Trade Liberalisation, Market Structure and Economic Performance in Manufacturing in Brazil, 1986-1999

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ABSTRACT

This thesis is based on the body of trade theory that implies that trade liberalisation will result in productivity growth and in increased competition, thereby leading to improvements in economic performance. Hence, the hypothesis tested is whether trade liberalisation, which was introduced in 1990, improved productivity, exports performance, and productive efficiency in manufacturing, in Brazil, over the period of 1986 to 1999.

The matter was approached with a multi-method technique, using quantitative and qualitative approaches. The quantitative approach was based on S-C-P (Structure-Conduct-Performance) models, developed on the basis of the imperfect competition assumption. The qualitative approach was based on visits to firms in the field.

The quantitative approach was based on data gathered according to the Brazilian domestic classification of industries, which lent a high degree of consistency to the analysis. The values were corrected for inflation using the gross sale inflation index, which can express the price changes in each industry. To test the hypothesis above, productivity was measured as labour productivity and as total factor productivity, exports levels were taken from the data on exports, and market discipline was indicated by the level of mark-ups. The data came from published data on firms' balance sheets, counting five years prior to trade liberalisation in 1990, and up to 1999.

The qualitative approach with visits to a group of ninety-four firms from six industries consisted o f a structured questionnaire submitted companies and interviews with the member of the board and plant directors. The companies were chosen, as they were part of a supply chain in order to capture the trade liberalisation effects on inter-industry price formation and other spill-overs in terms of learning technology. The visits for the interviews combined visits to the firms' headquarters and the plants. The objective was to identify the effects of trade liberalisation in reallocation of capital and employment in these firms, together with their initiatives to respond to the increasing competition from imports.

The results from both approaches emphasise the static and dynamic effects of trade liberalisation. Labour reallocation, resulting in job losses, brought about new employment structures, with skilled employees being valued, rather than unskilled ones, although in fewer numbers. The results also included capital reallocation, with new investment in machinery, product improvement, and technology, with more than 10% of the overall sample firms merging or being taken over by other domestic and multinational groups. Moreover, product quality and technology have been modernised, with an emphasis on buying foreign technology.

Hence, trade liberalisation achieved the goals of enabling the companies to modernise their production lines. At the same time, however, the firms also managed to maintain their mark-ups levels. Nevertheless, after trade liberalisation, the objectives of increasing competition and opening foreign markets to domestic firms, which involved stimulating productivity and product quality improvement, were achieved. However, forcing the firms to reduce their profits, in the benefit of social welfare, by increasing market openness worked only partially due to the possibility of importing intermediate goods, spare parts and technology, which allowed the firms to maintain mark-ups without increasing prices of the final products.

Declaration

José Maria de Oliveira, hereby declare that no portion of the work referred to in the thesis has been submitted in support of an application for another degree, or qualification of this or any other university, or other institute of learning.

DEDICATION

To my wife, my sons and my granddaughter.

ACKNOWLEDGMENT

ABBREVIATIONS

ABNT	Associação Brasileira para Normas Técnicas (Brazilian Association for Technical Standards)
ABAL	Associação Brasileira do Alumínio (Aluminium Brazilian Association)
AFRMM	Adicional de Frete para Renovação da Mariha Mercante (Tax for the Merchant Marine Fund)
BNDES	Banco Nacional de Desenvolvimento Econômico e Social (National Bank for Economic and Social Development)
CACEX	Carteira de Comércio Exterior do Banco do Brasil (Foreign Trade Department of Banco do Brasil)
CADE	Conselho Administrativo de Defesa Econômica (Anti-trust Agency)
CAGED	Cadastro Geral de Empregados e Desempregados (General Registry of Employed and Unemployed)
CNI	Confederação Nacional da Indústria (National Confederation of Industry)
CDI	Conselho de Desenvolvimento Industrial (Industrial Development Council)
CEBRAE	Cadastro Brasileiro de Empresas (Brazilian Registry of Firms)
CEMPRE	Cadastro Brasileiro de Empresas e Emprego (Brazilian Registry of Firms and Employment)
CEPAL	United Nations Commission for Latin America and Caribbean
CET	Mercosul External Tariffs
CIP	Conselho Interministerial de Controle Precos (Price Control Council)
CNAE	Classificação Nacional de Atividades Econômicas (National Classification of Economic Activities)
CPA	Comissão de Política Aduaneira (Customs Policy Committee)
DECEX	Departamento de Comércio Exterior (Foreign Trade Department)
EMBRAER	Empresa Brasileira de Aeronáutica (Brazilian Company of Aeronautics)
FDC	Fundação Dom Cabral (Foundation Dom Cabral)
FDI	Foreign Direct Investment
FGV	Fundacão Getúlio Vargas (Foundation Getulio Vargas)
FINAME	Agência Especial de Financiamento Industrial (Special Agency for Industrial Finance)
FINAMEX	Programa de Financiamento à Exportação de Bens de Capital
FINEP	Financiadora de Estudos de Projetos (Special Agency for Technology Projects Finance)
FOB	Free on Board
FTA	Free Trade Area
FUNCEX	Fundação Centro de Estudos de Comércio Exterior (Foreign Trade Studies Foundation)
GATT	General Agreement for Tariffs and Trade
IBGE	Brazilian Institute for Statistics and Geography
IBS	Instituto Brasileiro de Siderurgia (Brazilian Steel Institute)
IE/UNICAMP	Instituto de Economia/Universidade Estadual de Campinas (Economics Institute/State University of Campinas)
IEI/UFRJ	Instituto de Economia Industrial/Universidade Federal do Rio de Janeiro (Economics Institute/Federal University, Rio de Janeiro)
IMF	International Monetary Fund
INPI	Instituto National de Propriedade Industrial (National Institute of Industrial Intellectual Property)
IPEA	Instituto de Pesquisa Econômica Aplicada (Applied Economics Research Institute)

ISI	Import Substitution Industrialisation
ISIC	International Standard Industrial Classification
ISO	International Standards Organisation
JIT	Just-in-Time
LA	Latin America
LDC	Less Developed Countries
MDIC	Ministério para o Desenvolvimento, Indústria e Comércio (Development, Trade and Industry Ministry)
MEF	Ministério da Economia e Fazenda (Economy and Finance Ministry)
MERCOSUL	Mercado Comum do Sul (Southern Common Market)
MTE	Ministério do Trabalho e Emprego (Ministry for Labour and Employment)
MVA	Manufacturing Value Added
NAFTA	North American Free Trade Area
NICS	Newly Industrialised Countries
NTB	Non-tariff Barriers
OECD	Organisation for Economic Co-operation and Development
Pacti	Programa de Apoio à Capacitção Tecnológica da Indústria (Programme for Technological Training for Industry)E
PBQP	Programa Brasileiro de Qualidade e Produtividade (Brazilian Quality and Productivity Programme)
PCI	Programa de Competitividade Industrial (Industrial Competitiveness Programme)
PIA	Pesquisa Industrial Annual (Annual Industrial Survey)
PICE	Política Industrial, Tecnologica e de Comércio Exterior (Industrial, Technological, and International Trade Policy)
PIS/PASEP	Programa de Integração Social/Programa de Formação do Patrimônio do Servidor Público (Social Integration Programme/Programme for the Training of Public Workers)
PND-II	Second National Development Plan
PROEX	Programa de Financiamento das Exportações (Export Financing Programme)
PUC-MG	Pontifícia Universidade Católica de Minas Gerais (Catholic University, Belo Horizonte, MG)
PUC-Rio	Pontifícia Universidade Católica do Rio de Janeiro (Catholic University, Rio de Janeiro)
RAIS	Relação Annual de Informações Sociais (Annual Report of Social Information)
SAL	Structural Adjustment Lending
SEBRAE	Servico Brasileiro de Atendimento a Pequena e Media Empresas (Service for Supporting Small and Medium Firms)
S-C-P	Structure- Conduct- Performance
SDE	Secretaria de Direito Econômico (Economic Law Secretary)
SECEX	Secretaria de Comércio Exterior (Foreign Trade Secretary)
SEST	Secretaria de Controle das Estatais (Secretary for Controlling State Owned Companies)
SRF	Secretaria da Receita Federal (Inland Revenue and Customs and Excise Office)
TFP	Total Factor Productivity
TNC	Transnational Corporation
UNCTAD	United Nations Commission for Trade and Development
UNIDO	United Nations Organisation for Industrial Development
WB	World Bank (=Bank for the Reconstruction and Development)
WIDER	World Institute for Development Economic Research
WTO	World Trade Organisation
SH-NBM	Sistema harmonizado – nomenclatura brasileira de mercadorias (Harmonised System – Brazilian Product Denominations)

CHAPTER 1. INTRODUCTION

International trade and industrialisation have been central to the debate on development theory and policy for many years. Encouraged by the IMF and World Bank programmes or by their own initiative many less developed countries (LDCs) implemented Structural Adjustment Programmes (SALs), in the 1980s, which included trade reforms as one of the main pillars (Adhikari et al., 1992; Thomas, 1991). These overall reforms were typically focused on macroeconomic variables, such as the exchange rate regime, plans for controlling inflation and current account deficit, and increasing exports (Rodrik, 1992c; World Bank, 1990).

Although a consensus was not reached, trade reforms were supposed to follow a sequence, to achieve the overall SALs objectives: first, to eliminate quotas and other non-trade barriers, replacing them with tariffs ; second, to reduce tariffs to an agreed level, although maintaining a list of exceptions to the main tariff schedule; third, to bring the tariff levels to an appropriate range, basically harmonising the product denominations in the tariff lines, to comply with international standards; and fourth, to reduce the harmonised tariffs to international average levels (Nash and Takacs, 1998; Thomas, 1991) These four stages were to be accompanied by major reforms in other sectors, which affected the results of trade reforms. Exchange rate and foreign exchange markets were to be reformed together with labour market de-regulation, financial markets reform and fiscal and current account reforms (Greenaway and Milner, 1993; Krueger, 1984).

Trade policy reforms emphasised outward orientated trade, stressing the need to eliminate anti-export bias by reducing import tariffs. Increasing competition in domestic markets by allowing more imports was expected to make domestic firms more efficient, which would imply resource reallocation. Moreover, openness to imports would bring dynamic trade benefits, like technology and learning, which were the basis of sustainable growth and were used as an argument by the IMF and the World Bank to impose reform conditions on loans to LDCs (Balassa, 1989; Michaely et al., 1990; Thomas and Nash, 1992). However, these outcomes were not without controversy. Some authors have been positive with respect to the effects of trade liberalisation on performance, productivity and exports growth (Bhagwati, 1987; Dornbusch, 1992; Weiss, 1992; Weiss, 1998; Weiss and Mulaga, 1996). But others pointed out that constraints in LDCs' markets could limit the capabilities for resource reallocation, offsetting the benefits of trade liberalisation (Rodrik, 1988;1990;1992a;c).

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Others have adopted a rather middling position, questioning strong theoretical support for the links between trade liberalisation and productivity increase, but admitting that trade liberalisation, under certain circumstances, would contribute to increase productivity (Helleiner, 1992b; Pack, 1992). Other authors questioned the theoretical and empirical basis for trade liberalisation policies arguing that these policy reforms were based on the assumption of perfect competition, which was not the most common environment in LDCs (Lall, 1991; Morrissey and Stewart, 1995). However, all of them admitted that by increasing foreign supply trade liberalisation enlarged domestic markets and by increasing competition it forced firms to improve productivity and product quality.

However, there has been relatively little testing for the empirical evidence of the effects of trade liberalisation on manufacturing productivity at the country level. The assessment of such policies in LDCs, using cross-country studies, which have been the most common method of analysis of the advantages of trade liberalisation in LDCs, cannot disentangle all the details involved. Thus, country based studies became essential, having the advantage of allowing for particular circumstances, such as experiences implemented in a country, which could have special interest for trade liberalisation. An assessment of trade liberalisation in Brazil will try to fulfil that gap in empirical research. Brazil has a large manufacturing sector, which supported a case study based on firms' data. Moreover, most of the Brazilian manufacturing firms have a long history of import substitution, which increased the chances of having a proper counterfactual, by comparing the periods before and after trade liberalisation.

For the tests of the basic hypothesis, the framework was designed to verify the import discipline hypothesis, whereby efficiency, productivity and improved discipline would result from increasing competition in domestic markets (Balassa, 1971a; Corden, 1971). The import discipline hypothesis is discussed by Levinsohn (1993), who highlighted the importance of trade liberalisation for reducing market powers of domestic firms and groups, stating that after trade liberalisation increasing imports would discipline the domestic firms and groups:

> "when faced with intensified international competition, domestic industries,
> which may have reaped oligopoly profits in a protected domestic market, are
> forced to behave competitively"
>
> (Levinsohn, 1993: 2)

Based on the definition above, the focus of this research will be on market discipline, using productivity and exports to express the level of the local product competitiveness, since to be exported the product must match the international

requirements on quality and price. In the next subsection the objectives of the research will be discussed in more detail.

Section 1.1 The Research Objectives

The study of trade liberalisation effects, by combining microeconomic and trade theories with evidence from firm data was a challenge. The effects of trade liberalisation on firms' behaviour were hard to study partially because of the lack of consistent data at microeconomic levels, which was combined with flaws in macroeconomic aggregate measures, in the test periods (Helleiner, 1992b). For instance, in LDCs, trade balance problems were often mixed with macroeconomic aggregates, like exchange rate and inflation, which have implications for the effects of trade liberalisation. Hence this research on the effects of trade liberalisation will rely on manufacturing firms' data, in an effort to keep the results as close as possible to the micro level, and to discuss the policy evaluation in terms of the effects on the firms.

In addition to secondary data collected from firms, information was gathered directly from the firms, in visits to plants and headquarters, by a qualitative study of the direct effects of trade liberalisation in some industries. A set of research questions, aiming to clarify the analysis above, will be presented in the next subsection.

1.1.1 Modelling the Problem and the Research Questions

Based on the above definition of imports as a market discipline, together with the hypothesis of trade liberalisation improving productivity, two research questions have been set up for guidance of the main research points. Although trade liberalisation policies were undertaken in an environment of complex reforms and modernisation, the questions focused on trade liberalisation and were derived from trade theory, in particular the hypothesis of import as a market discipline. This came also from the theory of industrial organisation, which supported the importance of market structure in shaping firms' behaviour. The questions were as follows:

- Did Brazilian manufacturing companies improve their productivity, export performance and mark-ups discipline after trade liberalisation, in 1990?
- Did structural elements affect the relationship between trade liberalisation and productivity, export performance and mark-ups?

Other authors have researched the economic effects of trade liberalisation in Brazil, with results suggesting increasing productivity after trade liberalisation (Bonelli, 1992; Hay, 2001; Moreira and Correa, 1998). None of them,

however, included testing for change in industrial structures, other than market shares, although they recognised that structures in manufacturing were important issues for trade reforms. Hence including tests for the effects of structural variables will add value to this research. Furthermore, an extended period after trade liberalisation will be analysed, with data from 1986 to 1999, as opposed to the studies mentioned above, which covered earlier periods.

Another feature of this research is its reliance on data gathered from the Brazilian statistics and geography agency (the IBGE), using the Brazilian classification of industries, instead of reclassifying the manufacturing data on the UNIDO's standard classification (ISIC). This would imply losses of information due to regrouping and reclassifying originally collected information.

A set of influential elements, such as tariffs, effective protection, imports and productivity will be modelled and measured, in order to capture the effects of trade liberalisation. The sector's structure will be mainly based on the changes in employment, number of firms, foreign ownership, size, and capacity utilisation. Other macroeconomic issues however, like education level of the workforce, consumer information and local distances will not be discriminated by industry, although considered in the qualitative analysis. These are the main components used for testing the hypothesis that liberalising trade increases competition in the domestic markets, implying a rise in firms' productivity, exports performance and market discipline. Since most of the effects of trade liberalisation will be linked to the success of macroeconomic policies undertaken by the government, the next subsection will emphasise the need for relative macro-stability for trade to affect the firms and the markets as expected.

1.1.2 Macroeconomic Issues Related to Trade Liberalisation

According to the theoretical models, to ensure the appropriate outcome mentioned previously, trade liberalisation should occur under a sound macroeconomic environment, such as absence of debt or fiscal difficulties, exchange rate pressures, and resources unbalances (Edwards, 1993; Rodrik, 1989). Trade liberalisation was expected to push in the direction of more homogenous income distribution, since lower prices were one of the expected outcomes from increasing competition. Nonetheless, as trade liberalisation was expected to force increasing efficiency, by relative prices, in the long run, employment structures were expected to become realistic and sustainable.

Generally speaking, macroeconomic influence of trade liberalisation depends on the broader influences of the institutions and government interventions. For

instance, when employment decreased as a consequence of efficiency measures undertaken by the firms in the resource reallocation process after trade liberalisation, governments were faced with dilemma of intervening in the labour markets to stop employment reduction or maintain a liberal approach (Berry, 1999; Bhagwati, 1998; Brecher, 1994). In some cases, the LDCs opted for reducing the pace of trade reforms, in others they decided to allow the resource reallocation process to proceed. In both cases, institutional support from the government was decisive for the reforms outcome (Chadha, 1999; Corden and Findlay, 1975). Thus, in the discussion of the Brazilian trade liberalisation, government interventions and other institutional influences will be referred to, although the main focus will be on the trade liberalisation effects on companies' productivity, exports performance and mark-up discipline.

The main general macroeconomic aggregates connected to the changes in trade policies, according to the literature, are economic growth, income distribution, and exchange rates policies (Caballero and Hammour, 1996; Calvo, 1991; Choksi et al., 1991; Coes, 1994). The links between growth and trade openness have been established on many occasions, although other macroeconomic issues related to trade and growth were still in need of in-depth research (Greenaway, 1998; Morrissey and Stewart, 1995). As will be discussed in the following theoretical framework, the literature on trade liberalisation and income distribution was supported by the analyses of macroeconomic data. There are studies suggesting that macroeconomic conditions to growth and development were paramount, and needed to be fulfilled before trade liberalisation could show significant benefit (Edwards, 1997; Rodrik, 1995a). Based on the support of the relative cost advantage theories, competition in the domestic markets was the main example of the advantages of trade liberalisation to income distribution, by the adoption of world prices instead of high domestic protected prices. The effectiveness of such competition pressures depended on the country's factor endowment and market structure (Buffie, 1984; Greenaway, 1993; Greenaway and Milner, 1993).

Particularly, in the case of Brazil, income distribution was known to be uneven, and biased against the poor, which added the influences of factor markets to the effects of trade liberalisation (Franco and Fritsch, 1994; Bonelli, 1992). Since trade liberalisation was expected to result in resource reallocation, it could have two opposite effects on income distribution: reduce the biases against the poor, by forcing firms to reduce the goods prices due to increasing competition and also increase that distribution bias due to labour reallocation. Hence, discussing the effects of trade liberalisation on

employment, and labour productivity, in the following chapters, will indirectly discuss the effects on income distribution, although it is not the main focus of this research.

Moreover, with the removal of protection, the opportunities created in the externally oriented markets would benefit the low paid and the informal workers, which would confirm the advantage of trade liberalisation for distribution purposes. Hence, trade liberalisation in Brazil, by enabling access to imported goods at prices lower than those under protection, was considered as a significant benefit to the society in general, which includes the poor (Khan, 1999; World Bank, 1990;1997). This becomes more evident when one considers that, before trade liberalisation, most of the imported products were subjected to high tariffs and import prohibitions (Mckinsey & Company, 2000; World Bank, 1989).

Since the reforms introduced in 1990 have not been reversed and progressed with an stable macroeconomic environment for the trade reforms to deliver the expected effects on productivity and efficiency, it seemed appropriate to carry out an assessment on the basis of firms' data. Beside the multilateral trade issues, another central point, when implementing trade liberalisation, referred to the regional or bilateral trade regimes, which involved the situation in the neighbouring countries. Hence, the political and trade reforms in Latin America will be briefly discussed, highlighting the importance of regional trade arrangements.

1.1.3 Trade Policy Reforms in Latin America

To discuss the situation in Brazil, it became interesting to look into Latin America, particularly into the Mercosul, which is a free trade area (FTA), formally established in 1991, by the Treaty of Assunción, and includes Argentina, Brazil, Paraguay and Uruguay (MERCOSUL, 1996). Three Latin American countries: Bolivia, Chile and Peru, became "observers", as candidates to enter the FTA, though the successive crises led them to a "wait and see" attitude (Ffrench-Davis, 2000). Considering the situation in the Southern cone, and Mexico's success, with the NAFTA (North American Free Trade Agreement), trade reforms spread over Latin America, although the results were not homogeneous (Weeks, 1999). Nevertheless, due to the importance of intra-regional trade and Mercosul the objective of this subsection is to describe the trade liberalisation initiatives in the region.

The first Latin American country to enter the new wave of trade liberalisation was Chile, in the 1970s and, by the mid-1980s, Costa Rica, Bolivia and Mexico also removed trade barriers (Amin Gutierrez de Pineres and Ferrantino, 1997;

Araya-Gomez, 1993). During the 1980-90s, Argentina, Brazil, Peru, Venezuela and Colombia introduced trade policies in line with the SAL programmes from the IMF (Agosin and Ffrench-Davis, 1993). Since most of the reforms, which were introduced as a consequence of the IMF and the World Bank programmes, were not reversed, many scholars seized the opportunity to study their consequences. This included testing for the expected effects of trade liberalisation (Grether, 1996; Tybout et al., 1991). Mainly, the reforms in Latin America focused on the reduction of state leadership in implementing industrial strategies, and financing private organisations, narrowing the gap between those economies and the industrialised countries.

However, some shortcomings were identified in the implementation of the trade reforms. For instance, it has not been selective and based on sectors' specific features, which ended up by homogenising the tariff levels and the reductions of the non-tariff barriers without considering the appropriate levels that would have positive effects on output growth and the increasing non-traditional exports (Agosin and Ffrench-Davis, 1993). An example of important measures that have been neglected by the Latin American political reformists was the state's selection role, since liberalisation was understood as laissez-faire policy. At least two areas should have been better organised by the governments in Latin America. First the state should have acted as a conscious ruler for capital markets, instead of introducing the laissez-faire. Second, it should conduct the process of modernisation of the social structures by taking charge of training and education, which were also left to the domestic and foreign private firms (Ffrench-Davis, 2000).

There were complaints against the excessive protection that developed countries, such as the EU, Japan, and the US accorded to their agriculture, which undermined the efforts by Latin American countries to increase exports, in spite of the internationalisation of their economies. With privatisation of public sector companies on the one hand, and trade liberalisation on the other hand, competition increased strongly in domestic markets. This situation did not have a complete compensation from the international markets, which drove some companies out of business or into foreign ownership (Agosin and Ffrench-Davis, 1993; Baumann et al., 1998; Corbo and Tybout, 1991; Tybout, 1992; Tybout, et al., 1991).

Some authors attributed the differences in the effects of trade liberalisation in Latin America manufacturing to the variation on countries' size. For instance, trade liberalisation seemed to have caused an increase in labour productivity, in Bolivia, Chile and Mexico, although with weak causation links (Dijkstra, 2000). In

Nicaragua and Chile, competition from imports reduced the scope of industries, which was attributed to a change in structures due to increasing efficiency (Dijkstra, 1996). However, export efforts in Latin American countries have not shown strong results, with the exception of some high-tech sectors (computers in Mexico, and automobile in Brazil) that also benefited from increasing domestic demand (Dominguez and Brown Grossman, 1997; Weiss, 1998). This lack of strong positive results in the external sector has been attributed to market imperfections or foreign oligopolies which hindered the firms' initiatives to enlarge their world markets shares.

The changes in trade policies were accompanied with comprehensive changes in macroeconomic policies, according to the IMF and World Bank recommendations (Damill and Keifman, 1993; Dijkstra, 1996). For instance, Argentina and Brazil have followed similar paths on inflation levels, external and fiscal deficits in the 1970s and 1980s, although the crises in Argentina preceded the Brazilian crises in time. To face these crises both governments applied similar policies, beginning with stabilisation plans based on freezing prices and wages in 1985-86, 1988-89, in 1990, and in 1994, with the last two dates applying only to Brazil. These plans were aimed to control inflation, which was as high as two, three and four figures in the 1980s, late 1980s, and beginning of the 1990s respectively (CEPAL, 1996;1997). The GDP variation was negative, as a consequence of such instability, in 1987-88 and 1991-92, although in Brazil it never had strong increase during the 1990s as it had in Mexico and Chile.

Summing up, Latin American political economy during the whole 1970-80s was marked by high inflation, which contrasted with the Asian Newly Industrialised Countries (NICS). Government intervention was limited to unsuccessful stabilisation plans, until the beginning of the 1990s, when stabilisation plans combined with trade and other political reforms experienced long term successes (Agosin, 1996). Brazil experienced different stabilisation plans in the period of 1986-99 and, after overcoming the 1991-92 crisis, progressed with the structural reforms that were reflected in the stabilisation results from 1993 onwards. To emphasise the importance of the Brazilian stabilisation plans to the implementation of trade liberalisation, a description of such plans will be carried out next.

1.1.4 The Stabilisation Plans in Brazil

This subsection has the objective of introducing a brief description of the stabilisation plans that were undertaken by the Brazilian government during the

period of analysis to guide the discussion of trade liberalisation. During 1986-99 there has been six major stabilisation plans, four until 1990 and two afterwards. The most important were the Cruzado Plan in 1986 and the Real plan in 1994, together with the Collor Plan in 1990, which introduced trade liberalisation.

Four stabilisation plans have been introduced between 1985 and 1990. However, fell short of success. The first was the Cruzado Plan established in February 1986, which consisted basically in a fixed parity Cruzado-US Dollar[1]. As an heterodox plan it froze prices by the last levels, and wages, rents and pensions by the last six months average, which led to the use of a "tablita". This was a conversion table that contained the corresponding indexes for translating the old contract or wage values into the new ones according to the contract initial date. This arrangement failed by the end of 1986 due to the imbalances between increasing demand and frozen prices and wages. Food and consumer goods, including cars, had exacerbated demand due to extra purchasing power provided by price freezing. So political and economic reasons lined up to explain Cruzado's failure (Cardoso et al., 1993).

As a political explanation the heterodox measures were artificially extended in time and twisted in order to earn support for the President's party in the November 1986 elections. As a result, his party elected the majority of congressmen and almost all state governors. However, the economic price was high since the extension of the frozen prices was accompanied with a "trigger"[2] for wages and rents. By the end of 1989 this mechanism showed its bias, since the wages index was 193 as compared to 140 in 1985 (Baer, 2001:190). Increasing public deficits were one of the most visible effects, since they were 3.7% of the GDP in 1986 and ended 1987 at 5.4%, leading to the declaration of a foreign debt moratorium in February 1987 (Baer, 2001:190). Inflation was the most important success of the Cruzado Plan and had negative monthly rates, such as –0.1% in May 1986; but ended December 1986 at 7.6% and reached 28% in May 1987 (Urani and Winograd, 1994).

The economic reasons for the failure of this plan, however, were also linked to the maintenance of the import controls as before 1986, with prohibitions and high tariffs. This prevented the adequate supply to match the increasing demand for consumer goods and allowed for pressures on the markets. For instance, average tariffs which were at 50% in 1986-87 only reduced to 41% in 1988 and to 35% in 1989 (IPEA, 2001). Protection to domestic producers was linked to political pressures, since it was

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[1] Cruzado was the newly introduced currency, which valued 0.001 Cruzeiros, which was the previous currency.

intended to satisfy pressure groups that were used to supply the domestic markets at the premium prices.

Three other plans were implemented between 1987 and 1990: Bresser, "rice and beans" and the Summer plan. The Bresser Plan was implemented by the Finance Minister Bresser Pereira, who substituted the previous one after the collapse of the Cruzado. So it was introduced in June 1987 and consisted basically in a flexibilisation of the Cruzado Plan, allowing quarterly revisions on the levels of frozen prices and wages, including public sector prices.

This change introduced periodic adjustments on the basis of estimated future inflation and resulted in inflation falling to 4.5% in August, although it rose again as in the previous case. Moreover, government deficits and state firms losses, which were due to the strong price controls, ended up by undermining the plan. Political reasons and the lack of import freedom once again were at the basis of such failure, since these import restrictions were claimed by the protected industries; but had an increasing effect on domestic production costs. For instance government deficits (including state companies) rose by 41% in 1987, implying federal subsidies to local governments and state companies (Baer, 2001:197).

Another plan in January 1988 was the "rice and beans" plan, which by its lack of structural measures had little impact, since inflation ended the first quarter already at 18% and the fourth, at 28%. So in 1989, came the Summer Plan (Plano Verão) which again changed the currency denomination to Cruzado Novo[3]. It contained also heterodox measures, such as wage and price freezing, and orthodox ones, such as suppression of all indexation, including rents and other contracts, except for savings accounts. It increased reserves requirements, reduced credit lengths from 36 to 12 months and devaluated the exchange rate by 17.73%. However, although the monthly inflation reduced from 36.6% in January to 4.2% in March, it increased again ending December 1989 at 49.4% and almost reached hyperinflation in March 1990, at 81%. This escalade was then due to a political crisis, since the newly elected government was to take office in 1st March 1990.

President Collor took office with a new stabilisation plan that effectively introduced trade liberalisation, accompanied by a strong economic shock. Stabilisation, however, was not very successful, since inflation ended the year on the rise. A strong short term impact was caused by the decision of freezing 80% of all bank

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[2] Every time the accumulated inflation reached 20% wages and rents would increase accordingly.
[3] 1 Cruzado = 0.001 Cruzado Novos

deposits that exceeded Cr$50,000.00[4] for 18 months and a once-and-for-all tax of 30% levied on stock and financial assets, including gold. Furthermore, wages and public services prices[5] increased substantially, near 400,000 public sector employees were made redundant and bank and savings accounts gained strong financial regulations.

Although the plan covered a range of measures, it was considered as heterodox due to the strong intervention element. However, the measures were so strict that the government was unable to resist the pressure to alleviate them. This seemed to be in accordance with some literature about the trade reforms that indicate that the pressures towards protectionism are among the most intense in LDCs (Costa, 1984). Within 45 days the money supply, which was supposed to be under control, increased by 62.5%, which indicated a brake-up of the monetary control based on the freezing of the bank deposits (Nakano, 1990:146).

Beyond the deep recession in 1990, the Collor Plan brought overvaluation, which made exports fall (-8%), and imports increase (+11%). An adaptation of the Collor Plan was introduced in February 1991, based on a financial reform, which eliminated the very speculative 1-day funds[6] by setting up an obligatory composition for bank funds that had a maximum of 43% of government bonds, and other 13% of social development bonds (Nakano, 1990). As a result inflation that was at 21% a month in February became 6% in March, although it rose again later due to a political turmoil that resulted in the president's impeachment in 1992. President Franco took office, had four successive Economy and Finance ministers, introduced a new currency (the Cruzeiro Novo) by divining the Cruzeiro by 1000; but stabilisation has not happened until in 1993, when he appointed Fernando H. Cardoso as the Economy and Finance minister, who come up with the Real Plan.

The Real Plan consisted in a combination of financial tightness, fiscal adjustment and currency change. It refrained from prices and wages freezing, which made it an orthodox plan, although with some heterodox content such as the currency change. The initiatives for financial strictness came with a bank reform, which encouraged the privatisation of state banks and strengthened credit controls, reserves and bank regulations. There was a bank rescuing programme to preserve bank clients' deposits from collapse together with the process of cleaning the system from bad credits that was introduced.

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[4] Corresponded to US $ 1,300.00 by the exchange rate at the time.
[5] (gas 57,7%; energy and telephone 32%; postal services 83.5%; and wages 72.28%)
[6] It was a use for overnight placements in government bonds, which became outlaw.

