21	Capital Goods	-8.2	-8.1	-7.9	4.7	4.7	4.6
22	Public Other Manufs.	9.4	9.7	10.3			
23	Private Other Manufs.	-14.8	-14.7	-14.4			
24	Other Manufactures	-14.6	-14.5	-14.2	6.2	6.1	6.0
25	Electricity (Only Public)	165.5	166.4	168.7	164.4	164.3	164.1
26	Construction (Only Private)	-9.3	-9.2	-8.9	4.3	4.3	4.3

Table C.8 Contd.

Model 2 : Joint Effects of Increasing the Efficiency Parameter in all Public Activities (except petroleum and electricity)
Increasing All Public Prices
(Model where all sectors follow the cost-plus pricing rule, except petroleum and electricity [regulated])

		PERCENT CHANGE IN VALUE ADDED			PERCENT CHANGE IN MARKET PRICES*1		
		ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES	ALL IMPORTS COMPLEMENTARY	LOW TRADE ELASTICITIES	HIGH TRADE ELASTICITIES
	ACTIVITIES	1	2	3	4	5	6
27	Public Transp. & Comm.	53.0	53.3	54.2	*2	*2	*2
28	Private Transp. & Comm.	-6.6	-6.5	-6.1			
29	Transport & Comm.	4.3	4.4	4.9	11.8	11.6	11.2
30	Public Trade	68.1	68.2	68.3			
31	Private Trade	-3.2	-3.2	-3.1			
32	Trade	-1.9	-1.9	-1.9	-	-	-
33	Public Other Services	20.7	20.8	20.8			
34	Private Other Services	-2.7	-2.7	-2.6			
35	Other Services	5.3	5.3	5.4	4.5	4.5	4.5

*1/ This price effect refers to the commodity produced by the activity.
*2/ This price effect refers to the commodity 'trade and transport'. 'Communications', as a commodity is allocated to 'other services'.

Appendix D

Appendix D. ERP With Input Substitutability

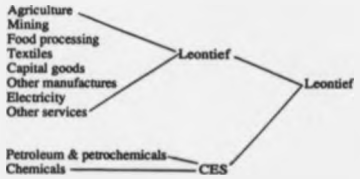
For calculation purposes, and given that we are postulating a constant elasticity of substitution (CES) function for the use of raw materials, it is always possible to specify a set of nested CES functions that combine at different levels. In particular, we have allowed for substitution between petroleum & petrochemicals, and chemicals, for all production activities, and, in addition, for the activities other manufactures and capital goods (both public and private), we allowed for further substitutability between the commodities capital goods and mining, trying to incorporate the fact that an important proportion of the production of capital goods consists of iron & steel. Finally, at the upper level all the groups of inputs were assumed to combine in fixed coefficients. This is illustrated in figure D.1.

The results of our estimations are presented in Table D.1, for the case in which subsidies to mining and petroleum & petrochemicals are removed. The associated vector of price effects is not presented because it is the same as the one presented in Table 7.4.

Table D.1 has four columns. In column one we simply reproduced the ERP shown in Table 7.4, to make comparisons easier. The remaining three columns describe ERP for three set of elasticity values. The low set refers to a situation in which substitution between petroleum & petrochemicals and chemicals, σ, equals 0.5, and substitution between mining and capital goods, λ, equals 0.6. The medium values in column three are twice the low values, whereas the high values are, in turn, twice the medium values.

Figure D.1. Substitutability Specification

For All Activities, Except Capital Goods, and Other Manufactures.



For Activities Capital Goods and Other Manufactures, Only.

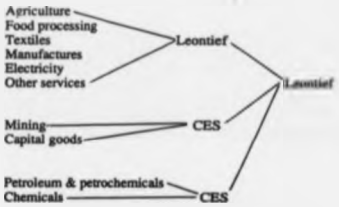


Table D.1 ERP With Input Substitutability				
Activity	Fixed Coefficients	Low Substitution	Medium Substitution	High Substitution
Public agriculture	0.2087	0.2017	0.1956	0.1865
Private agriculture	0.1599	0.1578	0.1559	0.1529
Agriculture	0.1604	0.1582	0.1563	0.1532
Public mining	-0.2180	-0.2186	-0.2192	-0.2203
Private mining	-0.2114	-0.2119	-0.2124	-0.2132
Mining	-0.2120	-0.2126	-0.2131	-0.2139
Public petrol. & petroch.	-0.4496	-0.4507	-0.4522	-0.4559
Private petrol. & petroch.	-0.4271	-0.4278	-0.4278	-0.4310
Petroleum & petrochemicals	-0.4491	-0.4503	-0.4517	-0.4555
Public food processing	0.2768	0.2739	-0.2711	0.2666
Private food processing	0.2194	0.2177	0.2162	0.2136
Food processing	0.2229	0.2212	0.2196	0.2169
Public textiles	0.2838	0.2811	0.2797	0.2756
Private textiles	0.2231	0.2223	0.2216	0.2206
Textiles	0.2243	0.2234	0.2227	0.2217
Public chemicals	-	-	-	-
Private chemicals	1.6277	1.4581	1.3137	1.0924
Chemicals	1.8831	1.6644	1.4824	1.2104
Public capital goods	1.8131	1.7306	1.6614	1.5547
Private capital goods	0.9650	0.9409	0.9201	0.8867
Capital goods	1.0530	1.0241	0.9992	0.9595
Public other manufc.	1.6355	1.5835	1.5395	1.4705
Private other manufc.	0.7293	0.7190	0.7101	0.6957
Other manufactures	0.7348	0.7244	0.7153	0.7006

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TITLE PRICE EFFECTS FROM PUBLIC SECTOR INTERVENTION. THE CASE OF MEXICO.

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INSTITUTION and DATE University of Warwick 1989