The fiscal adjustment programme came in two fronts: budget restrictions and tax collection improvement. The government managed to introduce via Congress approval the Fundo Social de Emergência, later reworded as Fundo de Estabilização Fiscal or Fund for Fiscal Stability. This fund corresponded to 15% freeze of the constitutional budget transfers to states and municipalities, making up treasury reserves. As it was introduced as a temporary measure, it was renewed each year until being made permanent with the name of Desvinculação de Receitas da União (DRU) with the percentage increased to 20% (Barbosa, 2002; Bonelli, 1993). Other taxes were created, such as the "Imposto provisório sobre movimentação financeira (IPMF) in 15-08-1994, which affected every bank transaction with 0.2% tax. In 15-08-1996 it was renamed Contribuicao Provisoria sobre movimentacao financeira (CPMF). In spite of being provisory this tax was extended for more 24 months in 12-12-1997, and in 1999, when it was also increased to 0.38%. In 2002 renewed for more 24 months (Barbosa, 2002). The Contribuição Social (CONFINS) at 1.65% of the firms' turnover was also introduced with the plan so finance pensions.

The currency change was introduced with previous negotiation of contract's terms by the economic agents, who had the faculty of voluntarily accepting the changes during a certain period of time. This began in 1st February 1994 by the introduction of an indexator named Unidade Real de Valor (URV), which fluctuated with the US dollar (1URV=1US$), varying daily under the central bank control. It became an official index for contracts, rents and prices in order to accustom the public with stable transactions. In 1st July 1994 the URV was extinct to give place to a new currency, the Real that was valued 1 US$. To make the conversion the values expressed in the old currency, the cruzeiro novo (NCr) were divided by 2750 to become expressed in Reals. The currency appreciated first, and in November 1994 1US$ valued 0.85R$. The Real was under control until January 1999, when a devaluation of more than 30% took place as full fluctuation was introduced.

The initial impact of the Real Plan was positive, with the monthly inflation of 50,7% in June 1994 dropping to 0.96% in September. The Real survived the Mexican crisis of 1994-95, the Russian and Asian crisis in 1997-98, but had problems at the end of 1998, which coincided with the Brazilian elections and contributed to the devaluation in 1999. GDP growth was 4.3% in the first quarter of 1994, and 7.1% in the same period in 1995, which seemed encouraging. However, in the whole period of 1994 to 1999 growth was not extraordinary, staying between 5.9% in 1995 and 2.8% in 1996. In 1998, growth was only 0.1% and 0.5% in 1999, which was consistent with the

capitulation during the Russian and Asian crisis (Amann and Baer, 2000: 1814). FDI also had a similar development with high inflows at the beginning of the Real Plan and a restraint from 1999.

Summing up, during the period of analysis Brazil had been subjected to at least five heterodox stabilisation plans for the economy, had six different currencies. The economy only stabilised after the introduction of the Real Plan that relied on imports to control for price pressures when demand expanded. Most of the heterodox plans contained freezing of wages, prices and contracts, instituted a sort of "tablita" to control for exchange rate, interest rates and other contract indexators, which have not work well. The Real had less heterodox elements, it did not intervene on contracts and adopted a pre-stabilisation period to mitigate the indexation effects. The absence of price and wages freezing due to the option for controlling them by market pressures favoured by trade liberalisation played a central role. Markets were expected to efficiently control rents, assets and bank deposits due free negotiations that were encouraged as part of the implementation of the Real. The result was that property prices fell in the rental and buying markets. The strong fiscal policy was based on the renegotiation of the local government and states debts. Privatisation of many state banks, firms and other state companies complemented the fiscal efforts.

Although the political reforms took longer that expected, assessing the effects of trade liberalisation in Brazil still is interesting. Based on the political framework described above, efforts were made to grant macroeconomic stabilisation after 1990. Trade liberalisation has the status of being the most important differential between the 1990 reforms and the previous stabilisation plans that were undertaken without trade liberalisation. Thus, from 1986 to 1999, the assessment of the effects of trade liberalisation in 1990 can earn meaningful results due to this differential with the other plans. Due to the complexity of the debate and the wideness of the issues involved, the analysis of the effects of trade liberalisation in this context needs to follow a theory to fit the results. Hence, the theoretical framework for the analysis will be summarised in the next subsection.

Section 1.2   Theoretical Framework

The objective of this section is to introduce the theoretical background that will provide the basis for the analysis to be carried out in the chapters ahead. To begin with, trade and macroeconomic policies should be assessed in a way that avoids

confusing their effects, since macroeconomic policies are far more generalised than trade policies. The aim of the latter is to affect microeconomic levels by tariff and non-tariff barriers reductions. The following statement about the lines of an assessment of trade liberalisation effects in LDCs summarises the challenge of this kind of study by stressing the importance of separating trade liberalisation effects from the macroeconomic issues:

> "Assessment of the nature and efficacy of a country's economic policies should, in our view, wherever possible, avoid confusing the issues of trade policy with those of macroeconomic (including exchange rate) policy. Trade issues relate, strictly speaking, to the overall structure of incentives to produce and consume, and hence import or export, tradable goods and services. It typically serves long-run objectives of growth and development. It is therefore usually closely linked to policies on both local and foreign investment, technology and particular sectoral objectives (industrial policy, agricultural policy, regional policies, etc).
> Macroeconomic policy, on the other hand, relates to the continuing (i.e. short-term as well as long-term) achievement of overall internal and external balance."

(Helleiner, 1994b: 5-6)

Bearing this in mind, for testing the effects of trade liberalisation in Brazil, the intention of this research is to take advantage of the long period of economic stability after 1990, to analyse the effects of trade liberalisation in a situation that allowed for the confusion between macroeconomic issues and trade issues to be minimised.

Trade theory indicated that trade liberalisation resulted in resource reallocation. The argument emphasised that the shifts in production actually increased output, although the way of achieving growth is to maximise one's comparative advantage, meaning that each country will produce goods that can be exchanged for other country's products (Helleiner, 1994b). Both countries would shift resources to improve their use. Thus, companies would set prices according to relative prices, which made resource reallocation a major consequence of trade liberalisation by changing production patterns, output and productivity.

Trade theory was first based on perfect competition, which implied some restriction when interpreting the cases of imperfect competition. In LDCs, increasing returns came often as a consequence of a situation of oligopoly, which was derived from LDCs domestic markets that only supported small firms or groups. This make them unable to compete with the large TNCs without increasing returns, which generally was provided by protection (Alvarado-Chapa, 1997; Collie, 1996; Venables, 1996). Hence, oligopolies maintained market dominance, when the structure of profits allowed for increasing returns to scale, or where the firms' growth implied even more profit growth due to the production scale.

Following this argument, trade liberalisation was believed to increase competition, by bringing foreign products into the domestic markets, allowing for testing the hypothesis of increasing competition and its effects on the oligopolies' behaviour. For instance, there were many arguments in the literature that supported such theory, assuming that imported goods were perfect substitutes to the domestic ones, which through trade liberalisation would effectively bring benefits to domestic consumers (Helpman and Krugman, 1999). Hence, even in situations of imperfect substitutes and imperfect markets trade liberalisation was expected to reduce monopoly powers by increasing competition.

A brief presentation of the resources that will be used for analysing the hypotheses for Brazilian manufacturing, under the trade theory, will be described in order to set the framework for the analysis. The data came from the firms in manufacturing in order to highlight the microeconomic level of the study and to bring information from the manufacturing basis. The central published data for the analysis was obtained from the government agency for statistics and geography (IBGE), and other government agencies, such as the Instituto de Pesquisa Econômica Aplicada, or Applied Economic Research Institute (IPEA), the Ministry for Labour and Employment (MTE) and the Foreign Trade Studies Foundation (FUNCEX). Part of the data have been accessed through the world wide web, since the IBGE, the IPEA, and MTE provided internet based data, with particular interest for the IPEADATA, a public data provider from the IPEA. The access to the MTE database has been supplied free of charge for the purpose of this study. The surveys originated from the IBGE were also acquired from publications and from a visit to its headquarters beside being downloaded from the World Wide Web. During the fieldwork, the IBGE libraries and the MTE offices were visited to check for data consistency and appropriated scale of the data provided.

In view of the lack of disaggregated quarterly data, which would allow for time series analysis, the quantitative analysis will be based on annual data, which allowed for cross-section econometric tests. The results were combined into a purpose built database, with annual data on wages, operational costs, sales values, assets, employment, capacity utilisation, number of firms by sector and foreign direct investment stocks and flows. A qualitative survey, involving originally one hundred firms, in six selected industries, was carried out, with structured questionnaires, visits and interviews with their boards, plant directors and assessing "in company" literature.

The qualitative survey, in the field, was designed to cover industries, in a supply chain, to highlight the linkage effects, which by trade liberalisation were supposed to be the transmission channels of competition pressures between industries. This system enabled surveying the supply of inputs, resource reallocation, technology transfers, learning skills and product quality changes. Cases were reported by firms to illustrate the effects of trade liberalisation. For a more comprehensive idea of these effects, visits to plants were organised with the objective of enlightening the point of increasing productivity and product quality. Trade associations and other information providers such as the organisation for the development of small and medium firms (SEBRAE) were also visited.

The remainder of the thesis is organised as follows. Chapter two will review the literature on the empirical evidence of trade liberalisation effects on productivity, exports, mark-ups and market structure. The third chapter will discuss the Brazilian industrialisation and manufacturing environment, and the changes in political economy and the trade policies, during the period 1986-99. Chapter four will discuss the changes in Brazilian manufacturing structures and the links that they could have with trade liberalisation processes, by describing the main features of the Brazilian manufacturing. This will pave the way for the analysis by detailing the changes of the variables that will be incorporated in the models. Chapter five will present the methodology to analyse the secondary data, and will detail the qualitative survey methodology for the fieldwork. Chapter six will analyse the data using a Structure-Conduct-Performance (S-C-P) model to test for the effects of trade liberalisation on productivity, exports and margins. Chapter seven will analyse the results of the qualitative survey, carried out in Brazil. Finally, chapter eight will summarise the findings and conclude the thesis.

CHAPTER 2. EMPIRICAL LITERATURE ON TRADE LIBERALISATION AND ECONOMIC PERFORMANCE

Section 2.1   Introduction

The classical trade models, predicting benefits for the countries involved, were based on perfect competition. However, the real world is subject to limitations such as barriers to entry, increasing returns to scale and other elements that make markets imperfect. Especially in developing countries, markets are known as imperfect due to small size, which indicated the need for a degree of protection to allow firms to have increasing returns to scale (Gunasekera and Tyers, 1991). The objective of this chapter is to capture from the literature the issues on trade liberalisation empirical studies, together with the theoretical justifications and methods. This discussion will support the methodology presented in chapter five and the quantitative analysis in chapter six.

A basic feature of imperfect competition is that companies become aware that they may be able to influence other firms' behaviour, as opposed to being price-takers in markets with many buyers and many sellers, as in perfect competition. Thus, the firms can reach maximum profits with prices higher than marginal costs, the gap between prices and marginal costs being dependent on the quantity of output and the slope of the demand curve (Krugman and Obstfeld, 1996). As a consequence, a reason for liberalising trade with imperfect markets was that it increased the quantity of sellers, and the market size, reducing individual firm's market power. The expected benefits from trade liberalisation, under imperfect competition, relied on the theory of market contestability, since increasing consumer choice will always result in some direct or indirect social benefit even with market failures (Baumol et al., 1982). Furthermore, there is very little evidence, as the discussion in this chapter will explain, to suggest that government interventions, by imposing tariffs or other NTBs, have been able to reduce the so-called market failures that made LDCs' markets imperfect.

Many empirical studies of the effects of trade liberalisation highlighted the effects on productivity, and efficiency, controlling for scale, and firms' entry and exit. A study based on data from producers in some LDCs collected evidence of the effects of trade liberalisation on productivity, and performance, by emphasising the increase in X-efficiency after trade liberalisation (Roberts and Tybout, 1996). Previously, another country-based study, sponsored by WIDER (World Institute for

Development Economic Research), approached trade and development with emphasis on concentration, industrial organisation and other manufacturing structures (Helleiner, 1992a). Later the same organisation sponsored a second study, published in 1994, focusing on international crises with country-cases (Helleiner, 1994a). There is also a famous study, in seven volumes, analysing the impact of trade liberalisation on growth, in 19 countries, following the before-after method covering a period of almost 20 years (Papageorgiou, 1991).

Apart from these comprehensive sources of literature other authors will be mentioned in the following sections, when appropriate for the discussion. The remainder of the chapter is organised as follows: the second section discusses the basic literature on international trade theory, since the arguments developed later will be derived from this theory. The third section discusses the S-C-P model for analysing firms' structures and behaviour, and the fourth section describes the variables used in S-C-P models. The fifth section concludes the chapter.

Section 2.2   The Trade Models and Empirical Literature

Before discussing the empirical literature on trade liberalisation, the trade theory will be summarised. Although trade has been central to economics for many years, with the renewed interest for trade policies by international institutions, trade theory gained a new focus. The introduction of trade policies in LDCs has always been accompanied by theoretical explanations, which supported the implications of such reforms. But had criticisms from its opponents, arguing mostly against the form of implementation (Krueger, 1978). Nevertheless, there is still a "narrow but deep argument" for trade liberalisation, in the LDCs, based on the argument that small markets would have much to gain from increasing the number of players with international trade (Krugman, 1993). International exchange of technology and enhancing "learning" constituted other important gains from trade liberalisation with great interest for development in LDCs (Krugman and Obstfeld, 1996). Hence, the objective of this section, besides discussing the literature, is to discuss the effects of trade liberalisation on productivity and economic performance, in LDCs. The basic argument is that productivity and efficiency increase after trade liberalisation, as a result of resource reallocation and technical change (Edwards, 1993; Krugman and Obstfeld, 1996). In the next subsection, the trade models based on perfect competition will be summarised.

2.2.1 Perfect Competition Trade Models

Although markets are not all in perfect competition, the basic theory, as presented in Figure 2.1 below, has the advantage of simplicity for understanding the mechanisms involved in trade. This discussion aims to focus the debate on the effects of trade liberalisation, stressing the consequences for society, in general, and for the companies in particular. For instance, in this environment trade was enlarging supply to domestic markets, and increasing markets for domestic production, which increased welfare by reducing prices to consumer and by enhancing goods' availability.

Three models have been proposed to explain trade mechanisms within this framework: Ricardo (1853), Heckscher-Ohlin (1933) and Samuelson-Jones (Krugman and Obstfeld, 1996; Samuelson, 1971). Ricardo explained comparative advantage based on the international differences in labour productivity, since the quantity of labour used to produce one unit of a good differs from country to country (Ricardo, 1951 (reprint)). The advantages are relative to the country costs and prices for the products that each country can produce and exchange with the others.
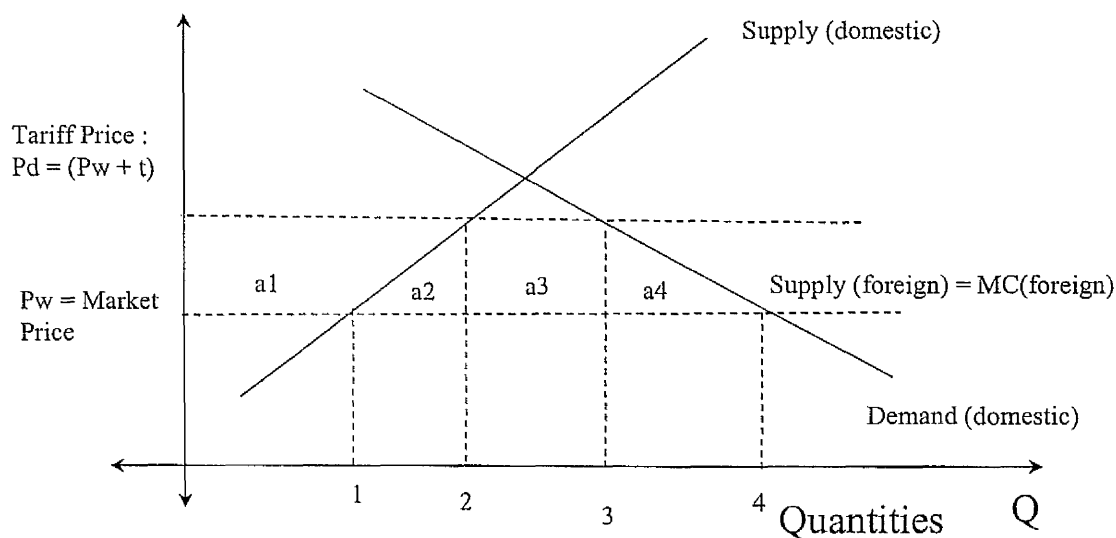
Figure 2.1. Classical Trade Model

Source: Based on Greenaway and Milner (1993: 12)

In Figure 2.1 Pd indicates the price in the domestic market, with domestic supply at "1" and imports quantities at (4-1). When the price goes from Pw(foreign supply and domestic demand) to Pd3 (domestic supply, foreign supply+tariff, and domestic demand), two supply components change: domestic supply goes up to "2", and imports became "3-2". The standard welfare effects of the tariff "t"

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are the areas: a1; a2; a3; and a4, where "a1"indicates the producer surplus, and "a3", the government revenues increase, with "a2" and "a4" indicating the residual triangles, or the dead-weight losses. "a4" indicates the consumer losses (some consumer were lost by increasing prices from "Pw" to "Pd"), and "a2" is the producers losses (interpreted as the excess costs of producing domestically some goods that could be imported at cheaper prices than "Pd").

If there were no distortions, and markets were perfect, there would not be losses, since supply would be flat, which would flatten "a2" and "a4". But, when tariffs were set up to compensate for distortions, there was a chance of introducing even more distortions, which would increase "a2" and "a4" values. The analysis of a tariff will be by quantifying these differences, and check whether the government gains (a3) would be greater than the sum of "a1+a2+a4", under the assumption that the government revenue and distributed revenue, in the form of low prices, had the same social effects.

In the Heckscher-Ohlin model, the idea was that trade caused resources reallocation, which resulted in a more efficient way of production, by increasing competition for factors, provided that quality and growth sustainability followed efficiency goals in the long-term (Krugman and Obstfeld, 1996). The model provided an extra instrument to analyse resource allocation and the patterns of trade. For simplicity, resources were usually reduced to capital and labour, the production factors, with technology determining their possible combinations, so that using less capital implied using more labour, and vice-versa, to achieve the same amount of production.

The possible combinations generated the production function line, which will determine the output level, based on the assumption of economic rationality, or that the actors will maximise production and minimise factors' use. In such circumstances, there will be a fixed production frontier, limited by the factors availability. Hence, the Heckscher-Ohlin model was based on the attraction that a large proportion of one factor could have on the type of products that the firms would decide to produce, implying that resources availabilities, i.e., the abundant factors, will lead production. Thus, increasing factor's supply favoured the production of goods using that factor. An effect on the outward orientated policies when applied with the concept of the abundant factor was the vent-by-surplus trade, where a LDC would engage trade of goods that could benefit from excess factor supply. This would build a trade trap since when the country ran out of such factor trade and growth stop sharply (Myint, 1977).

The third model combined the consequences for technological progress of Ricardo's model with the factor proportion model by Heckscher-Ohlin, resulting in a model based on factor endowment - the specific factor model. In 1971, Samuelson and Jones considered that factors were not reallocated easily between industries, since some industries were more demanding for labour, others for capital, resulting in imperfect substitution among different factors (Krugman and Obstfeld, 1996). The interpretation was that when trade was driven by specific factors growth tended to be directed towards the industry that used more that specific factor, which meant that trade was driven by country factor endowment together with industry specific factor. This ended up by confirming that growth was directed towards the country's abundant factor, since the industries using that factor will be those that could have comparative advantages.

Since the companies are assumed to set prices according to relative prices, resource reallocation became a major consequence of trade. In this framework, as in the previous ones, the shifts in production are directed towards the abundant factor and the industries using it (Jones, 1971). Thus this situation is meant to generate changes not only in resources allocation, but also in production structures. The concept of relative prices, which appeared in the discussion above, taken as the price of a good in a country relatively to its world price, implied the concept of terms of trade, which are the prices of one country's goods (generally its exports) expressed in terms of the imported goods (generally its imports), indicating the comparative advantage (Krugman and Obstfeld, 1996; Lutz, 1994).

This conceptualisation combined with the specific factor model engineered the argument that LDCs mostly primary goods exporters would have terms of trade decline due to the reduction in primary goods relative prices. Moreover these are also usually labour and land intensive products, which benefited from the abundant factors in LDCs; but would face excess supply in the world markets, implying further price falls (Prebisch, 1950; Singer, 1950). Although the original argument was based on empirical studies on terms of trade differences between developed and less developed countries, recent studies did not support such hypothesis, since LDCs' exports diversified and natural resources became relatively rare (Krugman and Obstfeld, 1996).

Turning to the discussion of the effects of tariffs, quotas and non-tariff barriers (NTBs), according to the models described above, a literature survey will be described in the following paragraphs. A method for calculating the levels of protection in LDCs, by applying the input-output (I/O) matrix weights to find out the level of intermediate consumption as compared to world prices was an effective application of

trade models (Corden, 1974). From these studies, Balassa developed comparisons between the effects of tariffs and quotas, by using the popular method for measuring the effective rates of protection (ERP) for several LDCs (Balassa, 1971a). In terms of theoretical models specially dedicated to trade and market structure, Krugman and Helpman analysed trade policies and the influences of market structures on the changes on these policies (Helpman and Krugman, 1999).

The effects of a tariff, which increases imported good's prices and encourages local producers to sell more than they would sell without the tariffs, will be a new equilibrium price that will be set up. This will be higher than the international prices, which causes reduction in domestic output and increase in profits. Hence, with a tariff, the government and domestic suppliers will gain; but domestic consumers will loose due to high prices, and foreign suppliers also will loose due to low sales. The analysis of the welfare effects of a tariff, however, was subject to the following assumptions: i) the tariff's social marginal cost was the same across industry, which meant that consumption increases lead to production increases without other sectors' losses; ii) social marginal revenues were also equally distributed, implying that increasing government revenues (tariffs) were equivalent consumers benefits (practising world prices),which is the assumption of "equal income distribution and homogeneous efficiency of the economy" (Helpman and Krugman, 1999:13). In such a situation, the net welfare gains from trade liberalisation, considering consumer and producer surplus, arise from the difference between the two benefits: social gains for the government and consumer/producer surplus from the price differences, and reduction of consumers prices, which were illustrated in Figure 2.1.

However, quotas or quantitative restrictions on imports instead of generating revenues for the government as tariffs do, reduce government income, and give rise to rents taken by the licensed importers by limiting imports. Comparing a quota barrier with its equivalent tariff level, the welfare effects depends on the system of allocation of distribution of import licences (Bhagwati, 1965). There were at least three possibilities of allocating licenses: i) auctions by the government, with companies bidding for import licences (which provides revenues to the government); ii) licences issued to home residents without bidding system, which lend to them the possibility of extracting rents from selling imported goods; and iii) licences issued to foreigners, which enables them to extract rents from domestic consumers or increase supply quantities, which means converting rents into market shares. The US government, for instance, used the last procedure, by issuing "sugar quotas" for exporters to the US,

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naming it "voluntary export restrictions" by the exporter country (Krugman and Obstfeld, 1996). Thus, the government scheme for licensing became crucial to define the effects of a quota.

Nevertheless, low level of protection could bring actually benefits to LDCs, although policy-makers will have many difficulties to define the right level of protection, and the appropriate instrument, which could be a tariff, a quota, a subsidy or a tax on exports. Usually tariffs were preferred by governments, and, second, quotas and export subsidies, against the rare use of export taxes. In general, the conclusions of cross-country studies have been that low level tariffs were preferable to quotas. Tariffs established at low levels and applied by large countries in order to alleviate domestic distortions could enhance welfare. But for small countries due to scale inefficiency liberalising trade was found to be the best policy (Bhagwati, 1965; Krugman, 1993;1994).

Summarising the discussion on the perfect competition models of trade, the production frontier seemed to be a baseline for indicating the possibility for trade to raise benefits by encouraging factor's shifts. Furthermore, industries factor specificity and country factor endowment were keys to determine the comparative advantages. Imperfect competition, however, may challenge these conclusions, which will be discussed in the next subsection.

2.2.2 Trade Models under Imperfect Competition

To continue with the discussion on the effects of tariffs and quotas, there is a need to define imperfect competition models, since in LDCs, due to the low scale production and to the lack of certain resources, the markets are likely to be imperfect. The basic characteristics of imperfect competition are barriers to entry, increasing returns to scale, and small market size (Krugman, and Obstfeld, 1996; Weiss, 1988). Other sources of market imperfections are the so-called market failures, which are paired with government failures in the process of intervention, which can also raise market imperfections. When the measures for correct the former were pushed too far, or not far enough, following the domestic distortions theory the government ended up by introducing new market imperfections (Collie, 1996; Eaton, 1986).

This led the discussion to the models for monopolies, which will be a proxy for the understanding of oligopoly behaviour for which the theories do not suggest a model (Helpman, and Krugman, 1999). The gap between price and marginal

revenue, in this model, depends on the quantity of output that the firm can produce, and the slope of the demand curve, as in Figure 2.2.

The quantity of output depends on the profile of the marginal revenue curve, because when a firm is making maximum profit, the quantity sold (Qm) was given by the intersection of the marginal costs (MC) and marginal revenue (MR), which made MR=MC. In such situation, but in the absence of competition, the output (Qm) is sold at the price (Pmon), taken from the demand curve, which is higher than the equilibrium price, leaving room for monopoly profits, over the average costs (AC), which is (Pmon-AC).

Figure 2.2. Monopoly Model
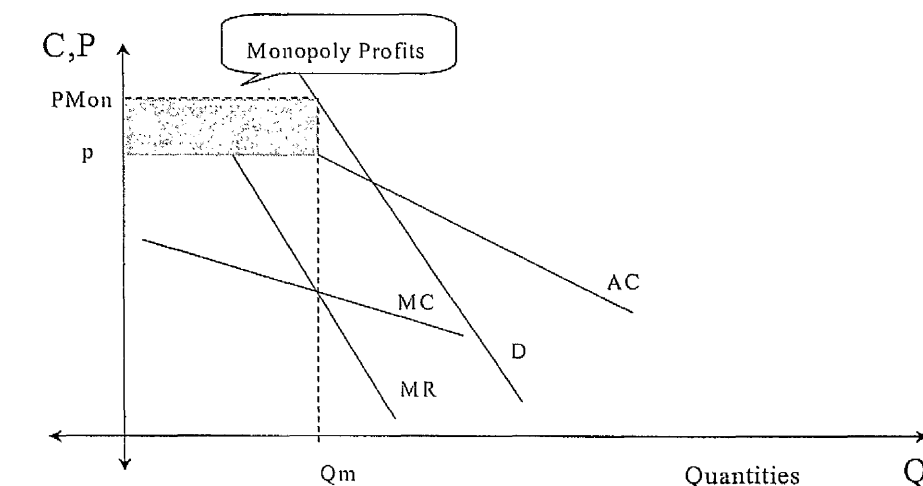
Source: Krugman & Obstfeld, (1996:125)

With monopoly the extra-profits constituted evidence of less than optimal efficiency. Although the indications on the curves could suggest that small changes would compete away monopoly profits, in fact, depending on the scale, monopoly profits were not negligible. As a result of imperfect competition in LDCs, few firms impose high prices to consumers, and production conditions to competitors. TNCs and some local groups dominate the markets, which became concentrated (Chadha, 1998). Small and imperfect markets were also prone to increasing returns to scale (IRS), which made prices higher than marginal costs, although by definition imperfect competition can cope with diminishing returns hypothesis. With imperfect competition, however, international trade became a vital instrument for reducing the domestic groups market power, by increasing the number of players in the domestic markets, as mentioned earlier (Krueger, 1984; Rodrik, 1992c).

To discuss firms' behaviour, the assumption was that oligopolies behave as monopolies, when firms collude, and as competition otherwise. Hence, the

effects of tariffs and quotas, in collusion oligopolies will be prices higher than non-collusive prices. So, when faced with a tariff or a quota, only the marginal revenue and demand will be influenced by each firm's perception of the other's behaviour. Since tariffs increased monopoly power and quotas increased it even more, as explained above, the effects of a tariff and a quota, in collusions, will be determined by the level of imports allowed, being their effects the same as illustrated in Figure 2.2, i.e., generation of monopoly profits.

However, the comparison of tariffs and quotas in imperfect competition by Bhagwati and Balassa demonstrated the behaviour of non-collusive oligopolies (Balassa, 1971a; Bhagwati, 1965). In this case, demand corresponding to a quota will be steeper than under a tariff, as explained earlier, marginal revenue under a quota will be lower than marginal revenue under tariffs was. Hence, output protected by quotas is lower than it is under tariff. Thus, comparing tariffs and quotas, for non-collusive oligopolies, as for perfect competition, indicated a range of tariffs that effectively did not allow for imports. But it kept domestic firms' pricing behaviour below the monopoly level, resulting in lower prices than monopoly prices.

Although a quota allowed for some imports, imports levels under a quota allowed for lower output and higher domestic prices than the equivalent tariff (Balassa, 1971b; Bhagwati, 1965). This happened because of the demand and the marginal revenue curves shapes under a quota, which became steeper than under a tariff (Helpman and Krugman, 1999). For example, a quota kept imports under a fixed limit, which depressed consumer welfare more than a tariff, by constraining product supply. Thus, quotas provided more monopoly power to domestic firms than tariffs provided, even in quota-tariff import equivalent.

The particular case of non-collusive oligopolies based on TNCs affiliates that were able to operate in both sides of the border, increasing intra-industry trade, could be interpreted as a reduction of domestic groups monopoly powers, if the industry was not submitted to a world collusive oligopoly. For example, carmakers, and chemical firms became global players, bringing increasing intra-industry trade to LDCs, with other benefits, like FDI, and employment (Balassa, 1989; Caves, 1991).

There is, however, a benefit from tariffs, by protecting infant industries, when their product would be profitable in the long-run, although it was not for the initial small quantities. In this situation when trade was liberalised, the average costs could be so high that local production would never take place, hence the whole supply would be imported, or the local small newcomers will not be economically viable. In

such situation, small local beginners will need a tariff to allow them starting production. However, when prices are higher than the sum of world prices and tariffs, with decreasing marginal costs, soon average costs will be higher than marginal costs, which leads the domestic output to grow enough to compete away all sort of imports (Corden 1974, Chap.8). The risk of such strategic import policies, undertaken with tariffs or quotas, was that, by keeping tariffs higher than the strategic level, domestic firms may be allowed to reduce output, and rise prices as monopolistic firms (Helpman and Krugman, 1999).

Summing up the effects of tariffs and quotas under the market structure of oligopoly, the possibilities of collusion enforcement, which transformed oligopolies into de facto monopolies, were not of much concern, for oligopolists could always cheat the cartel, to increase its profits, which would doom the cartel, making everyone's profits fall (Krugman and Obstfeld, 1996; Lommerud and Sorgard, 2001). Thus in monopoly or oligopoly, the benefits from trade liberalisation can be the reduction of monopoly power and profits that firms could enjoy. In the context of international trade, based on the theoretical models above, market imperfection, in LDCs, was mainly attributed to three sources: low scale production and demand, increasing returns to scale, which came as a consequence of the narrow domestic markets; and the action of institutions, which included government interventions, international institutions, and organisations, and the so-called externalities, which can include a wide range of market failures (Greenaway, 1991; Helleiner, 1992b).

Scale and increasing returns to scale were mentioned in the literature as a main cause of imperfect competition (Rodrik, 1988). A way for oligopolists to maintain their market dominance was when the structure of profits allowed for increasing returns to scale, which meant that by growing the firms were able to increase their profits due to their scale of production. But the small competitors were faced with diminishing returns due to their low scale. Besides increasing returns to scale, imperfect competition was also evident in markets with increasing marginal costs, with firms facing increasing costs as production increased. A popular model of imperfect competition and trade indicated that when protected firms are subjected to increasing marginal cost they will charge any price along the marginal cost curve, since prices rise with the demand (Bhagwati, 1965). So, concerns about increasing marginal costs were expected when trade liberalisation was implemented.

The idea of externalities causing market imperfection was simple, though defining and quantifying them became a complex task because of their variety.

A basic concept of externalities was: "benefits that accrue to other parties other than the firms that produced them" (Krugman, and Obstfeld, 1996: 280). And the most common examples of such benefits were of two types: real and pecuniary (Corden, 1974). For real externalities, the authors mentioned the firm's attitudes and motives, human capital formation and technology change, which affected economic results. The pecuniary externalities included the change in terms of trade of one firm by the activity of others, and wage pressures by the proximity of plants, and the intercommunication of their employees. This could be connected to the action of institutions such as trade unions.

Technology innovation as a result of externalities was the most usual example, which was attributed to the proximity of many firms, remembering the idea of cluster economy. By the contact between their staff, suppliers and costumers a firm would necessarily influence the others. The famous example was the Californian Silicon Valley, where workers communicated their progress in researches, working methods and developments in an informal manner, ending up by X-benefiting the other firms (Ghani and Steward, 1992). Externalities became interesting to trade liberalisation, because of increasing contacts between international firms benefiting product quality and technology transfers.

Another classification defined "positive and negative externalities" (Ghani and Steward, 1992:123). The later were those with negative influences on the environment and markets, such as car pollution, radiation effects, factories' smoke, etc. And the former were due to the influence of imported goods to domestic producers, because of the embodied knowledge that they carried. The case of the Brazilian Aircraft Industry was an example of positive externalities, as the development of that industry brought new technologies that influenced other industries (Baldwin, 1992). The strategic decision by the government to support aircraft construction even without profitability in the foreseeable future ended up by benefiting the communications and electronics industry together with education and training.

With externalities the local education system is encouraged to promote more learning, which indicates influences on the labour market. Local economy may be accelerated with trade expansion because of externalities, since the bulk of positive externalities as a consequence of trade liberalisation seems to be concentrated on technology, learning-by-doing, cultural adaptation and linkages to local networks, like education. Externalities based on intervention in the economy by external institutions were essential for the success of trade reforms in LDCs. International institutions such as donors of foreign aid are central to the effects of any policy reform undertaken. Thus,

an important consequence of the institutional framework of trade liberalisation concerns the concept of externalities. The results of any policy depend on the level of integration between the institutions involved in its implementation and progress. Among the international institutions that have had strong influence on trade reforms in LDCs the World Bank and the IMF, under the Structural Adjustment Lending Programme (SAL), have been the leading examples.

Since most of the SAL programmes with the World Bank and IMF, embedded the so-called conditionalities, to analyse trade liberalisation the assessment of such programmes was important. The assessment of such programmes was able to clarify some methodological points, and to provide a string of concepts and definitions used in the analyses. Most of the evaluations confirmed that the trade policies have been implemented, and only in few cases have they been reversed. But the expected export performance from outward orientation as a consequence of trade liberalisation showed mixed results (Krueger, 1978; Rodrik, 1995a).

The importance of the credibility of reformers, which were the LDCs governments, to make a successful trade reform had always been of great concern, due to the instable political regimes in many LDCs (Rodrik, 1989). A sound trade policy in LDCs due to their markets and political uncertainty was the corner stone for collecting the benefits from outward orientation, which were emphasised by the participation of TNCs (Dornbusch, 1992). But, TNCs shied away in many instances due to these uncertainties, which combined with small size LDCs' domestic markets emphasised the need for outward orientation.

Hence, LDCs' governments organised market interventions, with tariffs and other trade barriers, to correct the market prices for distortions already in place. However, there is no strong evidence that they have succeeded, as the evaluations of the protection regimes had shown (Krueger, 1974; Krueger and Rajapatirana, 1999). Often, tariffs, which were intended to correct for price distortions or to encourage infant industries, failed to achieve these goals. In other cases the tariffs ended up by binding the consumption beyond the appointed levels (Edwards, 1989). Thus, instead of balancing the market failures the governments introduced an extra imperfection to the markets. For instance, a study with an intervention index (Lerner index type) regressed into the production function to estimate trade intensity ratios for LDCs in connection with state intervention implied that there was significant negative correlation between state intervention and economic growth.

Summing up the discussion on imperfect competition granted room for a low level of protection, under the circumstances of a large country that could affect its own terms of trade. However, the level of tariffs, quotas and other trade barriers must be maintained low, according to some authors (Helpman and Krugman, 1999). For others protection in LDCs imperfect markets should not be encouraged, since the benefits from trade liberalisation will always outweigh those from protection (Richardson, 1989). Hence the benefits from trade liberalisation will be discussed next.

2.2.3 Empirical Literature on Static and Dynamic Effects from Trade Liberalisation

A large number of authors have studied the implications of trade liberalisation on growth, and development, analysing the static and dynamic gains from trade, derived from resource reallocation and efficiency improvement in the firms. Static benefits from trade resulted from resource reallocation, which followed trade liberalisation, as a consequence of changes in relative prices and costs. Dynamic benefits were also linked to resource reallocation, taking advantage of international contacts, bringing in technology, product quality and continuous learning from other firms.

According to the theoretical models discussed earlier, the static gains from trade have been empirically studied by many authors, whose views will be summarised below. The resource reallocation process, as a consequence of trade liberalisation, consisted in the search for a new equilibrium after the introduction of the reforms. Static benefits came from the efficiency in terms of relative prices and costs, brought by resource reallocation (de Melo and Faini, 1995).

In this context, restricting trade would cause allocative inefficiency, at a point in time, and the consequences of protection could be measured by the cost of protection, i.e., by the price differences of domestic and imported goods under protection. The social benefits of trade liberalisation also came from the price reduction and the gains are assumed to follow the theory of cost advantage, since resource reallocation occurs with gains to the firms involved. It is, however, hard to separate the inefficiency costs of protection from economies of scale and low capacity utilisation. In the literature, CGE models have been used to calculate the welfare cost of protection. In such simulations, the static gains from trade were about 5% of GDP in a cross-country sample of 80 LDCs (Krueger, 1984).

Another conclusion from the CGE studies, surveyed by other authors, achieved the same average gains in national purchasing power, which were two to three times the size of those estimated by partial equilibrium that reached 7.5%. The simulated adjustment pressures from trade liberalization were also higher than in the traditional estimated models (Richardson, 1989). When such studies included efficiency gains and technical resource reallocation, shifting to more efficient use of inputs, according to the world prices that are introduced when trade liberalisation is undertaken, the results showed efficiency gains of 15% of GDP for Turkey (Grais, 1986; Grais et al., 1986). The gains were 7.5% of GDP for India (Mohammad and Walley, 1984). In the same way, simulation with CGE models showed that the Moroccan economy without import quotas, should increase sharply benefiting intermediate goods and increasing local production of exportable goods (de Melo and Faini, 1995). Bhagwati (1988), however, criticised these large gains measured by CGE models because of the high difficulty to estimate the exact production function, although CGE empirical studies strongly supported trade liberalisation (Bhagwati, 1988). Another criticism of this approach was that the results were highly influenced by the measures and techniques used, which did not indicate the direction of causality (Edwards, 1993; Krueger, 1980). For instance, with Granger tests for causality, there has been poor evidence of causality going from exports growth to economic performance (Jung and Marshall, 1985).

Another set of studies compared economic growth and outward orientation estimated by three variables: economic size, per capita income and sectoral composition of the GDP. It emphasised the importance of economic size and distribution, since these variables came out positive and significant from the model estimations (Chenery et al., 1986). For instance, outward orientation was positively related to high indices of growth for small and large countries.

To overcome the cross-country limitations in evaluating trade reforms country-based studies were undertaken by analysing the effects of changing import substitution into outward orientation. For instance, comparing the levels of total factor productivity between manufacturing branches in Mexico for 1984-99 Weiss (1999) concluded that "some branches have no doubt benefited from trade liberalisation in terms of positive impact on their productivity level" (op. cit. p. 166). Studies on the static effects of trade liberalisation related the results to market structures stressing on the effects on the reallocation of employment or investment. Other examples came from Chile, Colombia and Morocco, by borrowing data from government statistical agencies,

including firms with 10 or more employees. Focusing on employment turnover and on resource reallocation, the findings were that more than 80% of the change in turnover occurred within the same industry, when size was controlled for (Roberts, 1996; Tybout and Liu, 1996). This large share of movements within the same industry, between firms of the same size, reflected the heterogeneity among plants and their different response to demand changes, as well as to cost imperatives. What becomes clear from these findings was that plants and firms were not at the same level of productivity, although they have similar sizes.

Particularly, to measure static effects of trade liberalisation, a useful model studied job reallocation and efficiency with fixed costs for creating jobs, technological improvement and cyclical fluctuations of demand (Caballero and Hammour, 1994). They confirm that in recession job creation and destruction were strongly linked to resource allocation, which was explained by reduced opportunity costs for labour, which supported the famous Shumpeterian "creative destruction" theory (op. cit. p. 1351).

Although the externalities argument was often used to explain protection, it was also used to encourage trade liberalisation due to the beneficial contacts with foreign products, which carried better technology embedded in them. Complementarily, competition from abroad was believed to force producers to raise product quality, which brought about productivity, growth and product quality, which was a dynamic effect of trade liberalisation. However, cross-section models often applied to analyse the relationships between trade and growth did not consider dynamic variables. For instance, having exports as the explanatory variable for growth was misleading the interpretation of the outward orientation effects (Edwards, 1993). An important element of dynamic effects of trade liberalisation was education, which could be measured by population's schooling years; but it was usually not considered in the models (Edwards, op ci. p. 1359). With this measure, education implied higher GDP growth rates as a consequence of exports increase.

To clarify the influence of education levels to production growth as a source of total factor productivity growth, the empirical evidence of the Asian NICs due to their good performance in education indicators emphasised the importance of links between trade liberalisation and education. In terms of education as a lever for the absorption of dynamic benefits this seems to be crucial. Domestic Korean firms absorbed foreign technology due to their labour force skills, which came from years of education (Westphal, 1990). However, learning advantages in many LDCs worked in

circle, since education was previously needed for the absorption of the dynamic benefits from trade liberalisation, on the one hand, and developing education, and learning skills were encouraged by trade liberalisation, on the other hand. The reason was that the contacts with international firms indicated the proper educational focus, and valued the skills acquired by the population, by the means of comparison and competition (Kim, 1997).

A counter-example is the poor efficiency results of the ISI policies in Brazil despite of the government efforts, which was partially due to the low educational levels. However, since education dynamics is a central topic in development, it certainly went beyond trade liberalisation issues, although the empirical results suggested that a certain level of basic education enhanced learning processes and technology transfers. The static and dynamic effects of trade liberalisation were expected to improve the productivity levels, based on the economic rationale that the firms would change their resource allocation, develop new products and enhance product quality and technology. Efficiency as a consequence of increasing competition by trade liberalisation has been studied by various authors concerning other LDCs, which will be discussed next.

2.2.4   Literature on Trade liberalisation and Productivity

The objective of this subsection is to discuss the literature involving trade liberalisation and productivity growth, efficiency and exports in LDCs. To analyse the relationship between productivity and trade policy, many studies used total factor productivity (TFP), relying on its advantage in capturing increasing static and dynamic efficiency, when expressed as a Solow residual, in the production function (Solow, 1957). For instance, TFP growth was found linked to 30% of GDP growth in LDCs and 50% in developed countries, reinforcing that TFP was the driving element for growth differential, as opposed to factor accumulation (Chenery, et al., 1986). In the early 1970s, a NBER project headed by Bhagwati and Krugger sought establishing the relationship between trade liberalisation and productivity growth based on dynamic effects of trade liberalisation with no strong causality links (Bhagwati, 1971; Krueger, 1978). Nevertheless dynamic benefits from trade liberalisation seemed to be high due to the previous lack of capital accumulation in LDCs, which would make dynamic efficiency differences a great result from trade liberalisation .

Some authors argued that trade reforms had weak links with performance and productivity, basically due to the influence of domestic and international institutions, which made trade reforms a matter of political economy. For

instance, the argument against strong and irrefutable links from trade liberalisation to increasing efficiency and productivity indicated that causal relationships must be in connection with imperfect competition (Rodrik, 1992a;c). The author stressed the Schumpeterian view that competition does not strongly causes innovation or low-cost investments, which were the basis of the rationalisation of industry and production optimisation. Furthermore, technical efficiency should not be counted as an expected result from trade liberalisation, since it comes from different sources, which were exogenous, based on technology improvement. Nevertheless, the author recognised a narrow possibility for trade liberalisation to be a necessary condition, although not sufficient, for productivity increase, based on increasing returns to scale (IRS) and imperfect competition.

The author also explained that much of the current discussion was due to a confusion between macroeconomic policies and trade policies, because both were undertaken together, in LDCs, often as a conditionality of SALs of the World Bank (Rodrik, 1992a;b). The lack of empirical evidence that could confirm the link between trade liberalisation, efficiency and productivity was indicated as a research area to be exploited. Many of the pro trade–efficiency positive relationships arguments are refuted, because they were made on the basis of macroeconomic reforms rather than trade reforms. For instance cross-efficiency and macroeconomic instability arguments did not stand because of confusion of macro and microeconomic policies. However, analysing outward oriented policies and the consequences of protection to the levels of exports in western Europe, protection barriers had no negative effects on exports (Rodrik, 1992a). The quotation is as follows:

> "trade restrictions do not affect adversely the exports incentives of protected firms"
>
> (Rodrik, 1992a:160)

However, when the author made clear that trade protection could not interfere directly into the behaviour of exporting firms, the following statement was added to complement the idea:

> "what is true is that with sufficiently restrictive levels of protection, trade policy may end up fostering an industry which is unable to compete abroad at any level of output. It is an argument against excessive protection rather than protection per se"
>
> (Rodrik, 1992a:160)

Thus, according to this point of view, the interesting issue is to verify when protectionism is taken too far or when trade barriers became an "excessive protection" by inducing too many firms to enter the domestic markets as a consequence of government subsidies, tariffs, and other means of protection allowing them to make profits at the expenses of local costumers and taxpayers.

Papageorgiou (1991a), shows in the 7th volume, with the calculation using 3 years before and 3-4 years after, covering a period of almost 20 years, that the average annual growth of real GDP increased after trade liberalisation, for tradable and non-tradable sectors (Papageorgiou et al., 1991c). When the exchange rate became depreciated, the tradable sector, in some LDCs, showed faster growth. Immediately after trade liberalisation, manufacturing output's rate of growth slows down, but after a while it grew a little faster than it did in the period before.

The World Bank report on the export performance, after the introduction of SALs, compared GDP and the export growth for 40 LDCs (World Bank, 1988). In 1988, the conclusion was that after (from 1982 to 1987), more than a half of the sample's exports grew faster than before (1965-81). Measured as a weighted average, external balance was negative (-3.2% of GDP) before SALs (1978-81); and became positive (1.4% of GDP) after SALs (1982-87) for the same sample. In the following year the World Bank used a mixed approach, since the study was based on 'before-after' methods for some groups of LDCs, with "non-SAL countries" constituting a "control group", with similar results as in 1988 (World Bank, 1989). Summing up the literature on econometric simulation seemed to support the advantages of trade liberalisation.

Beside international institutions domestic ones were of great importance for the success of a reform, since the application of the conditionalities and other policy reforms, to be effective, had to compromise with such institutions, whether political, social, economic or even cultural (Rodrik, 1995a). In this case the analysis of the changes in trade policies were concentrated on market structures, and other market and social indicators, which emphasised the importance of the institutional framework.

The importance of trade liberalisation in enabling LDCs to gain foreign markets has been discussed in many occasions, with different focuses and results. For instance, the recent popular introduction of TNCs affiliates' plants in Mexico, the so-called maquiladoras, was discussed by many economists in Latin America and elsewhere (Feenstra and Hanson, 1998; Wilson, 1992). Other examples are based on the clusters theory, which has a connection with the concept of externalities. Most of the cases of LDCs' success in receiving TNCs or having local producers connected to TNCs were based on the fact that these giant companies were able to provide access to the world market (Kaplinsky, 2000; Schmitz, 1995). Others highlighted the point of market management due to the traditional disadvantage of LDCs' exports concerning management skills (Lall and Keesing, 1992). A usual critique was that many LDCs had

interesting products with strong demand by final and intermediate consumers abroad; but their firms' marketing strategies were insufficient to actually export them. In the Korean industrial market, for instance, long term effects of trade liberalisation on companies and production rationalisation was associated with the links with western TNCs that were able to buy Korean products (Gunasekera and Tyers, 1991). Thus, market management seems crucial for the success of trade liberalisation with export orientation, although many other institutions were involved.

Since there is ground for believing that trade liberalisation was actually able to benefit LDCs, even with imperfect competition markets, according to the vast literature on the benefits from trade liberalisation, there were also many kinds of tests used to assess these benefits. Most tests intended to evaluate trade policies with regard to the expected effects on macroeconomic results. Three basic methodologies have been used by the economists: i) the 'before-after' approach, ii) the control group method and iii) econometric simulation methods. The first one compares the country's performance before and after the reforms. It has the great advantage of simplicity, but can not distinguish the effects that are directly linked to the programme from others in the period examined. A bias appears when elements non-related to the programme were not controlled for, which added some difficulty in wondering the direction of causality. The second procedure separated these two categories of effects, by choosing also LDCs that have not been submitted to the programmes to form a control group, maintaining, however, the assumption of LDCs homogeneity (Goldstein and Montiel, 1986). Simulation in econometrics was based on computerised general equilibrium models (CGE), which simulate the situations of general equilibrium with data from the country in study. The complexity of such method and the LDCs' usual lack of reliable data are the most common shortcoming.

Summing up the trade models and empirical literature on trade liberalisation, productivity and performance, the discussion in this section clarified the advantages of liberalising trade and the models developed to explain the trade theory. Trade was described as a way of enhancing production frontiers, which was appropriated to LDCs, and increasing markets for local and foreign producers, as well as increasing welfare by increasing product availability, quality and low prices, in line with increasing efficiency. The benefits from trade liberalisation were classified in static and dynamic benefits. Static benefit were obtained, when resulting directly from resource reallocation, which enhanced the production frontiers, and stabilised the production techniques in an upper level. Dynamic benefits from trade liberalisation

came with the contacts with international standards, clustering, technical progress and competition, which were perhaps possible without trade liberalisation, but became effective with such environment, since with protection importing technology, raw material, and machinery, in general, was difficult and inefficient.

The literature connecting trade liberalisation to productivity clarified the effects of trade liberalisation that may not be homogenously distributed to the firms and industries in LDCs. However, the tests concerning trade liberalisation effects on productivity and exports performance showed that increasing productivity was a consequence of reducing excessive protection even with imperfect competition. To choose the method to be applied for the analysis the next section will describe some of the previous assessments of the effects of trade liberalisation in LDCs.

Section 2.3   The Models Based on Firms' Behaviour

As a result of the increasing popularity of microeconomic approaches, trade economists have studied trade liberalisation stressing the influence of market structures, based on firm's behaviour. The study of market structure initially focused on two main points: number of players in the market (suppliers and customers) and scale of production (Kirkpatrick et al., 1984; Lee, 1992). The theory supposed that the higher the scale, the higher would be minimum efficiency scale (MES), which implied lower unitary costs that would drive the plants' profitability. However, the higher the scale, the lesser the consumer choice, which could lead to price increase (or margins), due to the domestic firms' extra market power. This paradox, in domestic markets, could be eased by trade liberalisation, as it was meant to increase the number of players and market size at the same time, which enabled increasing scale economies.

Because of imperfect market structure, which was the usual form of markets in LDCs due to their small markets, the assessment of the changes in firms' behaviour, as a consequence of trade policies, needed to be a comprehensive one. As a consequence of the situation of imperfect competition, which under certain circumstances gave room for protection, many authors approached trade liberalisation using econometric models considering firms' behaviour, such as Structure-Conduct-Performance (S-C-P) models (Kirkpatrick, 1994). The basis of this approach relies on the microeconomic theory, since it stresses on the importance of the firms' reactions to a policy and how this policy affected the markets (Lall, 2000).

The S-C-P models have been first applied to analyse the US economy by many authors, in different occasions. To a certain extent they have been used for performance assessment, output growth and factor changes (Hall, 1988). For assessing trade policies S-C-P models had the advantage of checking the effects of a change in trade policies directly by the firm's reaction rather than checking only whether the government implemented or not the policy condition. Hence, S-C-P models should be preferable to analyse trade in LDCs, though only a few studies have been carried out in LDCs using this methodology, mainly due to the limited data availability (Lee, 1992). Aware of these basic concerns the next subsection explores the literature on the S-C-P models and the applications to the study of trade policy effects in LDCs.

2.3.1 The S-C-P Model

This subsection's objective is to describe the Structure-Conduct-Performance (S-C-P) model, as an appropriate technique to analyse the complex environment of trade liberalisation in LDCs. It was initially based on the Industrial Organisation theory that traces the changes in companies' behaviour, together with the microeconomics efficiency and competition theory (Bain, 1956). S-C-P models became an instrument to test for the effects of a policy change in firms' behaviour in developed and less developed countries, due to the possibility of controlling for market structure.

The origin of such model was in studies challenging the assumption of perfect competition and constant returns to scale. Robert Hall (1988) challenged the assumption that the American economy was such an open market, where prices and marginal cost were equal. He confirmed that marginal revenues were far below prices in almost every industry. His article discusses the Solow residual as a measure of productivity challenging the assumption of perfect competition, since it was found that perfect competition and constant returns to scale, under which many comparative studies have been done, did not stand. A number of researches confirmed the leading importance of Hall's article (Harrison, 1994; Khan, 1997; Levinsohn, 1993).

Compared to previous studies on firm's behaviour, Hall's proceedings have been different, since he tested the hypothesis of perfect competition and constant returns directly from data on price, output and input values, avoiding relying on macro-measures and aggregate variables. Based on the measure of the Solow Residual, known as the expression of total factor productivity (TFP), the author compared the real word prices and costs, which showed that maintaining TFP unchanged US domestic output increased. This, if it was not attributable to total factor productivity, which remained

unchanged, had to be attributed to other factors. Thus, by connecting output growth to other factors, different from productivity, the alternative hypothesis against perfect competition was held.

The author found exogenous variables, such as military expenses, word oil prices and political party of the president, which were not correlated with the Solow residual (productivity), to test the joint hypothesis of competition and constant return to scale. For many industries, those variables were correlated with growth and labour productivity; but by definition they were not linked to productivity, which emphasised the explanation that the model's assumptions, e.g. perfect competition and constant returns to scale were not held.

These findings implied market power rather than perfect competition, in the US economy, because the explanation for the firms to be able to increase output and labour productivity as a consequence of a change in these variables was that they had the power to behave as such. Thus, industrialists had the power to increase production without increasing investment or employment, which were the classical causes of growth in the Solow model (Solow, 1957). Hence the author began to analyse the alternative for the Solow explanations for output growth. The suggestions were that firms had certain control on competition barriers, such as capacity utilisation, since the producers could have kept excess capacity without being penalised by competition. So they have been able to increase output without needing to add more input factors.

The conclusion was that for companies to have idle capacity they must be enjoying market power since, with monopoly power, firms could charge higher prices, which would have enabled them to earn profits even with idle capacity. Otherwise they would be constrained to use full capacity and to sell at market prices equal to marginal costs. Comparing price levels with costs, the author found a price-cost ratio between 2 and 3, which gave strong support to the alternative hypothesis that rejected perfect competition. Before consolidating the findings that the US-markets were imperfect, the author discussed possible specification errors, such as work effort error measures, particularly during cyclical contractions, unrecorded output, errors of capital measures, although the magnitude of the price-marginal costs ratio - 3 fold – did not leave room for explanations based on mis-specification errors.

Thus, breaking the assumption of perfect competition for the US troubled the interpretation that large markets should be assumed as perfectly competitive. Although trade was still able to improve the poor conditions of competition in LDCs, perfect competition was not working in international trade. Many authors carried out

other researches along those lines, on a country basis respectively: Côte d'Ivoire, India, and Turkey(Harrison, 1996; Mitra and Khrisna, 1998; and Levinsohn, 1993). Due to their importance, the following discussion summarises some of those studies on trade liberalisation using this approach.

Summing up, there was considerable support for the estimation of policy effects on productivity and performance, to include structural and behaviour variables, in order to control for other effects, that would have affected the tests of hypothesis. These variables should involve market shares, competition or pricing strategies, since the assumptions of constant returns to scale, and equality of marginal costs and prices were not held. And if these assumptions were not held in the largest, and one of the more open economies, such as the US, there was little chance to be different in LDCs. Hence, the application of the S-C-P model to trade liberalisation will be discussed in the next subsection.

2.3.2   The SCP Model Applied to Trade

After presenting the fundamentals of the S-C-P model, this subsection's objective is to discuss the literature analysing trade liberalisation and imperfect competition using S-C-P models. To formulate the S-C-P model market structures would be represented by a set of variables, having another variable indicating firms' behaviour, as depend variable. In such formulation the regressions will estimate the effects of the market structures on the firms' behaviour (Kirkpatrick, 1994; Lee, 1992). In order to formulate the models the discussion of market structure was based on a concept that it could be measured in a line with monopoly at one end and perfect competition at the other, being the intermediate types of market structure between these points.

The definition of the analysis' boundaries became essential, to define scopes, regions or countries, since LDCs territories and social structures were diversified enough to justify the inappropriateness of singular approaches. Moreover, the relationships linking market structure, conduct and performance in the international marketplace were not reproduced in LDCs, basically due to their dependence to developed countries (Lee, 1992). However, analysing trade liberalisation effects, with S-C-P models, required an appropriate definition of the market structures, since the usual definitions were based on sellers rather than producers, due to the enhanced visibility of the latter, whereas the producers themselves were not always transparent.

From this description, the most common approach to S-C-P to analyse trade and performance consisted in regressions of profits (as a proxy for the firm's behaviour) on a range of variables aiming to represent market structures. A variation of S-C-P models usually took price-cost margins, the rate of return of capital or value added to indicate the firms' behaviour. For market structures many took seller concentration, capital requirements, effective rate of protection and market entry barriers. Conclusions were reached on the basis of the relationships between the behaviour measures and the structure measures.

For instance, a study using profits as an indicator of firms' behaviour, and based on a panel data of three Indian industries (electrical machinery, non-electrical electronics and transport equipment) surveyed the effects of the 1991 trade liberalisation. Profits, estimated by price-cost margins as a behaviour variable, were regressed on gross productivity rates and returns to scale. This resulted in weak evidence of increase in productivity after the trade reforms, although profits and returns to scale reductions were significant (Krishna and Mitra, 1998). With the same framework, using mark-ups as behaviour measures and considering data from industrial censuses of 1984 and 1985/86, tests for trade liberalisation effects in manufacturing, in Turkey earned significant results, since there has been significant margins reduction after trade liberalisation (Levinsohn, 1993).

As data on entry and exit of firms were difficult to acquire, few studies relied on firms' turnover to indicate market structures. Among those studies, there was evidence for Chile, where trade liberalisation increased productivity in the industries with higher turnover (Tybout, et al., 1991). In Colombia, trade liberalisation also had significant links with productivity growth, for firms within the industries with higher turnover (Roberts, 1996). For exports, the results were mixed, since, when exporting industries were constrained to international prices without the possibility to discriminate local from foreign buyers, exports links to profits became significantly negative. This was interpreted that firms behaved in a manner to reduce profits or mark-ups in order to reach international markets when under competition pressures (Brander and Spencer, 1989; Kierzkowski, 1989).

As the empirical evidences gathered in these country-studies indicated, when domestic markets were protected, local suppliers, which were fewer than worldwide suppliers, easily colluded. Moreov . if domestic firms enjoyed non-trade barriers they were able to increase dramatica: their market power. But if with this protection they were also able to discrimin: between international and domestic

markets, their price cost margin increased even more. This situation fitted the theoretical argument that TNCs acting in domestic and international market tended to consider the weighted average of margins in both markets (Pugel, 1980). However, because of the difficulty to assess prices, costs, and market discrimination, the authors admitted that local suppliers, including TNCs affiliates, enjoyed entry barriers, against international competitors, before trade liberalisation.

For example, the effects of market distortions on total factor productivity induced by excessive protection in Argentina, Mexico, Korea and Canada, in the automobile industry showed mixed results (Murphy and Waverman, 1992). South Korea is the successful LDC, which ended up by having a strong local based car industry. But the automobile industry in Argentina and Mexico, despite the higher total factor productivity before and after the trade liberalisation, still relied on TNCs. Canada prompted an agreement with the American car-makers, by which they would close inefficient plants in Canada, and import automobiles from Detroit, which seemed to have increased consumer welfare, without losses in employment and technical development in Canada (Feinberg and Keane, 1998). Mexico seemed to have taken advantages from the free trade area with the US and Canada, by installing the "maquiladoras", which are TNC affiliates. They re-exported their products, such as cars and electronics to both countries after receiving the parts and designs form the parent companies (Feenstra and Hanson, 1998; Kenney and Florida, 1998).

Hence, the behaviour variables, which were mostly linked to profit and margins, and the specific policy variables are in line with many other studies concerning others LDCs. However, there is a need for a description of the market structure variables that will be presented next.

Section 2.4   The Market Structures Variables

The S-C-P models comprehend three types of variables: behaviour variables, such as profits and margins, which were mentioned previously; variables indicating a policy change to be tested, which are in this case trade liberalisation; and market structure variables. The latter will be described in this section by the discussion of the analyses in the literature on policy changes and firms' behaviour. Since market and production structures have been studied for a while, the literature on market structure has been abundant. The focus will be on the influences that these structures may have had on the companies' behaviour, especially concerning the advent of trade

liberalisation. Hence, the objective of this section is to mention the concepts and the literature linking market structure with trade liberalisation. In the next subsection the literature on size and concentration as the first structure element to be analysed will be described.

2.4.1 Companies and Industries Size

The objective of this subsection is to provide a comprehensive idea of the effects that differences in size could have in the trade liberalisation effects. The importance of the attention to size and concentration, which was a relative measure of size, came from the importance of scale economies, in the context of competition. Hence the first step will be to define and discuss the features of scale economies, to introduce the size measures later.

There are two types of economies of scale: external and internal. An industry benefits from external economies of scale when the size of the industry is associated to a reduction of the product unit cost. Internal economies of scale occur when the unit cost depends on the size of a firm (Helpman, and Krugman, 1999:26). A definition of economies of scale:

> "Economies of scale are usually defined as cost saving from a higher level of output with both product and basic technology held constant. Economies of scope refer to cost savings resulting from joint production of a range of goods or services. Economies of size (which is what most statistical analyses measure) can derive from economies either of scale or scope, not to mention any other advantages of size."
>
> (Berry, 1992:52)

An important application of the concept of scale and competition is the situation of increasing returns to scale (IRS). The models of comparative advantage discussed earlier assumed constant returns to scale. However many industries are likely to have IRS. The model of increasing returns to scale is similar to the monopoly model, in the way that companies do pricing and relate one to each other. IRS depend on sunk costs, which were associated to the firm' commitment to its business, represented by the costs associated with the initiation of production and to changes in the production system (George et al., 1993). IRS can be attributed to a firm or to a single plant, referring to new or renewed establishments.

IRS can give rise to intra-industry trade, since firms would maximise the efforts to improve quality and increase output with the objective of increasing profits. Since every firm was not in a position to behave so, many others have to be assigned a secondary role, which characterised the roles in a competitive economy as leaders and followers (Jacquemin et al., 1988; Jacquemin and Encacoua, 1981). The

latter will be assigned the top technology, quality, and will be able to increase R&D in order to stay leaders. The former will fit their strategies in extracting the maximum profits from their role as second to the leaders. As a consequence of such strategies applied to trade liberalisation, each country will be specialised in the production of a narrow range of products that maximise manufacturing profitability. But since domestic consumers will still need to consume almost everything, international trade will provide the complimentary supply of goods, since other countries surely will be able to produce them. An important consequence of such scheme is specialisation, which is associated with intra-industry trade because firms in the same industry will try to specialise in certain parts of the production chain by country (Krugman, and Obstfeld, 1996).

To discuss the literature on IRS and size, estimations of size influences on IRS with single output showed that IRS increased more than 1% in association with 1% increase in plant size (Tybout and Westbrook, 1993). However, in a panel of Chilean industries, many showed strong IRS-size correlations, although the estimations at plant level did not support the findings. For instance, at two digit level, after trade liberalisation IRS estimations were scattered between 0.8 and 1.2%; but at more detailed four digit levels, the span was from 0.7-1.6% (Tybout and Westbrook, 1993). The results confirmed a previous study on Mexican manufacturing, when IRS increases were linked to trade liberalisation (Tybout, 1995; Weiss, 1992). The authors emphasised that external returns to scale were not captured by their model, which left the possibility of increasing returns to scale from external sources.

As a consequence of such discussion, the concept of scale seemed to be part of the industrial activity, since firms, in every industry, had a minimum quantity of output to justify the setting up. Even after setting up, companies were constrained by the Minimum Scale Efficiency (MES), which only admitted profitability beyond a certain level of output. In the trade models, discussed earlier, Heckscher-Ohlin conclusion was that labour-abundant LDCs should benefit from their comparative advantage (labour being their abundant resource) and not only achieve higher rates of growth by exporting labour intensive goods, but also gather better income distribution by the means of trade. However, scale economies and efficiency frustrated that initiative when it was attempted, since large local firms, and TNCs became exporters. Therefore, beside the need to be efficient in order to export, they needed product quality, which sometimes implied the use of modern technology and employment reduction. Moreover, TNCs were used to capital intensive production rather than labour intensive. But due to the LDCs constraints they ended up by organising modern export sectors sided by

outmoded production for local consumers, which due to low scale postponed the dream of better distribution (Grether, 1996; Grether and de Melo, 1995). In some industries, although international markets ended up dominated by few TNCs suppliers, local and regional production could be diversified because of product differentiation, which led to oligopoly (Dixit, 1980).

Minimum scale efficiency was a reason for TNCs avoiding LDCs, due to their small market size, which resulted in only few firms entering LDCs, and causing de facto monopolies. Moreover, TNCs were unable to cope with low level of capital intensity, and unskilled workers, which would allow for small scale production. Protection or staying out of the industrialisation process were the alternatives for non-industrialised LDCs. They could always become specialised in a few products to export in order to afford the minimum size, although a trade trap could cause a problem (Berry, 1992). Studies using concentration and market size proxied by population revealed strong negative correlation between both, which meant that larger markets were actually attracting more firms, thus increasing competition (Forstner and Balance, 1990).

Although scale was often associated with technology, because technology change is the most important reason of changes in the MES, economies of scale do not guarantee that large firms will always have higher efficiency than smaller ones. It depends on the type of technology, management procedures, location, transport costs, etc. Productivity is expected to be greater for larger firms, but if cross-efficiency was lower, their overall efficiency could be less than that of smaller ones (Berry, 1996). Thus large firms can also be less efficient if they face more distorted factor prices, such as wages paid above the equilibrium wages, because of strong power of trade unions.

There were, in the literature on industrial organisation some challenges to the concept of size, as varying from large scale to small firms associated to high technology and capital intensity at one end, and low technology, and labour intensity at the other end. For example, subcontractors, franchisers, co-operatives and other schemes enabled small firms to enter large markets. This will balance the analysis on size and development, although scale still plays a central role in the relationship between trade and competition and profits due the technological gap between countries and firms (Nishimizu and Page, 1991). However, trade liberalisation still encouraged domestic firms to grow beyond the local possibilities (Krugman and Obstfeld, 1996; Tybout and Westbrook, 1993).

Combined with the importance of size, measured in terms of number of employees, or other indicators, the theory and empirical importance of scale economies

justified the analysis of trade effects on the firms' size. As the firms' size became of central importance to efficiency and competitiveness, its importance to trade liberalisation increased. Trade liberalisation effects could end up by being distributed, in a asymmetric manner, within an industry, due to size differences as a consequence of scale economies. Thus, the literature on scale economies, based on the size effects to economic results will be described.

Using the job turnover as a proxy for effective resource reallocation, LDCs presented the same patterns as developed countries, although with lower productivity levels. To give the figures, the average job creation in manufacturing, in Chile, Colombia and Morocco, was between 13 and 19%, and job destruction between 12 and 14% (higher rates than those of the US and Canada) (Roberts, 1996). Highlighting the dynamics of such effects, the benefits from factor movements became evident over periods larger than one year, and can not be taken for granted in every job changes because of new entrants yielding productivity gains with a lag (Roberts, 1996; Tybout and Liu, 1996). The effects of trade reforms on scale and technical efficiency in the Chilean manufacturing at establishment level, based on the 1967 and 1979 industrial censuses, showed that trade liberalisation had strong impact on firms' scale of production, indicating the kind of decisions on investment and employment (Tybout, et al., 1991). In the first period, with a sample of large plants, trade liberalisation, which occurred in 1974, when tariffs have been simplified and quantitative restrictions were eliminated, was linked to employment reductions and output increase due to X-efficiency and productivity rises (Tybout, 1996b). For small plants the results were similar and indicated increasing concentration, since plants increased output up to MES. The relationship between capital units and output or value added increased after trade liberalisation (Tybout, et al., 1991). The conclusion was that with trade liberalisation the firms were able to access better technology, which benefited high scale production, resulting in increased efficiency. Beside the effects of increasing efficiency, the learning effects were also consistent with trade liberalisation and IRS, since cumulative total output was growing faster relatively to the input consumption (Tybout, 1996a).

Beside the fact that concentration was a sign of higher production scale, it is a symptom of increasing competition, since firms tend to concentrate as a reaction to competition. Hence, turning to the discussion of the measures of size, and concentration, a number of possibilities were indicated in the literature. The most popular were the Herfindahl index (HH), the 4-firm index and the Employment Entropy Index (EE). The HH contains a family of indexes based in the seller market share of

each firm within an industry, with large HH indicating non-concentrated industries, and low HH indicating high concentration (George, et al., 1993). The 4-firm indexes show industrial concentration by the percentage of output, value added or market share of the 4 largest firms within an industry. The EE, which focuses in the number of employees per firm, was based on the assumption that large firms had more employees than small firms.

The employment entropy (EE) based on the total number of establishments or firms and the number of persons engaged in them by class size, with the maximum value when all the establishments have the same share of employees. A way to calculate it was to weight every establishment share in industry's total employment by the log of its reciprocal. The pitfall is that it does not count for companies supplying firms in the target industry and belonging to other industry, such as outsourcing employment. Informal employees, and others working under contract were also not considered (Forstner and Balance, 1990; George, et al., 1993). The formula for EE, in log format, is:

Equation 2.1. Employment Entropy Index

$$EE = \sum_{i=1}^{n} x_i \log \frac{1}{x_i}$$

Where:
x_i = share of employment of the establishment "i" as compared to the whole employment in the industry;
n = total number of establishments.

(George, et al, 1993: 135)

Like the others, the EE could be calculated on other measures, such as market shares. It is also subject to scale bias, due to sensitivity to capital intensity, which means that large firms tend to be over-represented in the calculations, due to the measures used, such as share of sales, value added, output and others being linked to the level of capital intensity. Nevertheless, a simple measure of firms size within an industry is the proportion of large firms, by categories of number of employees, sales, market shares or others, which indicates the importance of entropy for firms size (Jacquemin and Berry, 1979).

To illustrate the use of such indexes, as size indicators, a study using 51 S. Korean firms, regressed the 4-firm seller concentration index on the effective protection, showed that the most concentrated industries were significantly the most protected (Thompson, 1994). Other authors analysed concentration related to trade reforms, using other indexes. For instance, discussing the oligopolistic structures of the Brazilian electric and electronic industries, highlighting TNCs behaviour, using 4-firm

sales concentration index, and sales to the government as the dependent variable, showed that the most concentrated subsectors had the highest government procurement shares (Newfarmer, 1979). Using simple profits and broad profits accounted from the US TNCs in Brazil and Mexico, in 1974, and regressing them on 4-firm concentration index yielded positive links, significant at 5% level, which was interpreted as larger firms having higher profits than the smaller ones (Newfarmer, 1983).

Although concentration usually refers to seller and producer groups, leading to monopoly and oligopoly, buyers' concentration known as oligopsony also affected trade liberalisation. There were important insights that decisions of export or import in LDCs depended on buyers concentration, which was an attempt to overcome the limitations of product quality and market management by local producers. In such situation the small local firms were connected to large TNCs that are able to buy the production to sell in the world marketplace (Kaplinsky, 2000). However, there is little evidence that trade liberalisation would reduce LDCs dependency in a buyers concentration situation, since having a sure buyer was valued by the LDCs firms as an important step towards export orientation (Venables, 1996). Many production clusters in LDCs were able to keep a group of firms together to ease their relationship with concentrated buyers in developed countries (Krugman, 1989).

The cluster theory explains that local economies in LDCs could virtually be connected to the whole world economy by producing highly specialised products in large scale, which would never have enough consumption locally (Porter, 1974; Schmitz, 1998). Besides being a response to increasing competition, size and concentration also indicated the search for high production scale, since increasing production capability could be a deterrent to new entrants, and a sign of imperfect competition as indicated previously.

Summing up the discussion on size and concentration measures, the importance of size for trade liberalisation, productivity and exports was significant in most of the studies mentioned. For instance, larger firms were positively connected with exports and were more productive. In some cases, labour productivity was higher in small than in large firms, which was associated with the bureaucracy, and other sunk costs that constrain large firms. Since minimum efficiency scale and increasing returns to scale were also linked to capacity utilisation, the literature on this aspect of market structure in connection with trade liberalisation will be discussed in the next subsection.

2.4.2 Capacity Utilization

An important market structure, beside size discussed in the previous subsection, was capacity utilisation as a factor for rising barriers to entry and making competition imperfect (Hall, 1988). Building idle capacity was a behaviour undertaken by firms to gain extra-protection, since it would deter the newcomers. Thus the objective of this subsection is to discuss the literature on the effects of capacity utilisation on the relationship between trade liberalisation and productivity, which were highlighted in models of competition and empirical studies (Harrison, 1994; 1996).

By creating new investment opportunities for local groups and TNCs the new wave of LDCs industrialisation enhanced the possibilities of concentration as discussed in terms of scale economies, size and imperfect competition. However, many governments ended up by creating so many incentives to attract industries that they encouraged excess capacity, which by definition made the markets rather imperfect.

Trade liberalisation, however, was seen as an essential tool for the firms to increase capacity utilisation, since resource reallocation as a consequence of trade liberalisation should encourage firms to increase efficiency and would enable them to export. Thus, to reach the MES they had to build the minimum scale capacity, which sometimes exceeded domestic demand (Burkart, 1996; Markusen, 1995). Among others the experience of the "maquiladoras" in Mexico, which took advantage of the free trade zone with the US and Canada, showed the importance of trade liberalisation to keep capacity utilisation and production at the appropriate levels (Kenney and Florida, 1998). The success of such industrialisation clarified the advantages of trade liberalisation associated with the possibility of more efficient use of the industrial capacity and the resources. In such situation firms were able to manage the amount of extra capacity to face increasing demand in line with MES to overcome the entry barriers of idle capacity by incumbents (Francois, 2001; Geroski, 1995).

An empirical study on productivity change, after the 1985 trade reform in Côte d'Ivoire, using a panel data of 246 firms, during the period 1979-1987, showed that import penetration and gross price-cost margins were positively connected with productivity. Moreover, industries with high import penetration, after trade liberalisation doubled their productivity (Harrison, 1996). However, when capacity utilisation was taken into account to correct the measures of total factor productivity the links between productivity and import penetration became non-significant. This was interpreted as the effects of changing capacity utilisation on TFP, since the use of previous idle capacity has had strong effects on TFP measures. Thus, controlling for

capacity utilisation became a central issue, to reach the appropriate conclusions of the analysis of trade liberalisation effects on productivity.

Since capacity utilisation became empirically important by the use that firms made of idle capacity to increase market power and reinforce the barriers to entry, models to analyse increasing competition and trade liberalisation effects on productivity might include control variables for capacity utilisation. The association of capacity utilisation with barriers to entry indicates the need of studying entry and exit flows in each industry, which will be discussed in the next subsection.

2.4.3   Entry and Exit – Stock of Firms

This subsection's objective is to review the literature on entry/exit patterns related to the effects of trade liberalisation in LDCs, as another feature of imperfect competition. The flows of entry/exit firms indicated the entry barriers levels, which ended up by making markets imperfect. The literature review on the subject suggests that entrant firms were more likely to be small, and exiting firms were mostly small too, which was credited to the flexibility of small firms, due to their reduced level of bureaucracy, resources and staff (Geroski, 1995; Pugel, 1980). In the case of large firms, however, there were extra costs of internal bureaucracy and resources inventories, etc, which made them less likely to exit, when the competition increased. On the one hand, large firms had less flexibility, because of these characteristics, and on the other hand, they were able to anticipate failures and prepare better plans, due to their management, which gave them longer life than small ones.

Studying labour productivity of newcomers compared to the exiting firms', in a panel data on manufacturing in Colombia, entry/exit elasticity was more than 1%, when market shares and learning curve was controlled for (Tybout and Westbrook, 1996). The study found that the average productivity for incumbent plants was higher for exiting plants in Chile and Colombia, throughout the sample years (1978-1986), excluding 1980 and 1985. The authors explained these two exceptional years by the countries' financial situation in these years, which inflicted extra pressure to small companies, forcing them to leave, basically because they were not qualified for low cost credit offered by the government. Moreover, exiting firms coincided with the small ones, which were increasingly productive, but were forced to close down (Tybout and Westbrook, 1996).

In another estimation examining plants' cohorts for 5 years, from 1985 the results were that exiting firms were less productive than the remaining ones, after

the first year. From the second year the cohorts improved productivity, since the plants that had low productivity would have exited. So the remaining ones would have a positive impact on the cohort's productivity (Tybout and Liu, 1996). In conclusion, the literature on the effects of entry/exit on productivity shows that newcomers were more likely to exit during the first year.

Turning the discussion to the effects of economic cycles in firms turnover, empirical studies suggested that companies, in the reallocation process, were likely to increase turnover in counter-cyclical periods. In expansion this operation will be costly; but in recession opportunity costs of resources reallocation fall reducing the turnover costs (Caballero and Hammour, 1994). Another reason for increasing turnover taking place in recession was that changes were more efficient in recession. In expansion turnover only meant labour movements not benefits because of the labour market was demanding, leaving limited scope for increase in productivity by employing new people. Other empirical analysis considering the different situations of each of the three countries, Chile, Colombia and Morocco, showed that turnover had similar patterns. For instance, the average entry was 6.1%, 12.2% and 13.0 % and exit was 10.8, 11.1 and 6.0 % respectively. During the Chilean recession exit was 13% but in recovery it was only 5.3%. Entry during the Chilean recession was 4% and Morocco's 6%. Hence, in LDCs like in developed countries entry and exit followed business cycles (Haddad et al., 1996; Tybout and Westbrook, 1996).

Many authors have conducted econometric simulations, using CGE models, calibrated to show the measures of changes in welfare as a result of trade liberalisation. The common feature was to scrutinise changes in domestic competition after trade reforms and compare them to the changes in economies of scale in the search for oligopolistic actions by the firms. In a study using CGE model, Turkey showed that easing firms' entry and exit was decisive to determine the welfare increase after trade liberalisation, since restrictions to entry reduced welfare gains (Grais, et al., 1986). Hence, barriers to entry could be interpreted as an indicator of imperfect competition that might be controlled for to measure the changes in productivity. Although formal and informal sectors have a completely different turnover pattern in LDCs, entry and exit pattern was found significantly large to influence trade liberalisation effects.

Summing up the discussion on firms' entry/exit, it seems that natural entry barriers, barriers due to government intervention and oligopoly barriers all influenced the effects of trade liberalisation, as domestic firms were protected against competitors entry. However, in practice TNCs had the advantage of being in possession

of worldwide scale to face trade barriers, which would be alleviated by trade liberalisation. As firms' entry/exit during the introduction of trade liberalisation lead to increasing presence of TNCs in the domestic markets and as they were the most likely channel for increasing scale and efficiency in LDCs, the next subsection will discuss the literature on firms' ownership.

2.4.4 Ownership

A common method for describing firms' ownership, in LDCs, was distinguishing three categories: private, state ownership, and foreign ownership, which was identified with TNCs. However, the most popular analysis showed a dual vision: domestic and foreign ownership due to difficulties to have data on state ownership. Moreover this classification is consistent with the increasing importance of foreign direct investment (FDI) in LDCs (Markusen, 1995). Hence this subsection's aim is to review the literature on ownership, with emphasis on foreign ownership and the influences that it could have on trade liberalisation.

There are many studies on TNCs focusing on economic policy and development. Most studies showed TNCs being outward oriented, located in Export Processing Zones (EPZ) and being more productive than their domestic counterparts. TNCs usually come to LDCs to satisfy the domestic market or to export. They construct a plant to produce one or a few products, based on some resource advantage of the chosen LDC, which could be labour such as unskilled cheap labour and natural resource. In some recent cases international regulations, such as the quotas for textile constituted also an attraction for TNCs in the Southeast of Asia. Some countries such as Malaysia and Sri Lanka attracted TNCs from Hong Kong, Singapore and Japan, because of the introduction of textile quotas by the WTO (Athukorala, 2002; Yang, 1995). In their country of origin these TNCs were running out of WTO quotas to export garment, so they set up plants in those LDCs that still had quotas for exporting such items, in a case known as foot loose industry. In such situation, as in most EPZs, technology, designs, capital and business management came from the foreign owner, leaving to the local companies the production tasks (Anderson, 1997; Khan and Khwaja, 2001).

The few studies on TNCs' profits, in LDCs, however, were realised on country basis, and were concerned with the influences of foreign ownership on the changes in productivity. For instance, another experience which reinforced the importance of market structure such as foreign ownership was the Mexican participation

of the NAFTA, a free trade zone with the US and the Canada. Mexico increased output and productivity based on the "maquiladoras", which transformed particular Mexican regions in EPZ to assembly products, such as cars and computers, or to produce parts to export (Feenstra and Hanson, 1998; Wilson, 1992).

According to the industrial organisation theory as a basis of the S-C-P models described in the previous section, the results from the Mexican industrialisation with the "maquiladoras" indicated that the attraction of new plants to produce for export was decisive. These firms were brought in to exploit the local abundant labour, attracted by government incentives and location advantages. However, these TNCs beside bringing foreign capital also increased output and exports. This case reinforced the importance of foreign ownership in accelerating industrialisation particularly in certain degraded LDCs regions.

Similar importance needs to be attributed to location, since being inside a FTA opened the possibilities of exporting to the US market, which eased the entry of eastern firms, particularly Japanese ones. Hence, foreign ownership became an appropriate form for improving productivity, technology transfers and growth for these LDCs. For instance, the Japanese TNC affiliates installed in Mexico with the clear intension to reach the American markets, particularly for intermediate goods, spare parts, computers and electronics, enhancing the advantage of trade liberalisation (Feenstra and Hanson, 1998). Moreover, FDI increase was another benefit from trade liberalisation in such circumstances, which balanced for increasing imports. As for the US Canadian experience, the successful agreement inside the NAFTA ended up by improving the productivity in both sides of the border, when TNCs came up with production specialisation and intra-industry trade combined with trade liberalisation (Feinberg and Keane, 1998;2001)

Comparing TNCs results, another study signalled that small TNCs affiliates had lower profits than large ones, when the estimation showed positive correlation between profits and size, and profits and foreign ownership (Newfarmer, 1983). For instance, in a sample of LDCs foreign ownership showed positive and significant relationship with profits, which reinforced the usual idea that foreign ownership indicates profit orientation (Hunter, 1991; Levy, 1987).

Using data on Mexican manufacturing, from 1975-1988, including the period of trade liberalisation, a study showed that the share of foreign firms in each industry's labour productivity was significant in every test with S-C-P models (Weiss, 1992). The author regressed productivity measures, with other manufacturing structural

measures such as ownership. The share of foreign firms as an indicator of foreign ownership in each industry. The other market structure variables were advertising intensity as a proxy for product differentiation, which was significant across the industries.

Analysing the behaviour of TNCs, in the Brazilian electric material sector, there was found that the profits of foreign owned firms were higher than the domestic firms profits were (Newfarmer, 1979). Broad earnings of US TNCs affiliates in Mexico and Brazil, as measure of profit, regressed into market shares, as a proxy for size, indicated that Mexican largest TNC affiliates (with more than 50% market share) had earnings 66% higher than those in the bottom of the market share (less than 10%) had. In Brazil, firms with more than 25% of market share had 3 times more profits than those at the bottom had. These findings reinforced the idea that TNCs were more likely to have higher profits than domestic firms, although by their large scale, and imported technology, with average sunk costs shared with their parent companies, they were not associated with higher mark-ups than domestic ones (Meller, 1978).

Summarising the discussion on firms ownership, it seemed that foreign ownership was connected to high profits and large scale, which was an advantage from being part of international groups. TNCs affiliates were more productive in terms of total factor productivity and more profitable, although their price cost margins might not be higher than domestic firms. As they could have benefited from their larger scale to have profits, they could afford to have lower mark-ups, which indicated lower average costs. Moreover, foreign ownership was directly linked to higher exports, particularly when TNCs were located in EPZs, and could take advantage from labour and abundant resources in particular LDCs.

Summing up the discussion in this section, market structure seemed to be crucial for firms' behaviour in manufacturing, and has affected productivity measures, exports and profits, which signalled that trade liberalisation effects on these elements could have been affected by market structure. Scale economies, increasing returns to scale and other forms of imperfect competition were the main reasons for the market structure to became influential to firms behaviour. The first market structure indicator was firms' size, which could be perceived with concentration measures, which the most popular were Herfindahl index (HH), 4-firm index, and the Employment Entropy Index (EE). EE was based on the proportion of large firms to small firms, by employment categories in each industry. Size seemed to be connected with productivity in a way that large firms were more productive, in terms of total factor productivity,

although labour productivity sometimes showed the opposite tendency. Exports and margins were also connected to large firms, although after trade liberalisation small firms increased exports and reduced margins in some LDCs.

The second market structure variable was capacity utilisation, which in some empirical studies was found to have strong effects on total factor productivity in LDCs. The literature indicated that it was also linked to economic cycles, which also influenced resource reallocation, since in depression opportunity costs of resource reallocation were lower than in expansion.

The third market structure variable was the level of barriers to entry, which were connected to the effects of trade liberalisation on productivity and exports, although heterogeneous across industries. Small firms were the first to leave, and also the most to enter. Newcomers were less likely to be exporters. But their status of beginners allowed them higher margins and profits in most LDCs. Exiting firms were the less productive and had lower margins, with the exception of the years of high exchange rate devaluation, were although small the exiting firms were the most productive.

Ownership, as the forth market structure indicator, had significant links with trade liberalisation, where foreign ownership increased after trade liberalisation in most of the empirical analysis discussed. The TNCs were also positively connected with exports, mostly when they were located in a EPZ, such as the case of the maquiladoras in Mexico and the textile and garment industry in Southeast Asia. However in general TNCs were benefiting from local abundant resources, such as labour and natural resources and were having higher profits than the domestic firms had. Since TNCs benefited from large-scale production in connection to their parent companies, they could afford lower mark-ups. Having set up the basis for the S-C-P model, with the descriptions of previous analyses of the main structural variables in LDCs, with high degree of convergence, it seemed appropriate to analyse the case of Brazilian manufacturing using these variables to capture the effects of market structure, together with the trade liberalisation.

Section 2.5   Conclusion

According to the literature, the first effect of trade liberalisation was increasing efficiency and output, which has been explained by the models of trade and perfect competition. In the case of imperfect competition, however, the presence of

monopolies or oligopolies and the effects of scale affected the outcome of trade liberalisation. With imperfect markets, protection might reduce output falls, since the firms would only be encouraged to invest in small scale markets with protection schemes that provided appropriate IRS. However, with imperfect competition protection to domestic firms was a second best option of strengthening investment due to the high risk of introducing other distortions and favouring domestic and foreign monopolies and oligopolies (Helpman and Krugman, 1999). Since LDCs were mostly small markets, which needed small-scale firms, the effects of trade liberalisation would be enhancing domestic markets and providing production scale. This was achieved by enhancing the possibilities of importing inputs and exporting products. By this channel, however, intra-industry trade would increase. Nevertheless, some room still remained for trade liberalisation to contribute to productivity growth in LDCs provided that the major macroeconomic aggregates, such as inflation and exchange rate would be relatively stable (Cohen, 1997; Edwards, 1998).

Beside the expected outcome of the trade models with imperfect competition, there were still possibilities for trade liberalisation to be the best option of increasing domestic firms efficiency, productivity and performance. The alternative option of the appropriate level of intervention to protect domestic firms from any international oligopoly or monopoly was unlikely due to the difficulty to calibrate the level of protection. Most of the LDCs domestic markets were already overprotected, which suggested that reducing protection would become more effective. Moreover, there was not a firm assurance that government intervention would provide the return to capital in order to encourage investment in key industries with increasing returns to scale, in which case protection would generate even more distortions (Krugman, 1989). Furthermore, trade liberalisation would always increase consumer options, by adding more products and more firms to the domestic markets which, by the threat of competition from imports, were expected to behave more competitively, increasing consumer surplus and reducing monopoly power (Bain, 1956).

Thus, the way forward to analyse the effects of trade liberalisation on productivity, exports and efficiency was to control for market structure, being the size of firms, which determined scale, the number of firms and increasing returns to scale a decisive variable. Hence, the details of a model analysing the effects of trade liberalisation that considered market structure has been described, based on the literature on trade and industry. The S-C-P model was based on the Industrial

Organisation theory, combined with the trade theory and the efficiency theory (Bain, 1956; Dixit, 1980; Kirkpatrick, 1994).

Basically this model was preferable for analysing firm's data and was constituted by a variable indicating behaviour to be inserted in the estimations as a dependent variable; other group of variables indicating policy changes, such as trade liberalisation, and other group of variables indicating market structure. Analysing the changes in behaviour, connected to the policy changes, the interpretation of the links between these variables would provide explanations for the effects of such policies on firm's behaviour. The control variables indicating market structure would be estimated, mostly to keep the "ceteris paribus" assumption, though an interpretation of their influences on the behaviour variables, such as productivity and export performance will be of great interest. Moreover, the formulation of S-C-P models allowed for extended possibilities of control variables to be added, providing the appropriate flexibility to the analysis (Baumol, 1967; Katz, 2001).

Particularly, for expressing the changes in trade policy it was clear that tariff and non-tariff barriers were the measures needed. There have been studies focusing on trade and market structure in LDCs with the results discussed in order to confirm the possibilities of the research on the Brazilian case. Examples of plant-level empirical evidences that linked trade reform to efficiency in some countries have been discussed, highlighting that the links were not strong, which leaves open the question of positive relationships between trade reforms and productivity in LDCs (Nishimizu and Page, 1991; Tybout, 1992).

The variables indicating market structure that were analysed, according to the literature on trade liberalisation, industrial efficiency and productivity, in LDCs since market structure conditioned scale economies and decision making. The market structure variables were size, capacity utilisation, entry/exit barriers and foreign ownership. The S-C-P models were first applied to test for perfect competition, showing that capacity utilisation was a key variable, in many circumstances, to signal barriers to entry, which would make markets imperfect.

Size, as a scale indicator in most estimations in the literature, was linked to productivity and exports, indicating that larger firms were more likely to export more and to be more productive. However, although size was also found in positive connection with profits in many studies, the larger firms were not necessarily those with larger mark-ups, since they were able to benefit from scale economies.

Capacity utilisation was positively linked to increasing productivity and exports, indicating that the more capacity was used the more the firm was productive and exported more. The observation above about scale efficiency applied for mark-ups. However, excess productive capacity was a strategic policy undertaken by oligopolists, in order to increase their market power and avoid competition from domestic and international firms. Idle capacity worked as a deterrent for new entrants though it increased actual average product costs (Hall, 1988).

The third structural variable was entry/exit of firms to industries, which depended on the level of sunk costs and other barriers to entry such as technology. Entry and exit of firms, analysed in connection with productivity in Chile and Colombia revealed that the newcomers were more productive than the incumbents, after the first year. However, the exiting firms were less productive. For instance, exit was positively correlated with trade liberalisation measures in Chile and Colombia. Hence, after trade liberalisation exiting increased, which was interpreted as an effect of the reallocation process (Roberts, 1996; Tybout and Liu, 1996). Moreover, case studies on entry and exit, in LDCs, confirmed that exiting firms were, after one year, the less efficient ones, which combined with trade liberalisation supported the efficiency and resource reallocation hypothesis.

The last important structural variable was ownership, which distinguished between domestic and foreign ownership by expressing the share of TNCs in each industry. The share of foreign direct investment (FDI) was one of the most popular indicators for foreign ownership. There has been evidence that TNCs increased FDI flows towards LDCs and contributed to improving efficiency by answering to incentives for setting up plants in deprived areas. TNCs also took advantage of local labour and other abundant resources, and benefited from importing technology and raw material as a consequence of trade liberalisation. However, TNCs were more likely to establish plants in free trade areas and to take advantage of quotas and other localisation connected benefits. Mexico, for instance, as a consequence of trade liberalisation managed to set up an industrialisation programme based on producing parts and assembling products to the US market. This attracted TNCs from other countries beside the US such as the electronic companies from Japan in line with outward trade orientation (Feenstra and Hanson, 1998; Wilson, 1992). However, increasing competition did not have strong support from TNCs in Peru and Colombia (Papageorgiou et al., 1991b).

Having looked at the empirical literature in connection with trade liberalisation, productivity, exports and market discipline, there was a motivation for country-based studies on the subject. First there was a lack of literature especially on Latin American Countries with the exception of Chile and Mexico. Moreover, the discussion of the S-C-P models seemed to have pointed to an appropriate model for testing the hypothesis of trade liberalisation affecting productivity, exports and market discipline due to the general framework that could capture a variety of effects. Thus the moment and the method described in this chapter constituted a real opportunity to test the hypothesis of the effects of trade liberalisation, using Brazilian manufacturing data. Moreover trade liberalisation was introduced in 1990 at the beginning of a decade when Brazil experienced a certain level of economic stability, particularly after 1993/94, which enhanced the possibilities of having meaningful results from the analysis. To describe the political and economic environment which was the background for the introduction of trade liberalisation, the next chapter will focus on the Brazilian process of trade liberalisation.

CHAPTER 3. INDUSTRIALISATION AND MANUFACTURING PERFORMANCE

Section 3.1   Introduction

Having described the basic theory and the empirical evidence of the effects of trade liberalisation in LDCs, now the focus will be on the literature about Brazilian trade liberalisation. The first discussion in this chapter will be on the industrialisation process and the import substitution industrialisation (ISI) policies. ISI and infant industry protection encouraged the establishment of manufacturing firms in Brazil from 1940 up until the mid 1970s; but regained interest during the 1980s as means of coping with the debt crisis.

This chapter will also focus, particularly, on the wave of trade liberalisation introduced in 1990, emphasising the description of trade liberalisation process, and the industrial policies adopted during 1986-99. The chapter is divided into six sections: the second section describes the Brazilian industrialisation process; the third discusses trade policies and industrialisation in the 1980s and 1990s; the fourth describes the implementation of the trade reforms, the fifth describes exports and imports values, and the sixth concludes the chapter.

Section 3.2   Industrialisation and Macroeconomics for Trade Reforms

As a colonial economy, Brazil had strong links with foreign markets on which local producers relied, until the first part of the 19th century. Thereafter, the government and private entrepreneurs such as coffee planters shaped the structures of the Brazilian post-colonial development. Changes in economic structures towards manufacturing became effective after the Great Depression (Abreu et al., 1998; Bonelli and Gonçalves, 1998; Furtado, 1969). The process of industrialisation, in Brazil, will be described in the next subsection.

3.2.1   The Origins of the Brazilian Industrialisation

The Brazilian economy has a history based on exporting agricultural goods, which followed the Brazilian economic cycles: a) wood cycle (16th century); b) golden and stone cycle (17th and 18th centuries) c) sugar cycle (18th and 19th centuries);

d) coffee cycle (19th and first half of 20th centuries). From the Independence until the proclamation of the republic, coffee had been the main export commodity. But, after the First World War, manufacturing grew rapidly. In terms of shares, manufacturing was less than 10% of GDP in 1920, agriculture was 36%, and services, including transportation, communications, retail and finances was 53% of the GDP (Bonelli and Gonçalves, 1998). Based on similar definitions, in 1999 services share increased to 68%, agriculture fell to 12%, and manufacturing with industrial services reached 34% (IBGE, 2002a). Hence the classical change was from agriculture to manufacturing, with services share of GDP increasing less. Partial explanations to such evolution were based on the ISI policies implemented with the objective of reducing foreign dependency (Furtado, 1969).

For instance, the solution implemented by the government in the 1940s, to face goods scarcity due to imports reduction, was a national policy to equip domestic companies with machinery, and encourage selected TNCs to come for the Brazilian huge potential on iron ores (Flynn, 1978). Growth rates of four sectors shown in Table 3.1 below indicated that manufacturing and agriculture fell more than services and minerals.

Table 3.1. Average Annual Growth by Sector (%)

Year	Agriculture	Minerals	Utilities	Manufacturing	Services
1980	9.55	12.84	10.50	9.11	
1981	7.97	-2.23	3.40	-10.38	2.51
1982	-0.22	6.93	6.30	-0.18	2.20
1983	-0.46	15.45	7.80	-5.85	2.16
1984	2.63	30.49	12.20	6.17	2.13
1985	9.58	11.60	10.20	8.34	2.08
1986	-8.02	3.69	8.30	11.30	2.01
1987	14.97	-0.75	3.30	0.95	1.93
1988	0.84	0.38	5.79	-3.41	1.85
1989	2.85	3.96	1.62	2.88	1.77
1990	-3.72	2.73	1.82	-9.46	1.69
1991	1.37	-1.99	7.06	0.15	1.64
1992	4.89	-2.64	-0.13	-4.15	1.95
1993	-0.07	1.58	4.95	8.31	2.21
1994	5.45	6.16	4.19	6.95	0.44
1995	4.08	3.73	7.63	1.99	0.81
1996	3.11	5.98	6.00	2.14	1.36
1997	-0.83	5.27	5.90	3.15	1.71
1998	1.27	7.44	5.19	-3.36	1.47
1999	7.95	0.05	1.33	-2.57	2.28

Source: (IBGE, 2002b)

State intervention and ISI policies reduced the dependence in terms of international markets, at the beginning of the industrialisation process, with beneficial results for the industrialisation. The following discussion will clarify that when the government adopted ISI between the 1940s and the 1970s, industrialisation became central to the Brazilian rapid growth. But with the second oil shock and high indebtedness, manufacturing came to a prolonged slow down until late 80s, to regain growth under trade liberalisation from 1993 to 1997, as the growth rates in Table 3.1 demonstrate. The decrease in the growth rates in 1990-92 was caused by the depression.

The change in the industrial policy, in the 1930-40s, marked a U-turn in the Brazilian economy, which can partially be attributed to the strong external shocks caused by the Great Depression and the Second Word War. Moreover, since many newly introduced plants had excessive idle capacity due to imports reduction during this period, the government was forced to intervene (Baer, 2001). In fact the government took over many industrial activities from 1930, which only went back to the private sector in the 1960s and the 1990s. For instance, the success of ISI and infant industry protection, in the first period, was confirmed, since output increased 33% from 1930-32, and 66% from 1929 to 1939 (Furtado, 1988).

Concerning the external market, the Brazilian government emphasised imports up to 1930 due to the dependency on the revenues from import duties. For instance, until 1899, 66% of government revenue came from import duties. In 1930 the government introduced domestic intra-states trade duties, to compensate for the import reduction, due to the Great Depression (Vasano, 1996). However, in the 1940s, the relative low importance of trade duties enabled the government to increase tariffs as an industrial policy, which inaugurated the ISI period. For instance, the 1946 Constitution allowed the government to set inter-state export taxes up to 5% (BRAZIL, 1946).

There was, however, a social cost for ISI policies, which introduced two main distortions in the economy: subsidies to local producers and high tariffs to imported goods. First, to stimulate local industries up to the point that international trade became less important as a source of income, the government had to spend a considerable sum in subsidies and tax exemptions. Second, for controlling imports the state had to spend more in organising the bureaucracy, which was far more expensive than the previous one, since besides collecting taxes there was a need for organising the distribution of subsidies and the tariff exemptions.

Because of the domestic market size, even with such incentives, the number of firms in each industry could not increase enough to insure the appropriate

competition level. Moreover, due to the need of imported technology international groups of steel, automobile, computers and many other industries were not sufficiently attracted by the protection schemes. So the government set up state companies in some sectors and increased the pack of incentives in others, such as automobile, to attract TNCs. The most important industries like fertilizers, chemical industries, pharmaceuticals, paper and pulp, among others, have also been populated with giant state owned corporations and TNCs. As a consequence, the domestic market ended dominated by TNCs, large state owned corporations, and few private local groups until the 1990s, when privatisation took place. The exception was the partial privatisation of banks and insurance companies in the 1950s (Abreu, et al., 1998; Willmore, 1992). To complement the framework of the trade reforms, the institutional changes that accompanied trade liberalisation will be summarised in the next subsection

3.2.2 The 1990 Institutional Environment

Trade reform success depended on the outcome of other reforms, as discussed in chapter two. Hence, this subsection's objective is to describe the implementation of these reforms, which began by the reinstallation of a civil government in 1985 and a new constitution in 1988. Based on the efficiency argument, the changes in trade and industrial policies will be described to highlight the importance of trade reforms to manufacturing. Other reforms undertaken in the late 1980-90s, such as privatisation and stabilisation programmes under the IMF/WB lending packages, enhanced the conditions for trade liberalisation. The state reform, for instance, has been in continuous implementation, due to its complexity and to political and institutional uncertainties.

In Brazil the first reason for privatisation was the government's budget deficits. But the basic discussion on competition, efficiency and consumer satisfaction was an issue only for some industries, such as the telecommunications, energy and many manufacturing firms (Bonelli, 1998). Thus, although trade liberalisation was not benefiting from an improved general economic environment, the budget constraint reasons for privatisation coincided with the competition and efficiency argument for manufacturing. Yet another reason for privatisation was the classical difficulty of state officials to manage manufacturing firms, which implied modernisation to stop the use of state companies for political purposes. The old system ended up encouraging technological backwardness. Hence, privatisation also forced the implementation of modern managerial practices together with up-to-date techniques and machinery.

Nevertheless, beside privatisation other fundamental reforms were finance deregulation, and trade liberalisation to balance for the danger of monopoly power (Baer, 2001). With trade liberalisation providing extra-competition on the goods markets, price stabilisation was encouraged simultaneously avoiding shortages in the markets. To confirm the importance of trade liberalisation for prices, Table 3.2 summarises the political and economic changes and emphasises the frequent change of ministries of economy and finance between 1985 and 1994. For instance, in 1985 and 1992 there has been two ministers and in 1993 three.

Table 3.2. Political Changes and Economic Cycles

Year	President	Economy Ministry	Stabilisation Plan	Currency	GDP Deflator	Cycle
1980	Figueiredo	Galveas,			92.14	Recovery
1981		Galveas,			100.53	Recession
1982		Galveas,			101.03	Recession
1983		Galveas,			131.48	Recession
1984		Galveas,			201.74	Recovery
1985	Sarney	Dornelles, Funaro,		Cruzeiro	248.54	Recovery
1986		Funaro	Cruzado	Cruzado	149.18	Recovery
1987		Bresser-Pereira	Bresser		206.21	Recovery
1988		M. Nobrega	Beans-and-Rice		627.95	Recession
1989		M. Nobrega	Plano Verao	Cruzado Novo	1304.42	Recovery
1990	Collor	Z. C. de Melo	Collor I	Cruzeiro	2736.97	Recession
1991		Moreira	Collor II	.	416.68	Recession
1992	Itamar	Moreira, Kause		Cruzeiro Real	969.01	Recession
1993		Hadad, Rezende, Ricupero			1996.15	Recovery
1994		Cardoso, Gomes	Real	Real	2240.17	Recovery
1995	Cardoso	Malan			77.55	
1996		Malan			17.41	
1997		Malan			8.25	
1998	Cardoso	Malan			4.85	
1999		Malan			4.59	

Source: (IBGE, 2002c; MEF, 2002b)

The inflation also marked the period until 1993 with enormous variation, since the GDP deflator reached the level of 100%, in 1981-83 and 200% in 1984. Inflation increased rapidly since, reaching more than 1300% in 1989. In spite of the extraordinary 1990 stabilisation plan, that year inflation reached more than 2700%

(Collor I). It was temporarily reduced by a second shock (Collor II) to rise up to 2200% in 1994, when the Real Plan of Stabilisation ended this tendency. The extraordinary measure included in the Collor I plan consisted in freezing all financial assets and bank deposits, thereby depressing demand to control inflation. Liberalising imports to allow plenty of supplies was a central piece of the 1990 stabilisation plan that lasted throughout the further shocks. The introduction of a strong trade liberalisation measure had the intention to control probable collusion and other anti-competition practices that undermined similar stabilisation plans before. In fact, imports liberalisation was able to increase supply and maintain the firms under the threat of imports. Due to the political crisis in 1991-92 and to the recession cycle, which recovered in 1993-94, since the period just after 1990 was of a certain degree of instability, making the firms to stay in a "wait-and-see" strategy (Bonelli et al., 1997).

Turning the discussion to the exchange rates, the chart in Figure 3.1 below indicates that, in the years before 1990 there was an appreciation of the local currency, as measured by the amount of local currency needed to buy 1 US$.

Figure 3.1. Real Effective Exchange Rates (End of Period and Average)
(Index 1989=100)
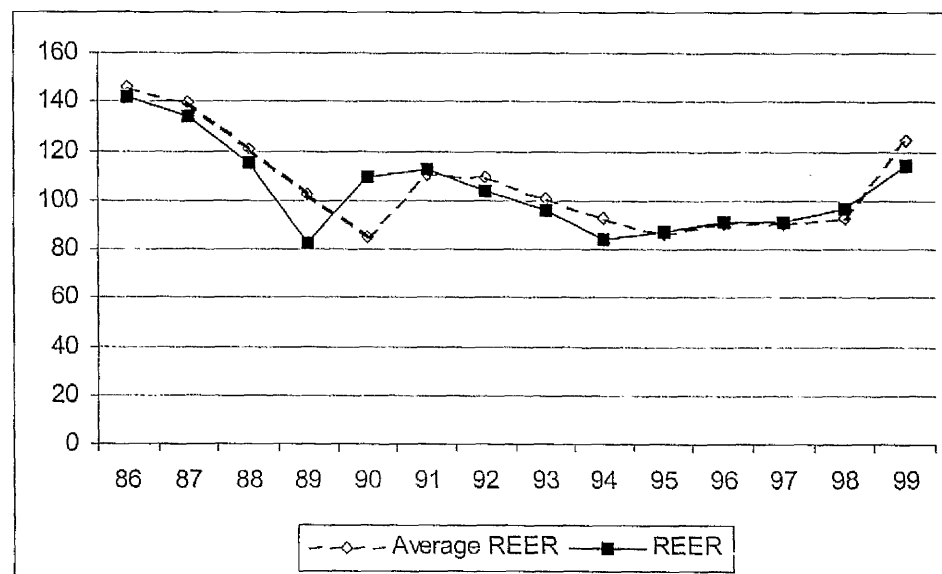
Source: (BACEN, 2002b)

The index showed that, from 1986 to 1990, this amount was reducing, implying appreciation; but after the introduction of trade liberation this amount increased, which meant devaluation up until 1992, when a new appreciation occurred until 1994, followed by a devaluation, which accelerated in 1999. With inflation and exchange rates under relative control, there has been stability in 1994-99, in spite of the international turmoil from the Mexican, Russian and Asian crises, which also

contributed for delaying structural and political reforms. To better understand the process of trade liberalisation the next section will describe the evolution of trade reforms.

Section 3.3   Trade Reforms in Manufacturing

This section will describe the changes in trade policies after the ISI policies in the 1980s, which finished by trade liberalisation in 1990, briefly mentioning the first attempt to liberalise in 1969-71, which was reversed due to the oil crisis. The introduction of such policy reforms has been conducted within the complexity of the government institutions and organisations, which emphasised the process of changing the legislation. This regulation had been in place for more than 40 years as the institutions that underpinned the ISI bureaucracy and other protection schemes. Hence the objective of this section is to describe the tariff reduction in Brazil in 1990, and the adoption of the measures to eliminate the institutions in charge of such policy, which constituted the dismantlement of the non-trade barriers and the introduction of other government programmes. The next subsection will discuss the industrial policies during the ISI period.

3.3.1   The Period of ISI Policies

As discussed earlier, tariffs and quantitative restrictions were the basic trade policies at the beginning of the industrialisation process, from the 1930s through the 1950s. To overcome the many market failures that were impairing the introduction of manufacturing, the Brazilian government ended up by enforcing a complete package of ISI policies in the 1940s that lasted until 1967. It was made up of quantitative restrictions and licensing procedures to protect the infant industry and to promote ISI for development. Besides protecting local producers the government stimulated large national projects, like roads, railways and automobile plants (Franco, and Fritsch, 1994).

The first change came in 1967, when the government started structural reforms, based on the newly established political order by the military coup in 1964. The period of 1968–73 became known as the 'Brazilian miracle' because of high yearly GDP growth (11%) (Bonelli, 1992). By privileging infrastructure investments such as road projects (Transamazonian for example), chemical products (Petroquisa: chemical and petrochemical state owned company), and paper and pulp plants (Jari, in the Amazon, which was a private project by an American TNC, and Aracruz, in the

Southeast, which was a state owned pulp company), among others, included in the II PND (Second National Plan for Development).

In 1967 the economic reforms introduced a more realistic exchange rate by establishing a market rate, which was later converted to a crawling-peg system to cope with the oil crisis. The government also eliminated the long-lasting multiple exchange rates, which have given rise to rent-seeking behaviour and distorted trade. Further export incentives were also implemented, on the basis of the institutional reforms, which included changing import tariffs, and export subsidies (Flynn, 1978:383). However, the oil crisis hit hard the Brazilian financial structure, which was based on external debt causing the reversal of many liberalising policies, in order to keep the level of foreign currency needed to pay for oil imports. The consequences of such kind of indebtedness were aggravated by the high international interest rates in the 1980s, as Figure 3.2 shows. But during the 1990s, interest rates were not threatening policy reforms, which helped the progress of the trade reforms.

Figure 3.2. International Interest Rates (%)
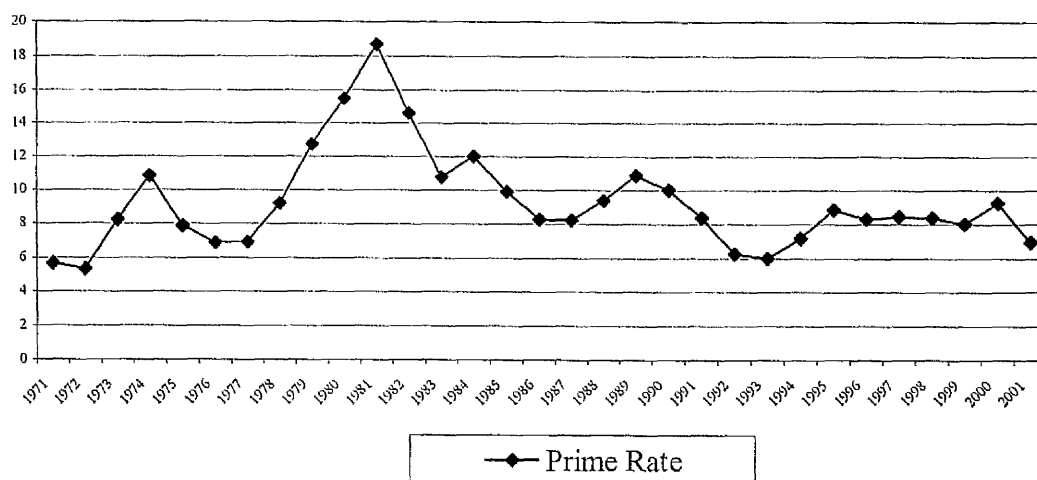
Source: (BACEN, 2002a)

To cope with the debt crisis, in the 1980s, the government introduced strong import controls. But to maintain the economy running it also introduced many exceptions to the import regime. The consequence was that the external sector became completely distorted and by the process of linkage to other sectors this distortion was transferred to domestic markets. For instance, in 1989, Brazil was operating 42 special import regimes, which in fact allowed every incumbent firm unlimited imports, at lower tariffs; but prevented newcomers from doing so, and had a large effect on prices, by rent

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seeking behaviour (Franco and Fritsch,1994). Licensing decisions were made on a case-to-case basis, since the Carteira de Comércio Exterior (CACEX), which was the licensing agency, implemented a consultation scheme with the industrial chambers (Câmaras Setoriais), which were dominated by the trade associations. The industrial chambers were given the power to allow or bar import licenses directly on the CACEX computer system. With this mechanism, trade associations were delegated power that extrapolated their role, since their decisions became crucial for projects and policies.

These kinds of controls and import restrictions resulted in discouraging investors, as the low levels of FDI inflows during the 1980s confirmed. The reason for that was the intervention from trade licensing agencies in the process of investment. In fact the licensing bureaucracy was taking the place of the government bodies in terms of industrial strategic planning. Every time that a project had import licenses refused overall costs increased far from reasonable levels, which impeached the investors to accomplish their plans (Franco and Fritsch, 1994).

There were, however, other political explanations for the changes in trade policies in 1989-90, when budget constraints were explained by increasing government expenditures, which beside the high interest rates in the 1980s, which inflated the debt, was also depressed by the state reforms promoted by the 1988 constitution. For instance, the law increased civil servants' benefits, and budget transfers to federal states, to local governments, and subsidies to regions (Vasano, 1999). Moreover, a range of new federal and regional agencies that was created claimed for officials, installations, etc. Minimum wages, which were not applied to public servants and pensioners, have been extended to everyone. All those measures increased government expenditure by more than 100% in real terms (Veloso, 1999).

The above description of the changes in government expenditure contributed to the urgency for reforms such as trade liberalisation, which had the benefit of effective price control and increasing market supply, without government funds. Thus, trade liberalisation came with the stabilisation programme, as a complementary measure to increase competition, and as an alternative to the failed price controls. Since the effective introduction and maintenance of trade liberalisation was granted after the stabilisation plan in 1993-94, the discussion now turns to the trade reforms mechanisms in the next subsection.

3.3.2 The Process of the Trade Reform

The objective of this subsection is to describe the process of trade reforms in the 1990s by tariff reduction and by the elimination of NTBs, such as subsidies to producers. To understand the process of changing tariffs, first one needs to know that the bulk of the Brazilian tax regulation was embodied in the 1988 Constitution. Constitutional changes needed the approval of two thirds of each parliament house, in a two-round vote, which made the reform process very long. Fundamentals, like tax denominations, tax originating events and the basic principles were at constitutional level, although tax rates could be set by a presidential decree, provided that the appropriate tax line was in the law (Bonelli, et al., 1997; Vasano, 1996).

Besides its rigidity this legislation was also increasing bureaucracy and application errors. For instance, for the sake of easing possible future changes, the government included as many tax lines as possible in the law, having many 0% rates. The long process of including everything in the text of the law was subjected to reversals and errors. For instance, many tax reform attempts are delayed in the Congress for long years without final approval (Vasano, 1996; Vasano et al., 1998). As an example of the government policies, Table 3.3 below gives an idea of the changes in tariffs and trade rules during two years (1994-95).

In this table the tariff changes for basic products such as petrochemicals, fibres and medicine were still reflecting the political aim to control inflation by liberalising imports. Many authors criticised this policy on theoretical grounds, based on Michaely et al (1990). These authors basically indicated that reducing tariffs at this low level (zero percent) without a compensatory strong devaluation of the local currency would harm the industries (Kume, 1998). However, there was great difficulty in determining the proper level of devaluation required by a tariff reduction in such circumstances (Corden, 1987). Nevertheless, in 1990-94 the introduction of such tariff changes came as a complement of the industrial policies, which were in the process of implementation (Kume, 1996a).

However, the real effective exchange rates, as discussed earlier, were in accordance with the theory above, since they were devalued after trade liberalisation, although a certain level of appreciation was seen in 1994-95 to justify the tariff adjustments. There has been increasing tariffs in consumer goods as Table 3.3 shows, which was intended to balance for the previous tariff cuts. For instance, industries such as toys, cars and tyres had tariff increases. Others had non-tariff barriers raised to

compensate for the appreciation of the REER in 1994-95 (Vasano, 1996). Finally, there was a balance on the introduction of trade liberalisation, which switched first from strong protection to liberalisation, and second it adjusted individual industries, in order to maintain price stabilisation and competition.

Table 3.3. Main Alterations in Tariffs and Trade Rules – 94/95

Date	Document	Goods	Tariff (%)	Change
11/3/94	PRT 119	Medicine, Hygiene,	2	-
24/3/94	PRT 145	Iron, Steel, other minerals	5	-
14/4/94	PRT 214	Food, Tyres, condoms	2	-
19/5/94	PRT 288	Toys	30	+50%
25/5/94	PRT 300	Medicines	20	+900%
14/6/94	PRT 327	Paper	0	-
16/6/94	PRT 334	Hygiene (other)	2	-
12/7/94	PRT 422	Tires	15	+750%
24/8/94	PRT 472	Fertiliser	4 to 6	(CET, anticipated -)
14/8/94	PRT 492	Car, Lorries, electronics,	20	20 (CET, anticipated -)
23/9/94	PRT 506, and 507	Every Product	Variable	(CET, anticipated -)
10/2/95	Decree 1391	Car, Lorries	32	+ (out of CET)
29/3/95	Decree 1427	Car, Lorries	70	+100%
11/4/95	Decree 1453	Corn, Petrochemicals	0	-
27/4/95	Decree 1471	Many	Variable	CET Exception List
28/4/95	Decree 1475	Many for ZMF	Variable – Quotas	+++
10/8/95	PRT 201	Food, petrochemicals	2 to 70	+
30/8/95	PRT 13 MICT	Toys	NTB – Conformity Licenses	+++
14/11/95	PRT 282	Lithium composts	43	+
14/11/95	PRT 282	Cover	70	+
26/12/95	Decree 1761 and 1763	Cars, Lorries, bikes	NTB – subsidies, 35 (conditioned to incumbents or planning to establish plants)	+ for non incumbents, - for incumbents

Source: (Kume, 1998; MEF, 2002a)

Basically, the Laws 8032/90 and 8034/90 established trade liberalisation, with massive reduction of tariffs and elimination of NTBs. Tax exemptions for local producers were suppressed at the same time. These laws introduced 0% tariff for inputs and capital goods and banned all import prohibitions and import suspensions that had been in force. Particularly, the legislation eliminated the

famous Annex C, which in the Decree that fixed the Mercosur External Tariffs (CET) included more than 5000 lines with provisional quotas and special tariffs. Moreover, in 1990 to keep the pressure on the markets and avoid reversals caused by the bureaucracy, the government used the "big bang" strategy for the trade reform, closing down the agencies charged of industrial policies, ISI supervision and import licensing, with the exception of the Conselho de Desenvolvimento Industrial (CDI) or Industrial Development Committee, which had its role redesigned.

Generally speaking, however, there was confirmed evidence of trade liberalisation, which was quick and deep in manufacturing, according to some authors, and slow and superficial according to others (Bonelli and Hahn, 2000). The methods and procedures in the state bureaucracy and in the import license agencies were not changed as quickly as needed due to the legislative process, as mentioned above. Thus, the implementation of industrial policies to cope with trade liberalisation and the reforms of the state bureaucracy, which will be dealt with in the next subsection, had a central role in the process of trade liberalisation. As the changes in trade policies were also based on the government agencies and institutions, their role will be described in the next subsection.

3.3.3 Government Agencies, Industrial and Trade Policies

This subsection has the objective of describing the influence of government agencies on trade and industrialisation policies, since one of the aims of the policy changes was to change the agencies' "modus operandi". During the 1970-80s, the government agencies played a central role in depressing the level of imports, according to the policy designed to restrict imports and encourage industrialisation. Basically, four government agencies were involved: the Comissão Interministerial de Preços (CIP) or price control committee, the Comissão de Politica Aduaneira (CPA) or Customs Policy Committee, the Carteira de Comércio Exterior (CACEX) or the foreign exchange department of the Banco do Brasil and the CDI.

Originally, the CIP was in charge of setting retail price ceilings, which could offset imports when combined with the high tariff protection that caused imports' prices to be above the ceiling. The CDI had the duty of implementing industrial policies, particularly those targets in the PND II. After the extinction of the PND II in 1985 this agency was charged of scanning license applications for local content, according to the minimum established in the licensing procedures. Local content requirements varied according to the financial scheme for importing, and for clearing

the corresponding foreign exchange. For instance, it was set at 85% in value, if some credit was granted by the Banco National de Desenvolvimento Economico e Social (BNDES) or by the Agencia Especial de Financiamento Industrial (FINAME) (Bonelli, et al., 1997). Since every project of firm or plant installation was to some extent under one of these industrial credit schemes, they necessarily would need to cope with local content requirements. For instance, in the first half of the 1980s, the amount of investment under CDI was between 0.5% and 0.8% of the GDP (World Bank, 1990). This policy targeted particularly intermediate goods, such as chemicals, pharmaceuticals, electrical equipment, aircraft, shipbuilding, etc., since these were concentrating the gross of the import licenses under the government credit scheme. Another important indicator is that in 1984 the CDI was responsible for 43% of the investment in pharmaceuticals and chemicals and 34% on cement industry (Franco and Fritsch, 1994:75).

The CPA was directly interested in the formulation of import policies, with the objective of organising the customs and excise offices. This agency was created for introducing the "ad valorem" tariffs in 1957, to balance the collection system and make tariffs an effective import barrier, according to the ISI policies. Later, it had increased its discretionary powers in licensing imports mainly by checking the applications for industrial incentives and subsidies schemes, instituted by the CDI. Every import operation was also scrutinised by a fourth agency, which actually issued all the import licenses: the CACEX, which was the foreign exchange operator.

Furthermore, some industries found themselves ruled by other agencies simultaneously, when participating in government programmes and subsidies. For instance, wheat mills had rules on capacity utilisation and import quotas, as a supplementary measure to insure that the levels of production would be achieved and the ceiling prices would be respected. Hence, wheat importers and retailers were submitted to the secretary for trade and industry for the capacity levels, to the CACEX for the import quotas, and to the CIP for the price ceilings. They were also controlled by the CDI and the CPA for industrialisation programmes, tariffs and quotas. Coffee producers and exporters were scrutinised by the Brazilian Coffee Institute (IBC) concerning exports levels and prices, besides the agencies above.

This system often increased inefficiency within the industries, in the name of an industrial policy, which built on a long list of exceptions to the import tariffs, i.e. the special import regimes. However only by the fact of making use of extra

bureaucracy, which was not cost neutral, the system resulted in high anti-export bias (Bonelli, 1994; Franco and Fritsch, 1994).

Furthermore, the decisions on technology and machinery disadvantaged the whole manufacturing, since firms had to wait longer and pay more for imported technical progress in the form of machines. As a result, the firms were kept locked in an old fashion production scheme, which was intensified by the poor level of skilled workers, in the labour force. The old fashion technology argument for trade liberalisation was emphasised by authors describing the low productivity and low competitiveness of the Brazilian manufacturing as compared to other NICs. They attributed this gap to import restrictions that offset technology improvement (Werneck, 1983). In fact, government agencies and officials were actually able to chose the firms or groups that have claimed protection, so they could benefit. But this system ended up worsening the society welfare by excess protection, less competition and increasing privileges to particular firms (Werneck, 1998).

Import licensing to the public sector, however, was submitted to other government institutions beside the agencies already mentioned, which until 1990 were consulted when state owned companies and government offices applied for imports. The most famous was the Secretariat for control of state companies (SEST), installed in 1982 to control the expenditures and administrative practises of the state owned companies and organisations. SEST's role included fixing annual import quotas and controlling for their adequacy and fulfilment, which was complementary to a 1976 legislation, which already forced government offices to establish triennial import plans (GATT, 1993).

A second restriction came in the form of government procurement regulation. The Decree-Law 2300 of 1986, strengthened import controls for the government offices, since it established that "preference has to be for Brazilian enterprises when tender bids are equivalent in terms of prices, contract and delivery" (BRAZIL, 1986). The Law 8666/96, which substituted Decree-Law 2300, did not bar government and state companies imports; but left some controversy by not removing the Decree 123/91 that established local content at the minimum of 60%, for government procurement (BRAZIL, 1991). Concerning government procurement restrictions to trade liberalisation, although tests for similarity were banned in 1990, the rules were still having doubtful interpretation.

Because of the existence of these federal agencies and requirements, setting up the necessary changes and adaptations to introduce trade liberalisation

required a strong administrative and political effort. Although trade liberalisation came under the principles of increasing competition and non-discrimination against industries and trade partners, conflicts of interest emerged between industrialists, who preferred the old ISI scheme, and the new trade and competition policies. Nevertheless, the state reform at that point was definitive, with the closing down of most of the agencies described above, with the exception of the CDI.

Summing up, in the period of 1990-94 the first effort to introduce trade liberalisation was the closure of four government agencies dedicated to enforcing import controls, together with the dismantlement of the consultation with trade associations to issue import licences. This last measure allowed effective openness, since small firms and independent importers began to have access to import licenses. Thus, all the dismantlement of the old import control agencies became a central instrument to consolidate trade liberalisation, together with the tariff reduction and the elimination of quotas and other non-tariff barriers. The next subsection will describe the industrial policies, and the new government agencies that were established after 1993-94 to replace the closed ones.

3.3.4 The Political Framework: the Role of the New Agencies

The new government elected in 1994 moved the reforms forward, with the introduction of new agencies, to shape the new industrial and trade policies, together with other reforms. The objective of this subsection is to describe the introduction of new government agencies and offices, which were created and reorganised in the aftermath of trade liberalisation. Their aim was to conduct the industrial and trade policies, under the principles of competition and innovation. The government actions, after introducing trade liberalisation, focused on the establishment of new institutions, and a new set of industrial and trade policies, according to the principles already introduced in the legislation, such as the respect to international engagements: the Mercosul and the WTO.

For instance, in 1995 the International Trade Chamber (CCE) was created by the Decree 1386/95 with the mission of examining regulation projects and providing expert reports on trade issues, including bilateral or multilateral negotiations as a guidance for the government and companies. Besides the CCE, the government promoted changes in the Trade Secretary (SECEX) as part of the Ministry of Trade and Industry (MDIC) including four departments:

- DECOM, responsible for the Trade Defence (dealing with anti-dumping, anti-trust, subsidies and unfair tariff from partners);

- International Negotiations, responsible for the implementation of the CET (Mercosul Common External Tariff);

- DECEX, covering the former CACEX licensing and controlling roles, when necessary;

- Trade Policies and a co-ordination Department.

Source: (Bonelli, et al., 1997)

These new offices were set up to support the Trade Defence Committee (CCDC), which was implemented by the government by the 'Portaria 14/95', as an inter-ministerial committee, composed by the SECEX, the Inland Revenue and Excise Office (SRF), the Planning Secretary, the Foreign Affairs ministry, and the Agriculture ministry. The CCDC was a new version of the CPA disappeared in 1990, and had the mission of establishing the import-export policies, with tariff and non-tariff barriers advice, provided that the international agreements were respected (Bonelli and Hahn, 2000; Oliveira, 2000).

Finally, new regulation on EPZs (Export Promotion Zones), which affected particularly the Manaus EPZ, which was located in the capital of the state of Amazonas, was introduced. This EPZ comprehends industrial districts dedicated to electronics, car-parts, computers and other intermediate industries, whose proceedings are mostly re-exported. In that context, the government re-introduced tax exemptions and drawback regimes for the exporters. Although tax exemption for imports, which would compose exported products, and drawback regime for imports as export promotion schemes, had been introduced in 1964, these policies had never worked as an engine of export growth. By concentrating these schemes in EPZs the government intended to reinforce exports and outward orientation. It compensates domestic producers that were threatened by international competition (Bonelli, et al., 1997).

The "Portaria MEFP 56/90" applied the new regulation to more than 3000 items, in the famous Annex V, with contained the list of banned and suspended imports and also extinguished the previous import projects, which were required from state owned companies. Imports of computers and software, however, were liberated in 1991, because they needed specific legislation; hence the law 8248/91 cancelled the previous law 7232/84, known as 'market reserve' for information technology goods.

To compensate local producers due to the increasing competition from imported goods the government implemented institutions and programmes aiming to improve product quality and productivity, which would strengthen local manufacturers and increase their capabilities. The most popular programmes were:

- PCI (Programme of Industrial Competitiveness) based on the PICE (Industrial and International Trade Policy, established in the Portaria MEFP 365/90 by the Ministry of Economy and Finance;

- Pacti (Programme of Technological Training), based on the law 8661/93;

- PBQP (Brazilian Programme for Quality and Productivity), based on the PBQP "termo de referência" from the Ministry of Trade and Industry;

Source: (Bonelli, et al., 1997; MDIC, 1991;1995).

Within the PCI the first attempt to build an industrial policy was the introduction of the Executive Groups of Industrial Policy (GEPs) in 1988, which lasted until the Sectoral Chambers were established in 1991. The main difference between the GEPs and the sectoral chambers was that beyond government representatives the sectoral chambers included trade unions' representatives. Both had the objective of bridging the gap between policy-makers and enterprises by exchanging information and proposing actions. They were both abandoned by 1995.

However, the most important government actions under the "Pacti" were undertaken within the Brazilian Design Programme, which had the objective of developing local designs and projects, to increase the domestic products aggregate value. It was supervised by the Ministry or Trade and Industry (MDIC) and the Ministry for Science and Technology (MCT). For instance, the software quality project Softex 2000 with the objective of improving software quality and exports was under the MCT. Organised in terms of technological training and trade enhancement these programmes focused more on organising forums and seminars, rather than delivering subsidies. In spite of the efforts, these programmes did not jump the barrier of being only good intentions (Bonelli, et al., 1997). Although there were many reasons for their partial fiasco, the PBQP programme that was linked to ISO certifications became successful and popular with the manufacturing firms.

Two explanations were essential for the success of the PBQP: first, the customers around the world began to require quality certifications such as ISO 9000, which the programme made accessible to firms. Second, increasing international competition by foreign suppliers, which was a consequence of trade liberalisation,

forced the firms to search for quality improvement. Beside ISO 9000, some domestic firms or TNCs affiliates looked for the British Standards Institute and the German Standards certifications in order to sell abroad (MDIC, 1991;2002). The programme, as in the previous cases, focused on publications, organising seminars, conferences, and a national quality contest for the firms. The aim of the PBQP was to reorganise production lines in order to cut production cost and improve competitiveness. Beyond reducing costs the PBQP became popular as a means of acquiring ISO certifications and increase sales and productivity. Its popularity boomed after 1990 also showed the importance of trade liberalisation as a motivation for firms to seek productivity and product quality.

The main components of the PBQP, which were emphasised in the conferences, seminars, and the soaring consultancy businesses, to shape the firms for the new challenges, were the quality and productivity tools based on the industrial organisation (Maranhão, 2001). Beside the popular techniques like total quality management (TQM), which involved total quality control (TQC) and quality circles (QC), the PBQP was based on a comprehensive approach with a variety of techniques (Chaves, 2000b; Ferreira, 2002). These techniques were based on the Japanese management practices with a Brazilian flavour. The efforts were aimed to avoid excess of throughput time, intermediate stocks and unnecessary handling of parts and tools and teamwork development, which was based on the Deming method of increasing productivity and quality (Walton and Deming, 1988). The results according to the literature have been impressive in terms of economising time, spare material and intermediate products, which finally reduced costs with increasing quality. Just-in-time (JIT) techniques complemented the management efforts under the auspices of the PBQP (Sanches, 2001).

The long period of maturity of these policies, and the failures of other industrial policies were, in part, a consequence of the sliced distribution of the government offices, in order to please many politician in the government coalition (Amadeo, 1996). The result was that secretaries and ministers came from three parties, which indicated the state companies directors, and the two or three layers of bureaucrats in each office, in a fashion that each group of ministries and companies were assigned to a party. In such environment one can imagine how poor the co-ordination of any policy change can be, since it depended on many different agencies and ministries, as explained above. This political weak integration reflected on the fate of these three

programmes (PCI, PBQP and Pacti), since each one was assigned to different ministries, which were allocated to different parties.

Beside these programmes, another important industrial policy that was assigned to another government agency, which was not central until 1994, was the competition policy, assigned to the Administrative Council of Economic Defence (CADE), which existed since 1962 (law 4137), but was reformed in 1991 (law 8158) and 1994 (law 8884), as an inter-ministerial committee. These reforms reinforced the bureaucratic structure by the addition of two other government bodies: the Secretary for the Economic Law (SDE) from the Ministry of Justice and the Secretary for Economic Scrutiny (SEAE) from the Economy and Finance Ministry. These secretaries have the duty of analysing cases of economic power, and advise on the actions against market power like mergers and take-over, which have to be approved by the board of the CADE. Hence, the original mission of the CADE as an antitrust agency was enlarged, to accommodate preventing the building-up of monopolies and oligopolies by establishing regulations beside judging cases of market power (Andrade and Serra, 2000).

Summing up, after 1993-94 the new government strengthened the previous strategy of trade liberalisation, which was focused on the dismantlement of the protection agencies and structures, to build up a series of new programmes to encourage domestic firms to face the increasing competition from imports. Nevertheless, these institutions were carefully established in order to avoid reversals of trade liberalisation. The automotive regime, which allowed for 50% reduction in the external tariffs for the TNCs with projects of establishing plants in Brazil, was agreed with the Mercosul. An important policy was the elimination of consultation with trade associations to issue import licences altogether with the sectoral chambers, which reduced the power of the incumbent firms in each industry to influence import licenses. Now, after establishing that trade has been liberalised and the industrial policies for the aftermath of trade liberalisation were in place, measuring the levels of trade liberalisation that has been achieved becomes of crucial interest and will be discussed in the next section.

Section 3.4   Tariffs, Effective Protection and Non-tariff Barriers

The objective of this section is to present the measures of the trade liberalisation in manufacturing, which were realised by tariff and effective protection rates reduction and the elimination of non-trade barriers. These measures will be crucial to establish the level of trade liberalisation and to enable the evaluation of its

consequences in quantitative terms. The first measure will be tariff reduction, which allowed imports increase after 1990, confirming the tendency of openness of the Brazilian economy (Kume, 1998:154). Overall tariffs were reduced mainly by the anticipation of the common external tariff for the Mercosul (CET) in 1994, which set the tariff levels close to international levels. Since there were basically three measures for trade liberalisation, the next subsection will discuss the first of them, which was nominal tariff reductions.

3.4.1 Trade Reform by Tariff Reductions

The objective of this subsection is to describe the nominal tariff reductions in 1990-91, since after that period the gradual implementation of the CET was the only major tariff change. Some authors considered that the bulk of the reforms was concluded by 1990 in spite that the new institutions and agencies would need time to become operational. Trade liberalisation actually took four to five years, and the Brazilian government was constrained by the WTO and the Mercosul, which ruled most of the implementations and allowed a variable period for the countries to adapt their legislations and procedures (Kume, 1996b).

Beside the description of the tariff reduction, measuring the nominal tariff will be discussed to clarify the scope of trade liberalisation in Brazil. For instance, the difficulties in measuring the tariffs, as mentioned in the literature are: "1) the existence of secondary tariffs; 2) exceptions and exemptions to the scheduled tariff; 3) tariff redundancy; 4) aggregation problems" (Greenaway and Milner, 1993: 64) Describing the impact of tariffs, the first and the second problems were not easy, for the Brazilian tariff schedule had more than 12,000 lines. For instance, at the same time that cars were taken out from the prohibition list, the road tax for imported cars, trucks and motorcycles was set 25% higher than road tax for cars produced internally. This combined with higher insurance premiums was effectively increasing import barriers. Redundancy was common before 1990, but has been mostly eliminated, as described earlier, when the import prohibitions were suppressed. However, the aggregation problem had to be dealt with, in the description of the tariff lines, since the analysis was based on the Brazilian classification of economic activities, which mimics the UNIDO three-digit classification. Moreover, with the reforms of 1990-91 not only tariffs were reduced, but they were re-established as the main policy instrument in substitution of non-tariff barriers. This was achieved by the elimination of the cumulative effects of

tariffs and quotas for the same industries and by ending the redundancies in the protection schemes (Franco and Fritsch, 1994).

However, following the ban of import prohibitions and the tariff reduction in 1990, the introduction of the Mercosul external tariffs (CET) in 1994 was an important step. For instance, between 1994 and 1996 almost 90% of the Sistema harmonizado – nomenclatura brasileira de mercadorias (SH-NBM) were submitted, at least, to one tariff alteration, and almost all of them were reductions. More than 70% of these changes were carried out to adequate tariffs to the CET; and 17% of the tariff lines underwent more than three tariff changes (Baumann, et al., 1998).

The government document Industrial and International Trade Policy (PICE) mentioned earlier has motivated changes in tariffs included in the tariff tables (MEF, 1990). The same government directive admitted exceptions for the industries under special circumstances in the international agreements, such as textile (Gatt/94 Micro-fibre Agreement), cars and auto-parts (Mercosul's automobile regime) and some chemical, and toy industries (Mercosul exception). Table 3.4 below presents the average manufacturing tariffs during the process of trade liberalisation, emphasising the reduction from 38.5%, in 1988, to 13.2% in 1993 when most of the changes were in place, with the exception of the progressive reductions in the CET (Baumann, et al., 1998).

Table 3.4. Weighted Nominal Tariffs during the Trade Liberalisation Process (%)

	Jul-88	Sep-89	Sep-90	Fev-91	Jan-92	Out-92	Jul-93
Average	38.5	31.6	30	23.3	19.2	15.4	13.2
Weighted Average[*]	34.7	27.4	25.4	19.8	16.4	13.3	11.4
Minimum Tariff	0.2	0.1	0.1	0.1	0	0	0
Maximum Tariff	76	75	78.7	58.7	48.8	39	34

Source: Kume (1998 :149)
Note:* 1. Weighted by the MVA of each industry, in a situation of Free Trade
2. The detailed tariffs for each industry are in appendix.

However, in 1996 exceptions to trade liberalisation were still in place, though the Brazilian trade partners were already familiar to them. For instance, the first exception list of protected products was the Dallari List[7], which constituted exception to GATT rules in the Uruguay round. It had 60 textile, milk and clothes products and has been implemented as the exceptions list to the Mercosul with the addition of other products such as motor vehicles, electro-electronics, etc (Bonelli, et al., 1997).

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[7] It is named after the Brazilian negotiator in some sections of the GATT's Uruguay round that came out with this exception list and the adaptation period argument.

For the Mercosul, some temporary protection instruments were allowed for five years, constituting the country's "list of exceptions", with tariffs higher than the CET. However, just the need for negotiating this list with the partners and the presence of a time limit confirms an improvement towards trade liberalisation. To summarise the protection that such lists provided, the Mercosul list for consumer goods was limited to 300 products and the Brazilian list had 233 in 1996. Capital and intermediate goods had 900 items in the exceptions. Although higher tariffs had a commitment to converge to 14% by 2001, it did not happen entirely due to crises in the region. Computer and telecommunication products were a list apart, with 200 items that are to converge to a tariff of 16% by 2006 (BRAZIL, 1996a).

After the expiration of the delay determined in the Decree 1427 (1/4/96) the government set up a new timetable for many industries to comply with the Mercosul rules, with tariff reduction of 2, 3 or 4% each year, until 2001. Further negotiations will occur with the Mercosul partners, on the following industries: sugar, textile, milk, clothes, shoes and automobile, since these are the bulk of the consumer goods exception list. Due to tariffs being somewhat imperfect measures of protection, they were complemented with non-tariff barriers, which will be discussed in the next subsection.

3.4.2 Non-tariff Barriers

The objective of this subsection is to describe the levels of the non-trade barriers, to emphasise the indirect costs that such barriers added to the imported goods, since the previous description of the government agencies, and other bureaucracy already provided an idea of such barriers. However, the mechanisms of such barriers needed some more detail, since the most impressive NTBs were linked to the foreign exchange operations, which always added transactional costs to the import operations. The methods of measuring NTB's are based on documentation and restrictiveness. Documentation varies from the simple listing of the NTBs to approaches that measure their impact. The most common is the coverage ratio, which consists in the proportion of tariff lines that are subjected to NTBs. Restrictiveness constitutes an attempt to measure the NTBs impacts on domestic prices (Greenaway and Milner, 1993). Since none of these measures were available for the Brazilian manufacturing during the period analysed, the simple documentation of the most binding NTBs will be analysed as a consequence of the previous description of the government institutions and agencies for controlling imports.

First the form "Guia de Importação" that had to be prepared for every import operation, with previous clearance of the foreign exchange, and three kind of taxes, were the most notorious paper-work cost. This was eliminated by trade liberalisation. Second, there was a tax on financial operations (IOF) with variable rates, from 1.5% to 0.5% after trade liberalisation. Third, there was a tax on the maritime freight prices (AFRMM) which was fixed at 25% of the imports freight costs and collected as a contribution to the national merchant ship fleet Fund, which also was reduced. Fourthly, there was a tax for the improvement of the ports (TMP), which was eliminated. In terms of restrictiveness, these taxes added 28% to the cost of imported goods (Kume, 1989). In 1994 the government set up a tax on bank accounts (IPMF/CPMF) at rates of 0.20-0.38%, which was cumulative, since it incurred to every amount taken from the account. For alleviating NTBs and anti-export bias, exported goods were exempted from other cumulative taxes such as PIS/PASEP and CONFINS, which were calculated as 1.5% of the wages paid and 0.65% of the turnover respectively by a provisory legislation (MP 1312/96), which was later made definitive (BRAZIL, 1996b;c).

There were a group of NTBs based on safety, technical and antitrust regulations, although Brazil was not a regular user of such NTBs before 1990. The law 9019/95 regulated the Gatt/94 regarding issues on competition, subsidies and dumping practises. By that law and the decree 1602/95 on antidumping rules, the decree 1751/95 on anti-subsidies rules, and the decree 1488/95 on safeguards for health and safety, imports were fully scrutinised to protect competition (MDIC, 1995). The advantage of such legislation was that it avoided imposing import licensing, as a means for controlling for these issues, but the agencies were allowed to act on demand, or after complaints by local firms. The only licensing procedures that lasted were related to health and hygiene (Baier, 2001; Feenstra, 1997; Motta, 1991). Nevertheless, Brazil has more and more been a frequent user of WTO complaints, mainly against other LDCs (China, Russia and India) for antitrust and dumping cases, particularly involving cars, planes and steel, beside agriculture (Piani, 1998).

Export promotion was another form of protection for local producers by restricting imports combined with re-exporting obligation. This was associated with EPZs, such Manuas EPZ as discussed earlier. Since export promotion, when it was not harming importing or discriminating foreign suppliers, was allowed under the WTO, the government reformed the old system of EPZs reinforcing export promotion and drawback. Beside the Manaus EPZ, in the state of Amazonas, the Northeast region also

had tax exemptions, and cheap public credits to attract firms on the basis of promotion of deprived regions (Bonelli, et al., 1997).

The automobile regime, which was agreed under the Mercosul legislation as an exception to trade liberalisation attended to the lobbies of domestic established TNCs. It reduced automobile imports by independent importers, since it introduced a 50% tariff reduction (35% instead of 70%) for the TNCs that intended to build a local plant. As a result of this situation, in 2005 Brazil was expected to count seventeen car makes produced domestically, as opposed to US, with eleven, the EU, nine, and Japan, six (Beting, 2000). These numbers showed the exaggeration of this policy of incentives and tax exemptions, which induced TNCs to set up plants in Brazil, in such large quantities. This is expected to introduce new distortions, since it seems unbelievable that many car-plants could survive long enough to make profits.

Nevertheless, tariff and non-tariff barriers were still a limited measure of trade liberalisation, since effectiveness became complete only when imports actually increased, which was assumed to be a direct consequence of imports prices reduction. Moreover, imported goods could be needed to produce other goods and services, escalating price increases in chain, when protection was high. Hence, there was a need for a more comprehensive protection measure such as the effective rate of protection, which is discussed in the next subsection

3.4.3   The Measures of Effective Protection

The main objective of this subsection is to discuss the levels of effective protection in manufacturing in Brazil, highlighting the 1990 reduction. Basically the effective rate of protection (ERP) measured the openness of the economy focusing on linkages between local producers and imports supply. ERP was defined as the rise of value added of a domestic product as a consequence of the imposition of a tariff or a non-tariff barrier (Corden, 1971). This was bases on the differences of value added of the activity "j" at domestic prices and value added of the activity "j" at international prices. All in one, the formula was:

Equation 3.1. Calculation of ERP:

Where:

$$g_j = (t_j - \sum a_{ij}) \times t_i / (1 - \sum a_{ij})$$

g_j = the level of effective protection to the activity "j"

a_{ij} = Free trade technical coefficient the activity "j" at international prices.

Source: (Kume, 1998)

Since there are different empirical methods for calculating the ERP, although the most popular were those by Corden and Balassa (Corden, 1971:35-38; Balassa, 1971). The differences between both methods came on the calculation of α_j. Corden (1971) used the formula below, which was also used in the calculations in this chapter.

To calculate the ERP for an industry, the average value added of each product and activity was used. The variable "g_j" in Equation 3.1 measures the effective protection given to each industry, by measuring the increased value added to these activities as a consequence of the tariffs (Kume 1998:155).

Equation 3.2. Formulation for the Technical Coefficients

$$a_{ij} = d_{ij}(1 + t_j)/(1 + t_i)$$

Where:

α_{ij} = free trade technical coefficient (measured by the share of the input i in the price of the activity j, at international prices)

d_{ij} = distorted technical coefficients (measured by the share of the input i in the activity j at domestic prices)[8]

t_i or t_j = nominal protection to activity j or input i.

Source: (Corden, 1971; Kume, 2000)

The 1985 input-output (I/O) table was the basis of the calculation of the technical coefficients (α_{ij} and d_{ij}), by the application of the tariff vector multiplied by the value added taken from the I-O table for each industry (IBGE, 1996;1997; Kume, 1998;2000). The summary of the ERPs is in Table 3.5 below, which indicated clear reduction in the average ERP of 50.4% in 1988 to 19.9% in 1993.

Table 3.5. Effective Protection Rates (%)

	Jul-88	Sep-89	Sep-90	Fev- 91	Jan-92	Out-92	Jul-93
Average	50.4	45	45.5	35.1	28.9	22.5	19.9
Weighted Average[1]	42.6	35.7	33.7	26.5	21.7	17.2	14.5
Minimum Tariff	54.5	-4.4	-4.3	-3.3	-2.8	-2.3	-2
Maximum Tariff	183	219.5	312.9	225.2	185.5	146.8	129.8

Source: Kume (1998:149)

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[8] Based on the Corden method, there is a possibility of separating the inputs in tradable and non-tradable, since the latter, by definition, would never be distorted by protection. But calculations with such sophistication did not held significant impact on the results (Kume, 1998:161).

The ERP levels, in Table 3.6 above, calculated under Corden's assumption of homogeneous distribution of tradable and non-tradable inputs, in each industry, were consistent with level of protection by the tariffs after trade liberalisation. This indicated the elimination of most of the NTBs and redundancies. To correct for distortions caused by redundancies in the I/O tables, the assumption of increasing slope for the supply of non-tradable goods was accepted, which implied that protection of one activity affected the prices in the same sense that it affect primary factor costs (Corden, 1971:35).

Table 3.6. Effective Protection Rates (Selected Periods) %

Industry	1986-87	July 1993	Dec 1994	Dec 1995	2006-CET
Automobile	308.10	129.80	44.60	270.90	53.10
Chemicals	62.90	12.80	9.00	5.20	16.10
Cloths	117.20	23.90	24.50	21.00	22.60
Coffee	73.70	12.70	10.10	11.80	11.80
Electronics	55.40	23.10	21.30	24.90	13.00
Electrics	88.50	26.10	26.30	31.30	20.40
Machinery	47.50	22.60	23.20	20.80	14.30
Meat Industry	43.60	10.00	7.10	9.70	9.80
Milk Industry	74.10	21.60	25.70	24.20	16.50
Mining	16.90	0.70	0.90	2.50	2.70
Miscellaneous	64.80	23.60	21.00	20.60	19.90
Misc. Chemicals	12.30	9.00	5.00	5.80	6.00
Non-iron Products	34.40	6.20	7.60	10.40	10.40
Non-metal Products	81.70	13.00	11.30	14.30	14.50
Oil & Gas	8.30	-2.00	-1.90	-1.90	-1.70
Other Food	118.90	29.70	22.20	23.90	25.10
Other Metals	88.40	22.70	19.40	21.30	21.20
Other Vehicles	73.30	21.30	21.60	21.00	14.40
Paper and Pulp	65.50	8.50	8.00	10.50	12.60
Petrochemicals	62.90	10.50	5.20	8.00	8.80
Pharmaceuticals	91.70	13.90	2.30	9.80	9.90
Plastics	31.40	21.50	24.40	23.30	22.30
Rubber	122.40	17.30	15.30	14.60	14.70
Shoes	96.90	15.10	15.60	21.30	15.80
Steel	30.90	10.70	10.20	12.90	13.80
Sugar	83.80	21.20	9.50	16.50	16.80
Textile	123.10	20.60	20.20	23.60	21.50
Timber	53.10	9.70	9.40	12.30	12.40
Manufacturing	67.80	14.50	12.30	12.90	15.40
Vegetable Products	121.60	18.00	17.10	23.20	20.70
Vegetable Oil	82.30	7.60	8.00	8.80	9.30
Average	77.53	19.22	14.72	23.72	15.62
Median	73.30	15.10	12.30	14.60	14.50
Minimum	8.30	-2.00	-1.90	-1.90	-1.70
Maximum	308.10	129.80	44.60	270.90	53.10
SD	53.63	21.85	9.67	46.52	9.15

Source: Kume (1998:165) and Kume (2000)

Note: The ERPs figures for the years in the period of analysis are in the appendix.

The next section will discuss the changes in exports and imports, since imports flows were an effective measure of trade liberalisation, and exports flows measured the links of trade liberalisation with the actual manufacturing performance.

Section 3.5   Exports and Imports

To compare the changes in trade levels this section describes the evolution of imports and exports, in the light of trade liberalisation. This indicates the actual level of trade liberalisation, since imports would signal the effects of reducing barriers by the penetration of foreign goods into domestic consumption and exports performance. Since trade reforms also aimed to include Brazil in the international arena, by eliminating the tariff barriers and the excessive protection, a strategic industrial policy based on programmes for productivity and performance could affect exports and imports. So this discussion are essential to the analysis of the matter.

Manufacturing imports and exports, as shown in Figure 3.3 below, clearly implied that protection, beside depressing imports before 1990, also had negative impacts on exports.

Figure 3.3. Imports and Exports
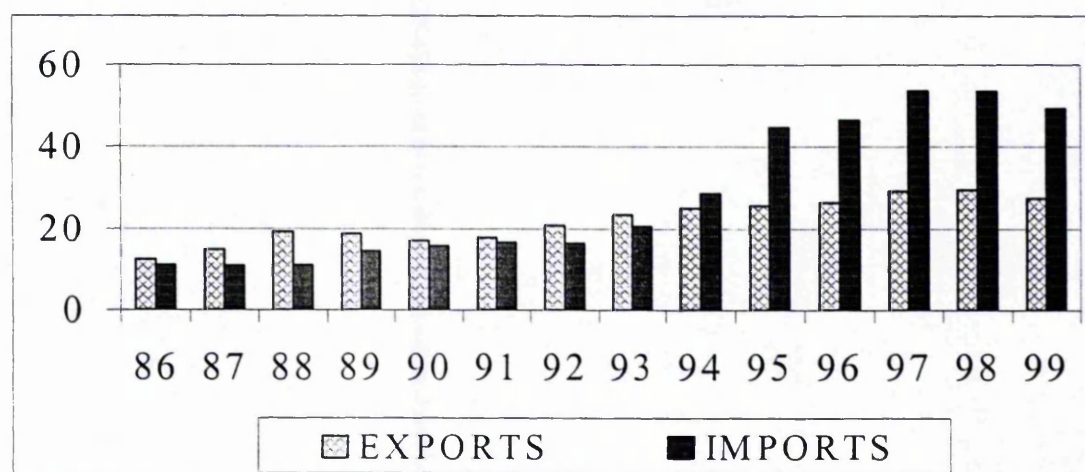
(US$ billion)
Source: FUNCEX (2001).

But exports grew less than imports after trade liberalisation. An explanation was based on the need for machinery and technology, in the first half of the 1990s. This was due to the poor conditions of manufacturing during the ISI policies, which generated inefficiencies and created industries based on old fashion technology (Moreira and Correa, 1997; Nassif, 2000). It is possible to see that exports grew at

almost 50% in 1992-97, and imports tripled in the same period, which was attributed to the use of trade liberalisation to control for inflation, as explained earlier. Naturally some sectors were able to increase exports more than others did. For instance, clothes, electronics, electric materials, other vehicles, paper, shoes, and sugar doubled the levels of exports, in values, in 1990-99. The others maintained the same levels, or increased less than 50%, like cars, machinery, coffee, vegetable products and vegetable oils. Since the elements of trade liberalisation have already been analysed, the next subsection will discuss in more detail the level of imports as a indication that trade has been liberalised.

3.5.1 Imports

Increasing imports was expected to be a very effective measure of trade liberalisation, since following tariff reduction and the elimination of NTBs. Imports levels became an indicator of the degree of freedom to import allowed to local firms. Hence, the discussion will focus on this indicator before and after trade liberalisation. However, considering the figures in Table 3.7 below manufacturing imports that were 2.72% of the GDP in 1990 increased up to 5.53% in 1996, which showed the effects of trade liberalisation.

Table 3.7. Imports related to GDP (%) – Selected Sectors

	1985	1988	1990	1993	1995	1996
Manufacturing.	2.72	3.03	2.72	4.12	3.94	5.53
Mechanic	0.58	0.74	0.67	0.86	1.17	1.18
Electric	0.36	0.44	0.41	0.58	0.86	0.92
Transport	0.24	0.17	0.16	0.53	0.10	0.60
Paper	0.06	0.09	0.08	0.10	0.20	0.18
Pharmacy	0.01	0.01	0.04	0.05	0.08	0.12
Plastics	0.08	0.08	0.08	0.15	0.23	0.23
Textile	0.03	0.07	0.10	0.27	0.33	0.31
Shoes	0.00	0.00	0.01	0.01	0.04	0.03
Food	0.04	0.00	0.02	0.03	0.09	0.10
Beverages	0.07	0.01	0.05	0.04	0.11	0.07
Tobacco	0.00	0.00	0.00	0.01	0.01	0.01
Toys	0.00	0.00	0.00	0.01	0.01	0.03
Oil	3.03	1.46	1.12	1.16	0.81	0.92
Total	6.43	4.87	4.31	5.83	7.26	7.12

Source: (IBGE, 1998).

Although trade liberalisation was in force from 1990, only in 1993 imports really increased rapidly, which was attributed to: 1) import anticipations by firms, due to the uncertainty generated by the political crisis of 1992-93; 2) depression cycle of 1991-92; 3) local currency overvaluation; 4) productivity rise (Oliveira e Silva, 1993). Productivity increase, in particular, could also have been a consequence of increasing imports, since the discussions so far justified that trade liberalisation allowed

for importing machinery and improving technology, which would have positive impacts on productivity. However, the Collor I Stabilisation Plan in 1990 froze assets and savings for 18 months, which caused a strong consumption depression and partially explained the delay of the effects of trade liberalisation on the import levels (Coes, 1994).

Import growth rates matched with GDP growth during the period of 1985-96. For instance, the already mentioned automobile regime partially undermined the success trade liberalisation in terms of pushing competition. It raised a tariff barrier against imports and imposed NTBs such as local content in a regressive basis until 2005. With this the figures on transport industry imports were 0.16% of GDP in 1990, then 0.53% in 1993; but fell to 0.10% in 1995. They rise to 0.60% in 1996 due to the external changes in the automobile regime, since some of its restrictions to imports were suspended by an WTO ruling. This illustrates the consequences of the changes in the automobile regime (Haddad, 1999).

Figure 3.4 below shows import ratios to domestic consumption and MVA, in percentages, in current prices, reinforcing the idea that imports increased more, as compared to MVA, than to domestic consumption, which emphasises the importance of intra-industry trade in manufacturing.

Figure 3.4. Imports/Consumption and Imports/MVA Ratios

(%)
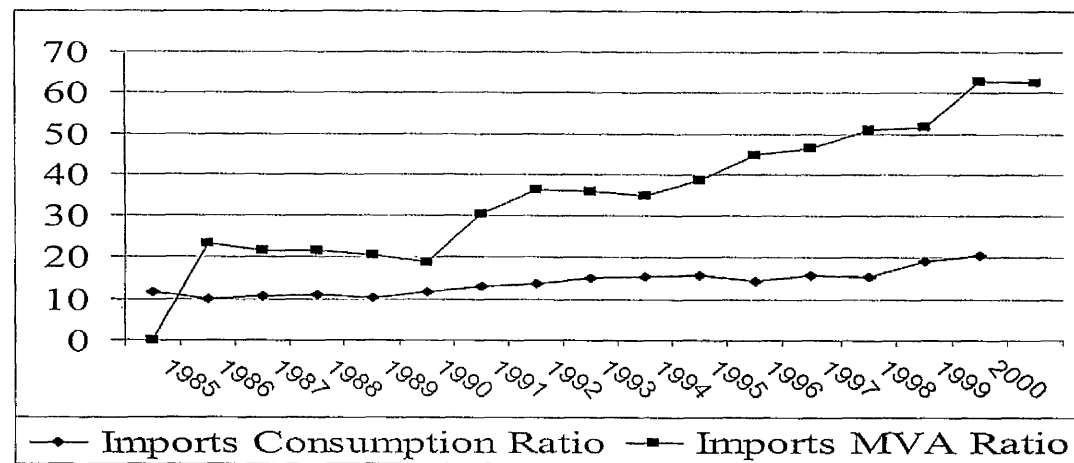
Source: (IBGE, 2002b)

Furthermore, some industries' imports showed high increase as related to the GDP changes. For instance, mechanic or machinery, electric, transport, paper, plastics and food increased imports by three fold. Pharmaceutical products imports, for instance, increased ten times, which can partially be attributed to the patent regulation in

1994-95 (Baumann, et al., 1998). The most impressive increase, however, came in the textile, where imports grew 100 times, after 1990. The traditional exporter industries such as shoes and tobacco also increased imports, which signalled that trade liberalisation reached every industry though with varied intensities.

After 1990, as a consequence of trade liberalisation imports/MVA rose sharply in 1998 to accommodate the domestic manufacturing. But as compared to domestic consumption imports rose with less intensity. The conclusion could be that until 1994 the firms were modernising production systems, which caused a slight increase on imports/consumption ratio due to the building-up of production capacity to supply the domestic demand. Moreover, Figure 3.4 shows a rise in manufacturing import penetration from 11% in 1985 to 12% in the late 1990, and a sharp increase to 20% in 1999 with trade liberalisation.

Nevertheless, the deadline is still 2005 for the Mercusul tariffs to converge, when discriminatory incentives will be suppressed. This indicates an important progress in terms of trade liberalisation. Moreover, according to the theory competitive threat and time delays for the firms to organise themselves will contribute to technical improvement and building capabilities. Since the firms' capabilities of competing with foreign firms would be better established by actual outward orientation, the next subsection will focus on the level of exports performance.

3.5.2 Exports

The objective of this subsection is to discuss Brazilian manufacturing exports, and to evaluate the consequences of trade liberalisation on export performance. Naturally, one of the aims of trade liberalisation was to empower the local firms with access to technology and inputs in order to raise their export capabilities by increasing efficiency and scale (Baumann, 1998). By analysing the changes in the export patterns and the intensity of increasing exports, this subsection will discuss the effects of trade liberalisation and the degree of outward orientation in manufacturing. Since export promotion schemes were implemented together with trade liberalisation, the increase in exports will be attached to the dynamic effects of trade liberalisation.

An important export policy change was the government's intention to restrict public credits for exports, which would be privately funded after 1990. First the government suppressed the programme for encouraging exports (BEFIEX), which was under the BNDES and the Treasury supervision. For instance, before 1990 the shares of this government export scheme increased from 35.5% in 1985 to 48.3% of total exports,

in 1989 (Franco and Fritsch, 1994). This meant that in 1989 the programme was financing almost 50% of the total exports, which also increased in values, since total exports were of 4.85 billion US $ in 1985 and became 8.98 billion US$, in 1989. Once BEFIEX was suspended in 1990, the exporters were encouraged to take foreign and private finance, which was a strong evidence of trade liberalisation by reducing state intervention in subsidising exports.

However, the government set up two other programmes to encourage exports: the FINAMEX, which was also controlled by the BNDES, and targeted specially capital goods, and the PROEX (operated by the Banco do Brasil, on behalf of the treasury), which was an equalisation of the interest rates, as a consequence of the domestic rates being higher than the international ones. FINAMEX was focused on machinery and intermediate goods exports. However, the scale of the credits allocated under these two programmes has been heavily downgraded, since their sum in 1995 was less than 650 million US$ (Bonelli, et al., 1997). In relative terms in 1998, the scheme financed 4.1% of exports, and 5% in 1999, which was low as compared to the years before trade liberalisation. This reinforced the commitment to finance exports privately (BNDES, 2002)

Analysing the changes in exports-GDP and MVA ratios in Figure 3.5, showed that the exports-GDP proportion has not changed strongly, although it decreased after 1992 up until 1998, which was attributed to local currency appreciation, which was reversed in January 1999 (Holanda, 2000; Jenkins, 1996; Kume, 2000).

Figure 3.5 Exports/GDP and Exports/MVA Ratios (1985-2000)

(%)

Source: (IBGE, 2002b)

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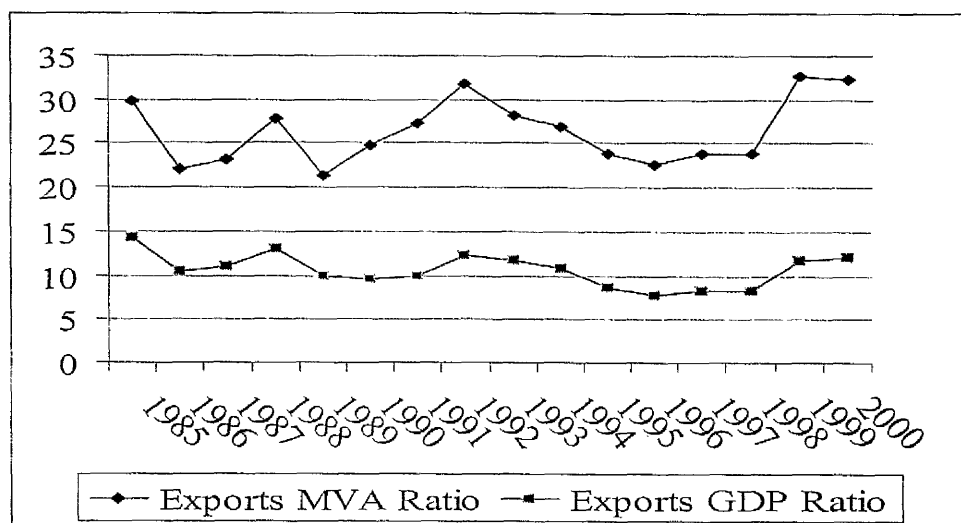
After 1994, the programme for exports incentive (PROEX) focused mainly on manufacturing, and in 1990-95 and covered a range of operations aiming to equalise interest rates to enable exports and mitigate the negative effect of the high domestic interest rates (Bonelli, 1998). Nonetheless, the bulk of exports was financed by private banks, insurance companies and other financial institutions. An example is the credit anticipation schemes (ACE and ACC) which consists of contracts of foreign exchange operations with six months in advance of the actual exports. They were similar to export notes, issued by foreign banks, and eventually hedged exporting contracts. 'Export securitisation' was regulated by the Circular BC 2717 from the Central Bank, allowing exports to insure debts related to export's contracts with domestic and foreign insurance companies (BACEN, 2000a).

Export performance after 1990, in terms of shares of the GDP, reduced manufacturing exports from 9.6% to 5.74% of GDP and total exports from 11.5% to 6.38%. One of the most affected industries was Tobacco, which reduced exports from 0.21% of GDP to 0.01% (100 folder less), as Table 3.8 shows.

Table 3.8. Exports Related to GDP (%)

	1985	1988	1990	1993	1995	1996
Manufacturing	9.60	9.03	5.93	7.97	6.11	5.74
Minerals	1.59	0.95	0.73	0.74	0.48	0.47
Metal	1.30	1.80	1.13	1.45	1.00	0.87
Mechanic	0.71	0.70	0.52	0.76	0.58	0.56
Electric	0.26	0.30	0.21	0.30	0.22	0.21
Transport	0.76	0.93	0.48	0.79	0.48	0.50
Wood	0.14	0.16	0.09	0.19	0.17	0.15
Paper/printing	0.25	0.41	0.26	0.37	0.40	0.26
Chemistry	0.47	0.44	0.29	0.38	0.32	0.32
Pharmaceutical	0.01	0.01	0.01	0.01	0.02	0.02
Perfumes	0.02	0.02	0.01	0.02	0.02	0.02
Plastics	0.18	0.21	0.10	0.16	0.12	0.10
Textile	0.45	0.39	0.26	0.32	0.21	0.17
Shoes	0.44	0.39	0.25	0.44	0.22	0.22
Tobacco	0.21	0.00	0.00	0.01	0.01	0.01
Toys	0.00	0.01	0.00	0.01	0.00	0.00
Oil	0.00	0.00	0.00	0.00	0.00	0.00
Vegetables	1.57	0.93	0.49	0.56	0.47	0.44
Total Exports.	11.50	10.24	6.56	8.83	6.76	6.38

Source: (IBGE, 1998) (Calculations by the author).

The interpretation for tobacco was partially because of international markets prices being lower than domestic prices. But, as this industry was highly concentrated and dominated by TNCs, changes in export performance can also be explained by companies' strategic decisions rather than market mechanisms. In 1993 the

toys industry had a significant export performance (0.01% of GDP); but this ratio fell again later. Textile and shoes industries, for instance, were heavy exporters despite 50% reduction on export-GDP ratios. The industries: electrical materials, transport, paper/printing, chemicals, pharmaceuticals, plastics and rubber also were strong exporters; but did not change their shares of exports in GDP. This was explained by the strategic trade conducted in intra-industry trade, which made up the bulk of these sectors (Moreira and Correa, 1998).

To sum up for exports and imports, there is a clear indication that imports grew faster after trade liberalisation, which is a strong evidence of policy change. However the effects that it could have had on export performance depended on many other factors, particularly on the pace of modernisation of the domestic industries and on increasing competitiveness. Since this section described the consequences of the policy packages that were put in place, to reduce the level of protection in the Brazilian economy, it was clear that imports increased in absolute and relative terms after trade liberalisation. But exports had not the same impressive performance, though the changes in industrial structure had also a positive result for exports, since manufacturing exports values actually decreased relatively to GDP as opposed to imports that increased.

Section 3.6   Conclusion

The discussion in this chapter showed a clear and significant degree of trade liberalisation that has been introduced in Brazil in 1990. This was evidenced by the falls in nominal and effective rate of protection, by the imports increase, and by the elimination of NTBs. The analysis of the effects of trade liberalisation on manufacturing productivity and performance will be based on this evidence and on the certainty that policy reversals did not happen afterwards. Although tariffs kept changing over time and some industries succeeded in partially resuscitating some trade barriers, particularly embedded in the automobile regime, it is clear that after 1990 Brazil has actually implemented trade liberalisation. The international institutions Mercosul and WTO had a crucial role in maintaining the reforms and preventing reversals. For instance, the automobile regime that rose some types of protection in 1994-95 must be agreed by Mercosul partners and had to match the WTO rules. The high level of ERP for carmakers in 1996 has fallen, when quantitative restrictions were abolished following

WTO ruling, which emphasised that the previous ISI policies were not allowed a return to the scene.

Beyond establishing that trade has been liberalised, this chapter discussed the institutions that conducted the implementation of trade liberalisation in Brazil. In spite of the complexity of the legislative system, the bulk of the laws on trade has been changed according to trade liberalisation. The dismantlement of the previous bureaucratic schemes devoted to protection which has been in place for almost 40 years, was achieved by 1990-91. Apart from the changes in the law and the bureaucracy, which supported protection, trade liberalisation efforts were supported by a change in macroeconomic policies, although those changes were submitted to a political crisis, which only stabilised in 1993-94 with the introduction of the Real plan of stabilisation. Hence, institutional issues, macroeconomic reforms and political stability, which were fundamental for the whole economy, came during a complex and long process and were reflected in the firms' behaviour.

The analysis of exports and imports highlighted that imports responded to trade liberalisation in an effective manner by increasing in absolute and relative terms, in every industry. Although not with the same intensity, exports also increased after trade liberalisation, which indicated that firms were able to enhance their performance to face foreign competition. Since it is clearly established that trade liberalisation was introduced, the argument now will seek for evidence of productivity rise in manufacturing. In the next chapter the labour and total factor productivity indexes before and after 1990 will provide the basis for the analysis. Furthermore, the changes in the Brazilian industrial structures, emphasising the elements that will determine the variables for estimating the models in the following chapters will also be discussed.

CHAPTER 4. MARKET STRUCTURES AND FIRMS' BEHAVIOUR

Section 4.1   Introduction

Structural elements of LDCs' industrial evolution were used in chapter two to explain changes in competitiveness, based on the assumption that scale economies play a central role in competitiveness, together with technology improvement. Different variables have been used in the literature to evaluate industry structures, such as concentration, size and market shares, capacity utilisation, ownership, and firms' turnover. The reason for targeting structural elements was the connection with the decision process, which directed companies' behaviour. In chapter three the discussion was on Brazilian policies through the process of industrialisation, and on trade liberalisation focused on the changes in tariffs, NTBs and the levels of imports and exports. In this chapter, the focus will be on the changes in manufacturing structures, and how they might have influenced the consequences of trade liberalisation.

Although industrial regulations and government interference in the competitive process may be important for building-up the manufacturing industries, the level of intervention in Brazil, as described in chapter three, was so high that it brought negative consequences in terms of entrepreneurial behaviour and efficiency (Fritsch and Franco, 1994). Evidence of this was rent-seeking behaviour by companies, since with a level of protection as high as it was in Brazil, many firms were able to find investments with increasing returns based on government subsidies and incentives. Moreover, government intervention made it difficult for companies to acquire technological capabilities, since the protection measures beyond tariffs and NTBs, used the so-called 'similar law' to prevent firms from buying modern equipment and technology. This kept many industries locked into old fashion machinery, software and equipment as substitutes for the imported goods (Allain, 1995).

In this chapter, the objective will be to describe the manufacturing behaviour indicators by the assessment of the firms' productivity and performance and market structure in each industry. The basic variables were taken from the national statistics on manufacturing, published by the Instituto Brasileiro de Geografia e Estatistica (IBGE), that is the Brazilian Institute for Geography and Statistics will be described, with the objective of setting up the industrial structures of manufacturing. The market structure variables are based on data from the Ministry for Labour and Employment (MTE), the Central Bank and the Applied Economics Research Institute

(IPEA). The basis for the analysis of the trade liberalisation will be the level of tariffs, and effective protection, already discussed in the previous chapter. Hence, this chapter describes a complementary set of variables, which will also be the basis for the analysis by the S-C-P model. The remainder of this chapter is divided in four sections, as follows: the second section describes the changes in manufacturing structures, the third discusses the firms' behaviour indicators; the fourth describes the market structure variables, and the fifth concludes the chapter.

Section 4.2   The Changes in Manufacturing Market Structure

The description of the changes in the structure of Brazilian manufacturing will be crucial for approaching the trade liberalisation effects on competition, costs, prices and margins within industries. The impact of the increasing number of firms by liberalising trade was found to be linked to market structure, as discussed in the second chapter for other LDCs. Thus, the objective of this section is to analyse the changes in the manufacturing structures, in Brazil, before and after trade liberalisation.

First, manufacturing value added (MVA) will be discussed, since, by the industries being factor specific the shares of each industry in the overall MVA were an indicator of capital, labour and technology intensity. Approaching the shares of each industry MVA will show the structural changes and the influences of government intervention, which distributed subsidies and protected industries in order to stimulate a certain kind of industry rather than others. For instance the most protected industries, such as automobile and computers were expected to have higher shares of MVA, which will be detailed in the next subsection.

4.2.1   The Shares of MVA

The shares of an industry MVA in the total manufacturing MVA showed the importance of such industry as compared to the others. Moreover, since the industries by their specific factors could be classified according to technology, capital, labour or natural resources inputs, the analysis will emphasise the kind of effects protection had on the manufacturing structure. A description of Brazilian manufacturing structure showed in Figure 4.1 divided the MVA into traditional and dynamic industries. These definitions followed the timing of their introduction to the Brazilian manufacturing, which was a consequence of the demand for final goods such as food, other consumer goods and the technological level involved. Traditional industries

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included consumer goods, food and beverage that have been established for long time. Dynamic industries included durable consumer goods, with dynamic A including infrastructure, packing, chemicals, plastics, metallurgy, rubber. Dynamic B: mechanics, electric and transport equipment, which had the basic characteristic of producing intermediate goods were technology intensive (Bonelli and Gonçalves, 1998).

The traditional group fell from 90 % of the MVA in 1920 to 35%, in 1975, 39%, in 1990, and 42% in 1998. The A and B dynamic industries grew respectively from less than 10% and 0% of the MVA in 1920, to 45% and 22% in 1975, and 43% and 19%, in 1990. They were at 41% and 19% in 1998 (Bonelli and Gonçalves, 1998). The rise of the technologically dynamic industries highlighted that these industries became central after the introduction of industrial policies in the 1940s. The particular emphasis of intermediate goods industries, such as mechanical and electrical material in 1975 was also a consequence of strong government intervention with the Second Development Plan (PND II). A return to traditional industries after 1990 seems in connection with trade liberalisation and FDI.

Figure 4.1. Changes in GDP Structures

(%)
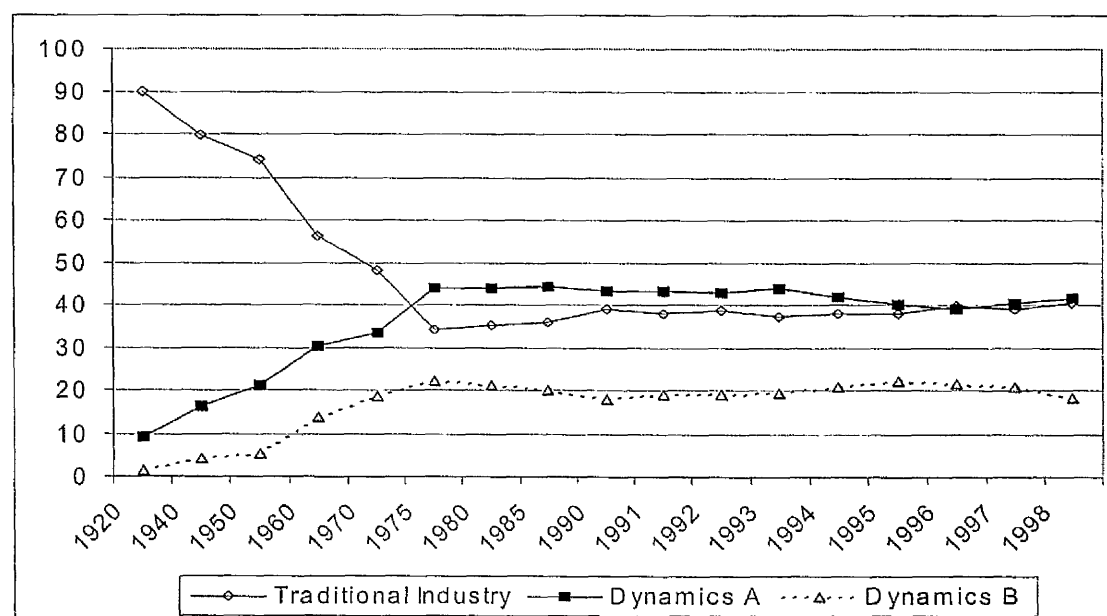
Source: (IBGE, 2002b) and Bonelli and Gonçalves (1998).
Note: The details by industry are in Appendix 1.

In terms of the timing of their introduction in Brazil, first came the traditional industries to supply the consumer market, second came dynamic A focusing on import substitution, and thirdly came dynamic B also to reinforce import substitution (Bonelli and Gonçalves, 1998). This classification has some pitfalls, as dynamism is more likely to be spread all over the sectors. Despite its limitation the concept of

dynamism highlighted the timing of establishing manufacturing firms in Brazil, and the government intervention by implementing ISI policies. For instance, government intervention encouraged the introduction of automobile TNCs for lorries and buses before 1950, and in 1959 for cars. Introducing electronics and communications needed some more time, since before 1990 TNCs' entry was not encouraged in those industries (Luzio and Greenstein, 1995).

Local machinery and electrical material industries were also encouraged by ISI policies, from the late 1930s, which prevented the entry of TNCs. But in mid 1980s TNCs were welcomed due to the first ban on the ISI policies by the adoption of SAL programmes to face the debt crisis (Amann, 2000). During the 1970s the government acted as investor or partner to TNCs, for the implementation of the called 'basic industries', such as chemicals, metallurgy and paper and pulp, which were classified as type A industries (Franco and Fritsch, 1994). As a result of this target, intermediate goods (chemicals) and machinery increased their MVA shares from 14.1% in 1967, to 27% in 1975 due to government intervention. This strategy involved protection, cheap credit and tax holidays to attract local and international investors. Hence, the ISI impacted the transformation of the country's economy from agriculture to manufacturing. However, the extension of such policies beyond 1980 for the reasons of current account deficits ended up by insisting in a kind of old fashioned production scheme. In the 1980s to overcome this situation policymakers agreed on attracting TNCs due to their technology and access to world markets, so the government agencies provided credit, infrastructure, subsidies and protection by trade barriers (Moreira and Pinheiro, 2000).

The structural transformations in the Brazilian economy were linked to the changes in industrial policies for a long time, since the introduction of intermediate goods manufacturing was due to the government policies in the 1950s, and to the PND II in the 1970s (Baer, 2001). However, the overwhelming protection, import substitution measures and the level of production and export subsidies resulted in an excess of inefficiency. This was mostly caused by intervention before 1990, which gave rise to excess capacity and low productivity (Moreira and Correa, 1997). Although the distortions were important, the basic effort towards industrialisation using ISI had never neglected state intervention, including even import prohibitions. This was a high price for the society to pay, particularly in the 1980s when import prohibitions weakened the industrialisation process by preventing imports of intermediate goods, such as computers and software (Franco and Fritsch, 1994). Since the changes in resource

allocation were in many occasions measured by the changes in employment, it will be interesting to assess how employment changed, before and after trade liberalisation, which will be discussed in the next subsection.

4.2.2 Employment Structure

One of the reasons for trade to influence economic performance and productivity was resource reallocation resulting from increasing trade operations in an open economy. Therefore as labour constitutes a basic resource, employment reallocation became a crucial issue to understand the effects of trade liberalisation on resource reallocation. The emphasis will be on the possibilities of labour movements in manufacturing, which was bound by the low flexibility of labour markets, in Brazil.

Two important surveys: the Pesquisa Nacional de Domicilios, or National Household Survey (PNAD) and the Pesquisa Mensal de Emprego, or Monthly Employment Survey (PME) provided employment data. But they could not provide firm data on costs and margins, which prevented their results to be used in the estimation of the models. However, they will be used in the form of charts to illustrate the discussions on employment.

Figure 4.2 below shows that general employment was submitted to a strong structural break in 1990. This was attributed to trade liberalisation, and to a less extent to state reforms, since those were spread over the period of 1990-1997. But as the general employment break coincided with trade liberalisation that was introduced in 1990, it is likely that trade liberalisation was the main cause of this change.

Figure 4.2. General Employment Index (July1993=100)

Monthly - 1986 to 2000)

Source: (IBGE, 2001c)

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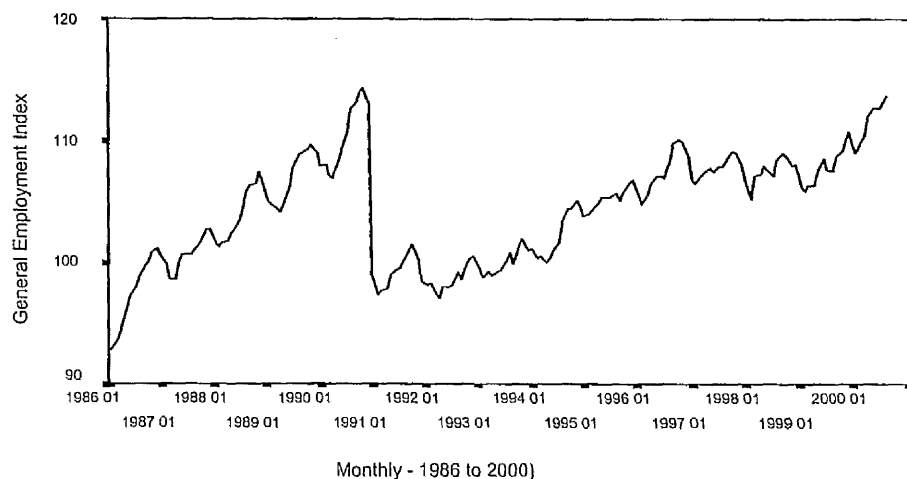
However, the changes in manufacturing employment had a different evolution: instead of a structural break manufacturing employment reduced constantly after 1990 as Figure 4.3 below confirms. Firstly, the efforts to industrialise by ISI and infant industry protection had important effects on the overall population structures and accelerated the changes in the workforce. For instance, from 80% in 1950, the rural population decreased to 20%, in 1999, according to the PNAD (IBGE, 2001d). Migration to urban centres was a result of industrialisation and everything that urban centres can offer to the population in contrast with the rural deprived areas, such as better health care and education, which came in combination with the modernisation of agriculture that expelled agricultural workforce.

Although general workers were not direct beneficiaries of trade liberalisation, they earned some advantages as consumers, since welfare increased by tariff reduction, NTBs elimination and increasing imports. As trade liberalisation was not reversed, trade openness was in fact used as an instrument to fight inflation, as mentioned in the previous chapter, which granted the benefits to consumers.

Figure 4.3. Manufacturing Employment Index (July 1993=100)

Monlly From 1986 to 2000
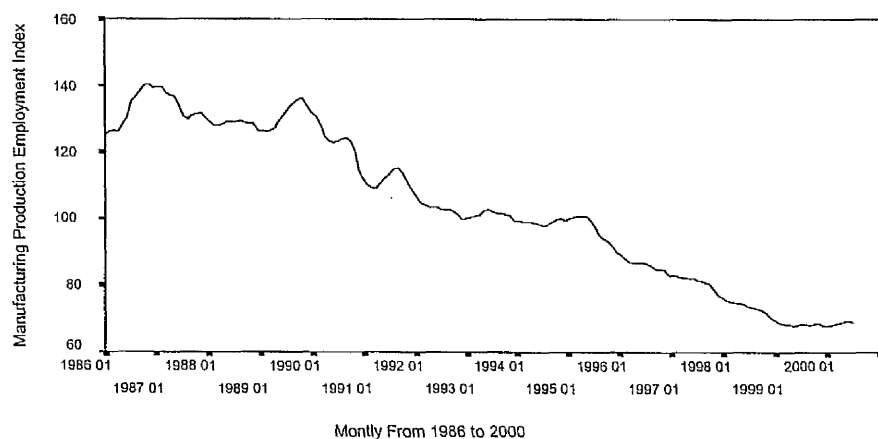
Source: (IBGE, 2001c)

Moreover, the presence of a large informal sector contributed to the flexibility of the overall labour market, which was a condition for employment reallocation (Barros et al., 1997). Manufacturing seemed to have strongly reduced the workforce, which decreased much deeper than general employment, as an evidence of reallocation movements. Net manufacturing employment losses in connection with trade liberalisation were estimated at 6% after 1990, which corresponded to 127,000 job losses in 1993-95 (Barros, et al., 1997). In the period of 1990-97 similar reductions were found and the overall job losses were estimated in more than 50% (Moreira and Najberg, 2000).

For better understanding of the trade liberalisation effects in employment, which were a central part of companies' costs due to the presence of indirect taxes and contributions, it is crucial to discuss the labour market rules in Brazil, since these regulations prevented firms from creating more formal jobs. Two sets of rules were in force: 1) rules on the benefits to workers and firms and government obligations; 2) rules on wages limits and wage increase. In 1994, Plan Real introduced some flexibility into the labour market with negotiations between employees and employers subjected to a minimum wage.

Other costs that became significant in the period after 1986, were: 1) 30 days paid holidays per year, 2) social security contribution at 20% of the wage bill;   3) wage rise following past inflation (every 3 months until 1987; every 4 month until 1989; every month until 1990; every 4 months again, until 1994, and then every year) (Urani, 1998). These rules added 102.06% to the wage-bill (Ramos and Reis, 1998). This tax load was the chief reason for dropping relative share of formal workers in the economy since 1988, in spite of growing total labour force (Urani, 1998). For instance, in 2000 the PNAD showed that from 87 million employees and self-employed, 50% were informal (IBGE, 2001d).

An indication of the impact of trade liberalisation on manufacturing employment structures was the fall in real wages after 1990, although this period also coincided with a depression phase, in the economic cycle, as Figure 4.4 below demonstrates. However, when the expansion phase came in 1994, which also coincided with the stabilisation of the economy, wages in manufacturing doubled and were kept high until 1999. Another outcome of these changes, which allowed this rapid increase of average real wages, was that these figures only counted for the formal workers, which after trade liberalisation, by the process of modernisation, were better paid, although in fewer numbers, as demonstrated in Figure 4.3.

Figure 4.4. Average Wages in Manufacturing

($1000Real/worker)

Source: (IBGE, 2001a;b)

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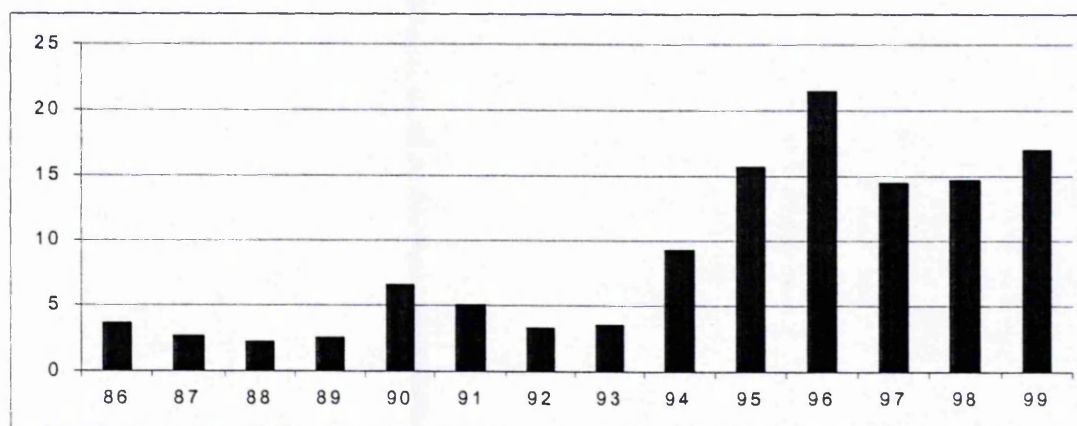
With strict legislation on wages for the formal sector, one must expect that the firms were prone to increase the levels of informal workers, which were ruled by informal contracts with no taxes (Urani, 1998). Manufacturing industries, however, had mostly formal workers, by many reasons based on structural characteristics of the labour market and the manufacturing sector. Most manufacturing firms were TNCs affiliates, which were constraint to a degree of legitimacy, which prevented them from having informal workers.

Furthermore, TNCs were not familiar with local culture and informal channels, which added greater risks to any informal operation. Like in other LDCs, the Brazilian government fixed goals to TNCs concerning employment, profits reinvestment and technology transfers, which were enforced by the Law 4131/62 (Bonelli, 1998). Moreover, TNCs needed to fulfil a certain level of bureaucracy to please the local government and their foreign boards. Hence, as a result of having few informal workers, manufacturing was less flexible in terms of labour reallocation, which was seen as the main cause of increasing wages after trade liberalisation.

Another reason for less flexibility before trade liberalisation was the workers' educational level required by the manufacturing firms, which also explained the high wages. Since high educational levels were rare within the population, there was a vicious circle of low level education and old fashioned production system, which made modernisation more expensive for the companies in terms of training costs. This could not be improved in the short run and education was kept at low performance by the government during the 1970-80s. Thus, this situation implied less skilled workers that compensated the lack of skills by being abundant and low paid for the international standards. This situation created labour inequality, which came from an unequal education system that was the results of old fashioned production schemes, which did not have demand for high quality workers. But to have better education people needed better jobs, since good education opportunities were in general connected to private schools. Thus having high numbers of low skilled workers to avoid high technology production schemes demanded extra protection that was provided by ISI and infant industry protection.

The introduction of trade liberalisation changed employment structures in manufacturing, due to the modernisation process, and broke the equilibrium described above. The new production system, based on modern equipment and machinery, whose imports was now allowed, needed other type of employees, better paid, but in much lower numbers. Hence, the vicious circle describe above was, at least,

partially broken by trade liberalisation. In spite of the few changes in the legislation, the proportion of informal workers also rose in manufacturing, which provided extra employment flexibility. Informal workers were engaged when needed, constituting a key condition for the reallocation process (Ramos and Reis, 1998; Urani, 1998). In chapter seven a description of the flexibility solutions adopted by the firms will be explored in more detail. Hence, the technical changes that came with trade liberalisation in 1990, which, although implying new skills and new employees, enabled the firms to lay off large number of old style employees. Thus, these changes in the manufacturing labour market were significant due to the combination of informality, changes in skills requirements and modernisation (Amadeo et al., 1994).

Summarising the manufacturing labour markets, in Brazil, it seemed that labour reallocation was effective and rapid, after trade liberalisation. Before 1990 there were many blockages by strong labour legislation, by a vicious circle of low skilled workers and old fashion production schemes and by controls on imports of technology goods. As import prohibitions and high tariffs were eliminated after trade liberalisation, the firms were able to import modern equipment, which enabled the lay offs. Labour legislation, however, has not been changed, in spite of the government efforts. But education has benefited from a boost, although skills and education were reforms for the long run. Nevertheless, in the aftermath of trade liberalisation, manufacturing employment fell drastically, although average wages increased, since the total number of employees resulted below the level of 1986. As a consequence of increasing output and modernisation, the average real wages finished 1999 three times higher than they were in 1990. Modernisation of the production schemes brought new technologies and was partially due to of trade liberalisation. Next subsection discusses capital reallocation.

4.2.3 Capital Structure

The objective of this subsection is to present the changes in capital assets in manufacturing and to discuss the effects of trade liberalisation on investment. Beside capital formation and investment in manufacturing, general infrastructure investment in public services, infrastructure and capital goods were often presented as important elements for increasing productivity and competitiveness (Ferreira and Milliagros, 1998). However, the description in this subsection will focus on firms' capital assets, for these were the investment that was directly connected to production and productivity. Moreover, the firms' capital assets were described, in development

models as an engine of growth and development, since the capital intensity is a determinant of economic growth (House, 2000; Solow, 1957).

Before discussing the capital assets figures, the firms' investments will be discussed, since the priorities set up by the firms contained important information about the changes in behaviour according to the changes in trade policies. For instance, in 1998 a survey on small and medium firms' investment decisions conducted by the Serviço Brasileiro de Apoio a Pequena e Media Empresa, or Brasilian service for the small and medium enterprises (SEBRAE) indicated that the exports oriented firms had different investment priorities from the domestically oriented ones. In manufacturing, among the firms already engaged in exports, 53.3% focused investments in ISO 9000 certifications, which emphasised the importance attached to these certifications, as a means for gaining international respect (SEBRAE, 1998). Moreover, 81.1% of the exporter SMEs invested in supplier development, which also emphasised the focus on product quality and performance, since ISO certifications combined with best suppliers, in terms of technology and equipment, would also enhance exports. However, non-exporters SMEs concentrated their investments in improving inventories, marketing and building new plants. With these different priorities, this survey result supported the idea that export orientation was linked to product quality and productivity improvement.

Capital allocation was also a result of state reforms, such as privatisation, which occurred mostly after trade liberalisation, although the first operations happened in the early 1980s. So, in 1981-89 38 privatisations took place, though concerning minor companies, since the net revenues were 726 million US$ (Lima, 1997). After 1990, however, the law 8.031/90 created the Programa Nacional de Desestatização or national programme for privatisations (PND), under which 18 large state companies were privatised generating 5.4 billion US$, according to the BNDES, which was the institution in charge of the privatisation programme. Another 15 privatisations were concluded in 1992-94 with 4.6 billion US$ revenues (BNDES, 1999). After 1995 the programme resulted in more 72.7 billion US$ revenues, which represented 85.3% of the total revenues in the 1990s (Pego-Filho et al., 1999).

Beside the changes in capital allocation linked to privatisations, which were, at least, indirectly connected to trade liberalisation, investment going to manufacturing changed in firms' assets in 1986-99. After trade liberalisation, the pattern of capital assets changed: total stock of capital, which was of 115 billions R$ in 1986, doubled until 1990, and was six fold in 1999, reaching the level of 650 billion R$ considering inflation (IBGE, 2001a;b). By 1999 some industries, like automobile,

electric materials, electronics and pharmaceuticals multiplied their 1990 capital assets by five. Others, like machinery, paper & pulp and plastics followed the general pattern and increased three fold the 1990 capital assets. Finally, there has been a group such as shoes and fur and clothes that although subjected to transformations ended the period with the same assets values as in 1990. All these changes seemed to be expected by the theory of trade and competition, since the industries that enhanced the technology to face foreign competition needed to increase capital assets. The ones that were already competing in the world marketplace, such as shoes and fur, maintained the asset levels, though they also introduced modernisation. After discussing the changes in capital assets, the attention will turn to the results of these changes in labour and capital structures, by analysing the firms' behaviour indicators.

Section 4.3   Behaviour Indicators

Trade liberalisation effects on productivity and performance would be a result of companies' behaviour, according to the discussions in chapter two. Moreover, the changes in productivity were analysed, in the literature, as a consequence of the strategic decisions by the firms, which were reacting to the policy changes, such as trade liberalisation (Krishna and Mitra, 1998). Based on these definitions, the model described in chapter five will approach trade liberalisation effects by the changes in behaviour variables. These variables will first be discussed in this section, with the exception of exports that have already been discussed in the previous chapter. Hence, the first behaviour variable to be discussed will be labour productivity.

4.3.1   Labour Productivity

The purpose of this subsection is to discuss the changes in labour productivity in manufacturing, before and after trade liberalisation. The high level of taxes levied on the total wages paid, as explained in the previous chapter, encouraged the companies to invest in capital goods and reorganisation to reduce the number of fixed workers, which would result in lower wages bills. Hence, two explanations were plausible for high labour productivity in manufacturing, after 1990 as compared to other periods: increasing wage costs and work organisation that encouraged companies to find ways to lay off employees. These two measures matched with the efficiency theory, and with the theory of industrial organisation and trade liberalisation was central to both. It encouraged competition and efficiency, and by allowing imports it provided the means for improving modernisation and productivity.

labour productivity was calculated with the formula below, concerning the calculation of single labour productivity, to the data based on the PIA, in order to take advantage this survey based on firm's data, although output was proxied by sales. The estimation of MVA was not accurate enough, because of the inclusion values of non-finished products, and on-goings, which lead to the use of net sales a proxy for MVA, for the estimation of labour productivity. The values from the PIA were deflated by the Indice de Preços no Atacado, or Gross Price Index (IPA) from the Fundação Getúlio Vargas (FGV). Although these data constraints were basically connected to the high inflation before 1993, the estimation of labour productivity followed similar studies in the literature (Bonelli, 1992; Hay, 2001). Hence, estimations of labour productivity were calculated as follows:

Equation 4.1. Labour Productivity

$$L_i = Y / L$$

Where:

Li = Labour Productivity
Y = Output
L= Labour used to produce Y
Source: Amann (2000:80)

The calculations were based on a dataset derived from the comprehensive database, which has been offered by the IBGE (PIA 1986 to 1999)(IBGE, 2001a;b). The advantage of using such a database was the opportunity to derive most of the estimations from the same dataset, which increased internal consistency. The results, for the whole manufacturing sector are in Figure 4.5 below.

Figure 4.5. Manufacturing Labour Productivity (Sales per worker)

(R$ 1000/worker)

Source: (IBGE, 2001a;b)

The calculations were therefore based on the number of workers as resources, which would give an accurate measure, according to the discussion in the previous subsection, since the majority of workers in manufacturing are formal. However some shortcomings were expected, as the level of outsourcing and part-time jobs increased after trade liberalisation.

The strong increase in labour productivity up to 1999 in some industries showed the importance of trade liberalisation in this matter. For instance automobile, electronic, electric materials, oil & gas, other vehicles, textile and vegetables increased 4 to 5 times their 1990 labour productivity index. Those that increased less almost doubled their 1990 labour productivity in 1999. These were clothes, shoes and fur and timber, which was consistent with their investment levels discussed earlier.

Figure 4.6 . Labour Productivity (Selected Industries)

(R$1000/worker)
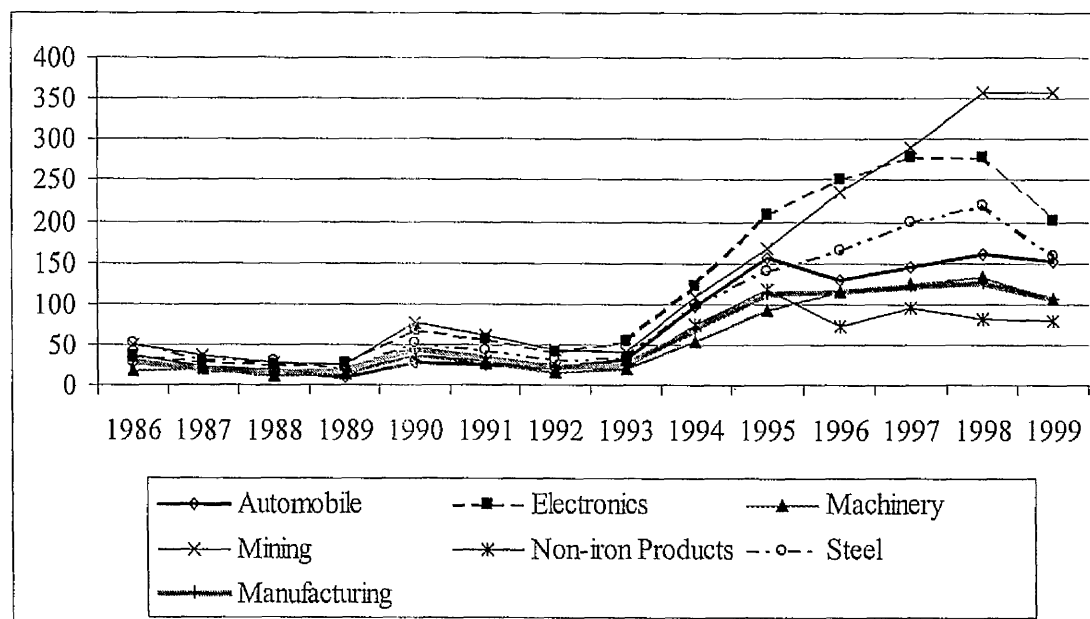
Source: (IBGE, 2001a;b)

Other estimations of labour productivity for some industries showed that high labour productivity levels were common after trade liberalisation. For instance, in 1980-89 the annual labour productivity average for steel was 3.7%, making Brazil second only to Germany with 3.9%. Moreover, after trade liberalisation the yearly average for steel industry increased sharply to 12.8%, although Germany was still leading with 15.5% (Amann, and Nixson ,1999). The US kept the average at around 7%, for the whole period, which was attributed to the fact that they did not change their import policies at the time. Japan increased labour productivity by less than 2%, which also can be explained by the previous period high productivity increase. Nonetheless, in

1970-73 the average annual labour productivity in Brazilian manufacturing grew faster than it grew in the two decades ahead, at 5.6% a year, as opposed to 1% in 1973-80. The average productivity growth followed GDP growth, which confirmed Verdorn's law (Bonelli and Fonseca, 1998).

Another approach to productivity gains was comparing LP growth with employment change, as presented in Table 4.1 below, which shows inverse relationship. This table shows that after trade liberalisation employment has been dramatically reduced in manufacturing, with the exceptions of furniture and soap/perfumes. But labour productivity increased. These results found support in the previous literature and in the discussions on employment in the previous section (Bonelli and Fonseca, 1998).

Table 4.1. Changes in Employment and Manufacturing Productivity: 1992–1997(%)

Sector	Employment	Labour Productivity	Sector	Employment	Labour Productivity
Overall. Industry	-21.2	58.1	Chemicals	-22.4	57.8
Mining	-39.9	113.2	Pharmaceutical	-4.1	37.3
Non-metal	-25.3	72	Soap, Perfumes	1.5	21.4
Metallurgy	-13	43.9	Plastics	-9.7	57.2
Mechanic	-26.3	72.1	Textile	-35.7	35.1
Electric	-11.9	80.9	Clothes/Shoes	-35	40.8
Transport Equipment	-14.2	83	Food	-17.5	42.7
Wood	-14.5	24.8	Beverage	-18.3	65.5
Furniture	8.7	33.4	Tobacco	-25.3	55.3
Paper and Cotton	-19.8	43	Printing	-	-
Leather and Fur	-13.9	-1.3	Rubber	-31.7	72

Source: (Bonelli and Fonseca, 1998)

It is interesting to highlight the importance of the changes in labour costs in some industries, for they had relatively low labour costs, when the hourly costs are considered. First, the steel industry showed the lowest labour costs, at 10 US $ per hour of labour, as compared to US, Germany and Japan, with 35, 40 and 36 US$ respectively, according to Booz-Allen and Hamilton (Amann and Nixson, 1999: 72, Figure 5). Mexico and S. Korea had labour costs almost the same as Brazil for this industry. The same pattern was repeated, when labour costs were measured as US $ per ton, with costs at 70-75 US$ in Mexico, S. Korea and Brazil, and at 150-200 US $ in the US, Germany and Japan (op.cit:73, Figure 8). From these figures, one can conclude that labour costs were a central issue for increasing labour productivity. The explanation of high labour productivity can be traced by the differences of labour costs that were clear for this sector.

Further literature on labour productivity in Brazil presented similar results for selected industries. Capital goods, especially shipyards, rail equipment, electrical equipment and mechanical equipment increased capital and labour productivity, after trade liberalisation, due to three complimentary mechanisms: reduction of government interventions, technical improvement and organisational modernisation (Amann, 2000). By the first mechanism, trade liberalisation substituted import restrictions and protection; by the second, production schemes were modernised to improve product quality; and by the third, the firms engaged on total quality programmes combined with training and education schemes. The gains from trade liberalisation came from the competition pressures in terms of quality and prices, which led to the option for reorganisation and the adoption of new technology. The same situation was found in steel and paper industries (BNDES/CNI/SENAI, 1996; de Paula, 1999a). To complement the perception of productivity, total factor productivity will be discussed in the next subsection.

4.3.2 Total Factor Productivity

The aim of this subsection is to present the estimation of total factor productivity (TFP) in manufacturing, and to discuss its changes as a consequence of trade reforms in 1990. To calculate total factor productivity, estimations of production, labour and capital inputs would be needed, as a basis to calculate single capital productivity, since single labour have already been discussed in the previous subsection. Hence, the step forward will be to discuss the formation of total factor productivity, by combining both single productivities and to extract the residual productivity, which corresponds to the output that exceeds the single factors' productivity.

In the literature, the three methods for calculating TFP were based on the production function. Economically, the first method uses a Cobb-Douglas production function, which was used in the classic development model (Solow, 1957). To estimate the product "Y", which is based on the production function ($Y=AL^aK^b$), GDP or MVA values were used, and calculations to find out the real levels of labour(L) and capital (K), consistent with the product (Y), would be necessary, to reflect the actual use of labour and capital (Bonelli, and Fonseca, 1998:279). The second was based on productivity ratios. The third method - growth accounting – was based on the initial identity between the value of the production and the sum of the payoffs to the factors of production, in the production function. Hence, TFP was calculated by a formula based on the growth rates of single productivity, as below:

Equation 4.2. Total Factor Productivity

$$TFP = y - al - (1-a)k$$

Where:
TFP = Total Factor Productivity
y = change in product
l = change in labour
k = change in capital
a = coefficients of use of labour and capital

Source: Solow(1957); (Bonelli, 1992)

Many arbitrary weights ("a" and "1-a") were used by authors to estimate Equation 4.2 with the main restriction that the weights should add up to 1. So the TFP estimate would be the residual, in an econometric estimation, since the changes in factors' inputs would be taken off the output changes. In the formula above, labour productivity was taken as the estimated before, and capital productivity (K), which originated k, was calculated as follows:

Equation 4.3. Capital Productivity

$$K_i = Y / K$$

Where:
Ki = Capital Productivity
Y = Output
K= Capital used to produce Y

Source: Amann (2002:80)

In the estimations below the "a" and "1-a" values were 0.3 for labour, and 0.7 for capital, under the assumption that for the modern industry the weight of the capital goods was dominant, since the lack of technology made them rare and socially expensive in Brazil (Bonelli and Fonseca, 1998; Marshall, 1992).

Figure 4.7. Manufacturing Total Factor Productivity

Index (1986=100)
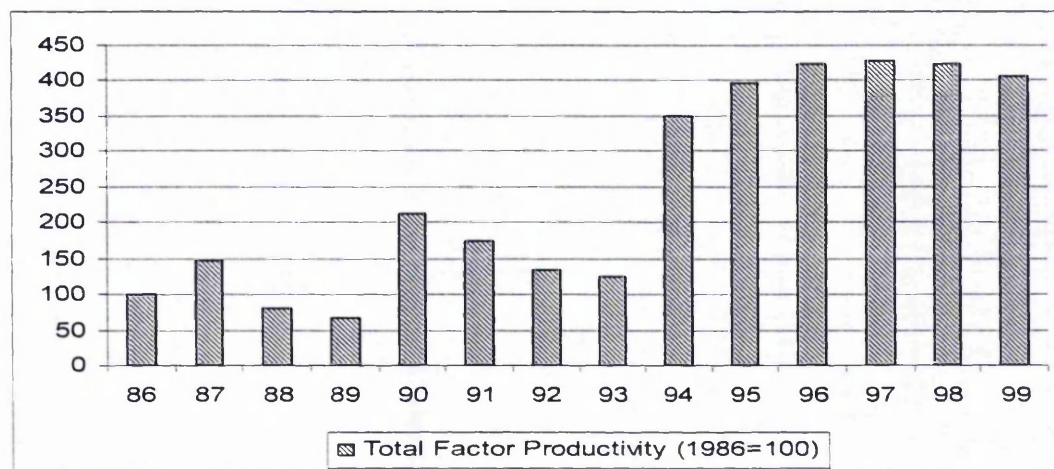
Source: IBGE (2001a,b)

Sensitivity tests were carried out, with different values for "a", in the production function, to check whether the chosen values would have strong impacts on the estimations, and earned similar results for 0.4 and 0.6. Another advantage of this method was estimating TFP, on the basis of single productivities (labour and capital), based on the production function. Figure 4.8 below shows that manufacturing TFP grew four fold after 1986, and increased faster in 1993-94. The estimations of capital assets included also unfinished products inventories following the calculations of total factor productivity of Brazilian manufacturing (Hay, 2001; Moreira and Saboia, 1996).

Although the non-operational assets were partially purged out in the data available, capital and labour productivity relied on proxies for the estimation of the output. Moreover, some argued that biases in estimating MVA were due to the increase of imported raw material and capital goods that were not taken into account by the Sistema de Contas Nacionais (SCN) which generated the technical coefficients for the I/O Matrix. To correct for this the labour productivity estimation of 58% rise in 92-98 would be reduced to 52% when imported inputs were considered (Haguenauer et al., 1998). However, this correction was discarded here due to lack of consistency with the data from the PIA.

Figure 4.8. Total Factor Productivity – Selected Industries

(Index 1986=100)
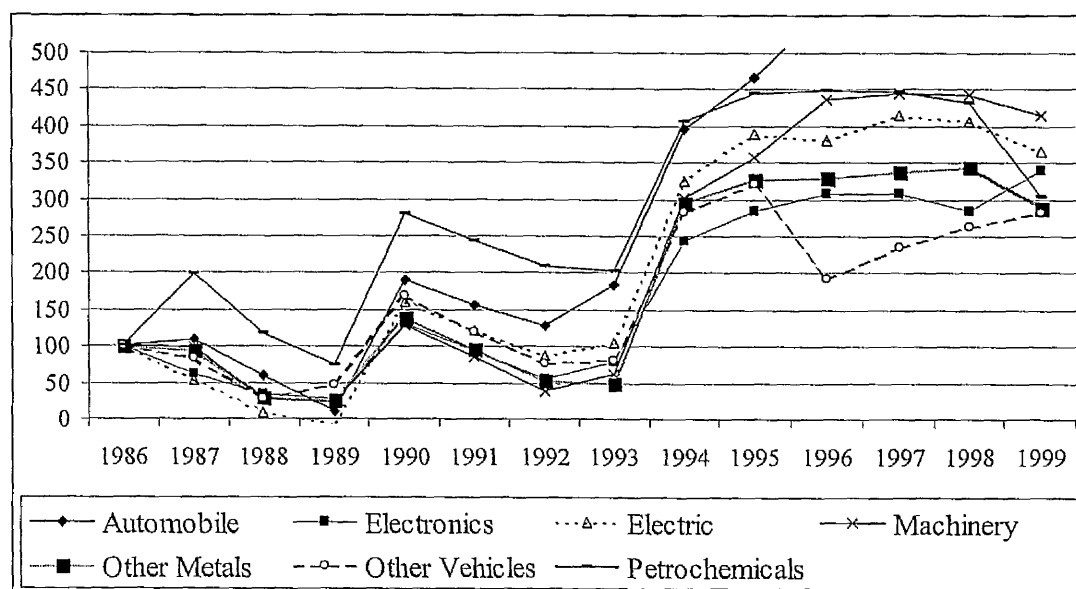
Source: IBGE (2001a,b)

When compared with labour productivity, total factor productivity emphasised the effects of resource reallocation, in terms of investments, since many sectors increased TFP more than LP. For instance, Figure 4.8 shows that automobile

increased TFP five times in the whole period. Electronics, electrical materials and other vehicles increased TFP three times, and LP less than twice. However, clothes and timber industries seemed to have reallocated resources, in different proportions, by increasing LP more than TFP, which was interpreted as a movement towards modernisation, as a result of increasing competition (Barton, 2000; Dalcomuni, 2000).

In general, TFP fell in most industries between 1986 and 1990, and increased afterwards, which seems coherent with the cycle depression, in 1991-92, and recovery after 1993/4, which was partially due to the Real stabilisation plan. Particularly, the estimations were consistent with the rest of the data analysed. Moreover, the consistency with the price-cost margins ratios, which will be discussed in the next subsection, was granted by the use of the same database (IBGE, 2001a;b).

4.3.3 Price-cost Margins

Price-cost margins or mark-ups were discussed, in the literature, as a key variable for reflecting firm's behaviour. Hence, the objective of this subsection is to discuss the evolution of price-cost margins of manufacturing companies in Brazil. The evidence of the effects of trade liberalisation on mark-ups in the literature, as discussed in chapter two, suggested a weak link between both. However, after trade liberalisation mark-ups reduced consistently in India and Turkey (Krishna and Mitra, 1998; Levinsohn, 1993). The overall manufacturing changes in margins are shown in Figure 4.9, which emphasises the influence of trade liberalisation by the reduction in mark-ups, after 1993. However, margins increased again, in 1996, after the stabilisation introduced by the Plan Real that relied on the trade reforms implemented earlier.

Figure 4.9. Manufacturing Price-cost Margins Index

(Index 1986=100)

Source: IBGE (2001a,b)

122
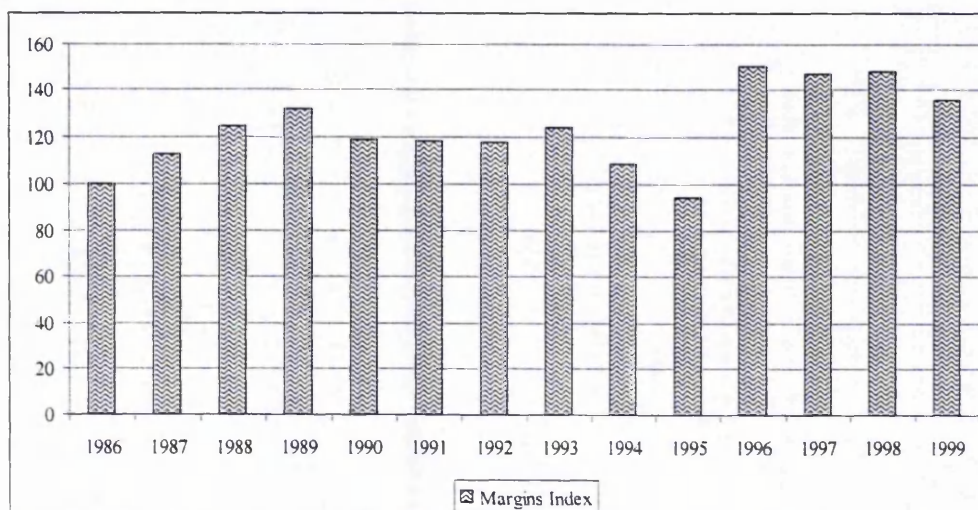
For selected industries Figure 4.10 below shows that margins were similar in level across industries, with few exceptions. Only oil & gas and mining were exceptions, since price-cost margins increased after 1986-87. But it maintained a low profile throughout the crisis of 1991-92, experienced a slight reduction after 1993 and regained the trend upwards in 1996 before stabilising up to 1999. This will be explored in the search for an explanation in the discussion of the model of mark-ups behaviour in chapter six and in the analysis of the firms' initiatives in chapter seven.

Figure 4.10. Price-Cost Margins - Selected Industries

Index (1986=100)
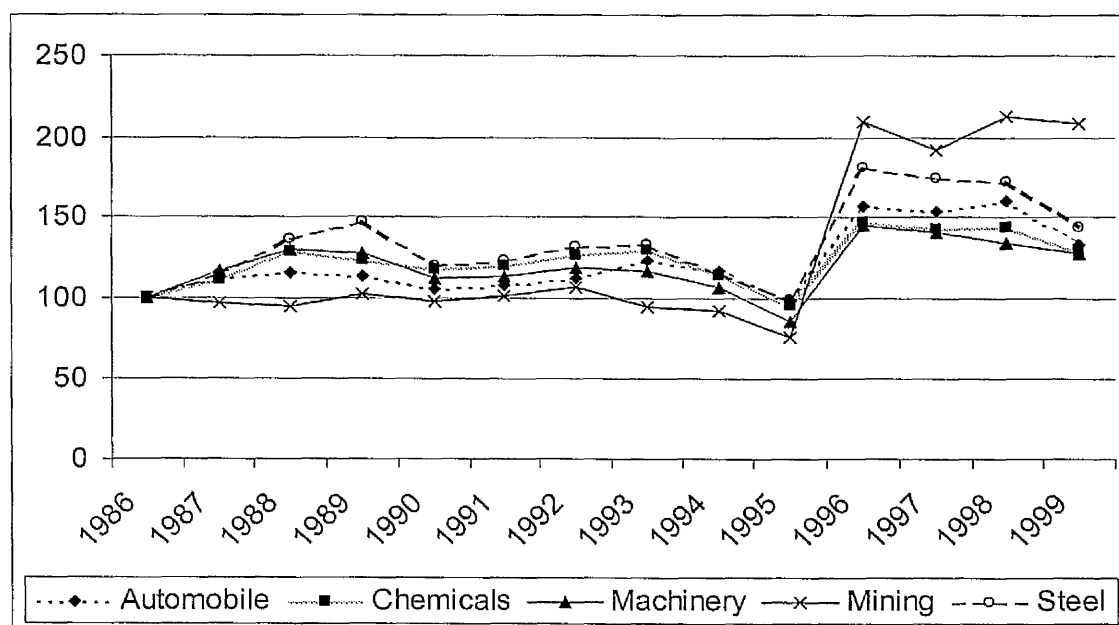
Source: IBGE (2001)

Looking into the detail some other sectors, however, increased price-cost margins after trade liberalisation, such as automobile, chemicals and machinery. The average manufacturing mark-ups also increased, which indicated that apart from the reduction after 1991-92 the firms were able to increase margins, even after trade liberalisation. This shows that the shocks of trade liberalisation that were strong in 1990-94 were the most important policy that could have affected companies' behaviour in defining their levels of mark-ups. As explained in chapter 3, in 1994-95 some industries managed to regain partially the previous protection by tariff increase or having their products included in the Mercosul's list of exceptions. However, most of these initiatives were tied to investment projects, which also have been indicated in the literature review as a cause of increasing profits due to the effects on productivity

(Murphy and Waverman, 1992). Nevertheless, in the period analysed, situations such as the automobile regime provided some extra protection, which allowed for stable, instead of declining, margins as the firms always stressed the need for project profitability, which consequently supported stable profits, to face competition.

Mark-ups are believed to be linked to business cycles, although in the long-run other factors also affect them (Hunter, 1991; Krishna, 1996). For instance, the literature on manufacturing mark-ups in Brazil, beside showing the cycle influences, emphasised interesting findings briefly summarised below. It confirmed that in the long-run companies were more likely to fix mark-ups as a target, rather than as a reaction to business cycles (Camargo and Landau, 1983). A study checking for anti-cyclic or pro-cyclic firms' behaviour regarding mark-up and price determination, found that out of 25 firms in Rio and São Paulo, 22 firms determined prices by adding a mark-up ratio to variable costs. One firm agreed that prices were taken from the market, and two avoided a clear answer (Considera, 1975). Asked how they calculated mark-ups, 17 firms explained that they aimed to keep a pre-determined rate of return over their direct production costs, which would justify a stable return to investment. Asked about their objective, 12 firms explained their objectives as keeping stable price levels. Hence, this survey emphasised the assumption that firms were enjoying sufficient market power, to decide mark-ups levels with little consideration for the market's signs. And the conclusion was that demand levels influenced short-term pricing decisions more than long-term planning and strategies. International trade was referred to as a constraint to margins fixing, rather than a central variable (Considera, 1981). However, with trade liberalisation, the role of international competition in the determination of mark-ups was expected to become central.

Although there was a pro-cycle tendency of the level of mark-ups, in the Brazilian manufacturing, other research on the transport material concluded for mark-ups increasing in an anti-cyclic way, aiming to maintain returns. However, in the long-term mark-ups tended to constant increase, which was interpreted as a consequence of monopoly power, despite other influences on mark-ups (Considera, 1983). As for the origins of increasing mark-ups, there was correlation between the level of mark-ups and variable costs (wages and row material), which was interpreted as an explanation for the stable margins after trade liberalisation (Calabi, 1982). These findings matched with the theory in the second chapter, which stated that margins should reduce by increasing competition (Berry, 1992).

Productivity was a key variable in influencing pricing behaviour, since increasing productivity was reflected in mark-ups reductions, when competition was strong. Combining the findings with the information that companies determine prices by imposing a fixed margins on the variable costs, mark-ups became an important behaviour variable to test for the effects of increasing competition (Calabi, 1982). It is important to check whether competition has increased enough to force companies to reduce their margins, although other alternatives existed.

After this discussion on the mark-up levels, and the causes that may affect the firms' decisions on maintaining mark-ups targets, it became important to discuss the costs level, since costs were determinant for mark-ups. Changes in margins showed the differences between prices and costs. Operational costs, in some industries showed no changes during 1986-99, although they declined slowly with increasing output. This was due to stable low costs in these industries, such as the steel production chain, which in Brazil had one of the world lowest operational costs. For instance, in 1994, a ton of iron ores cost 10 US $ in Brazil, as compared to 25 US$ in the US, 30 US$ in the EU and 28 US$ in Japan and S. Korea (Amann & Nixson 1999: 72). Electricity costs, which were a main component of energy costs, were also low in Brazil, at 0.03 US $ per KWh, as opposed to Japan, where electricity had the highest cost (Mckinsey & Company, 2000). Down in the production line, total operational costs for steel were at 200 US$ a ton in Brazil, which was slightly less expensive than the same costs in S. Korea and Mexico, and much less expensive than in the US and Japan, where these costs ranged between 250 and 300 US$ (Amann and Nixson, 1999).

For instance, testing the relationships between industrial costs and prices (or mark-ups) in the Brazilian manufacturing from 1978-98, by the Kaleckian hypothesis, showed that negotiations were better between the actors in the supply chain, since negotiations were able to reduce the seller's monopoly power. But with oligopoly buyers negotiating had not the same success (Bahia, 2000). Since buyers were not in a good position to negotiate prices with oligopolies, the firms were able to maintain their margins, as discussed above. An important question was to evaluate the influence of manufacturing structure on competition, which was hypothesised to have affected trade liberalisation. So the indicators of Brazilian market structure according to the literature in chapter two will be discussed in the next section.

Section 4.4   Market Structures Indicators

4.4.1   Stock of Firms and Entry and Exit

In Brazil, the number of firms by industry indicated that the stocks of firms were all reduced from 1986, which seems that exits were exceeding entries. Furthermore, while firms' creation was impressive, so were closures, which left the net stock of firms almost unchanged, and a high turnover. In this subsection the discussion will focus on the stock of firms in each industry and in the entry/exit flows, which seemed to be essential for the level of competitiveness.

An important element that influenced firms' entry/exit was the "similar law", which acted as an effective protection scheme. Every import operation was submitted to a process of scanning, which only issued import licenses for products without local similar, as explained in the previous chapter. As a result, when applying for imports newcomers and small firms were not assessed in the same way as the incumbents and large ones. This was because of the system of consultations with trade associations that could deny import licenses (Fritsch and Franco, 1994:72). Besides the bias against newcomers that were not influential inside the trade associations, small firms would also be denied in their new projects, since local suppliers were most of the time inadequate and more expensive than the foreign ones.

Other industries, however, had more entries than exits, which matches with the investment reallocation process, as a consequence of trade liberalisation. In fact the machinery industry was reduced by four thousands firms in 1990-99 reflecting the number of mergers and take-overs. Based on the Labour and Employment Ministry (MTE) database of firms for the years 1995-97, the analysis of firm's creation and extinction confirmed that, although the turnover varied cyclically, the small and young firms were more likely to fail than the established and large ones (Najberg et al., 2000).

As a consequence of such barriers, the number of firms, which was declining before trade liberalisation, increased in many industries afterwards. However the firms stocks in 1999 were at the same level as in 1986, as Figure 4.11 shows. The exception was machinery, which showed a decline in the number of firms, as a consequence of the reallocation process, since this industry was overprotected before 1990. This ended up by encouraging too many local players, which had been attracted by government incentives. So, when the subsidies were phased out by trade liberalisation, entry of new firms reduced and exit increased. The industries subjected to total forbidden imports increased the number of firms. In this group were microchips,

computer and software and automobile. This policy overprotected a few incumbents against a higher competition in the markets.

An interesting case was the microcomputers, which were dominated by Brazilian firms, during the time of import prohibition and TNC restrictions. But as main-frame computers were in a mixed policy the industry was also protected against newcomers but dominated by two American giants. As a result of this system of import licensing and TNCs controls the American TNCs in an tacit agreement did not really complain against the excessive protection, since most of the domestic protected firms were, in fact, their affiliates (Luzio and Greenstein, 1995).

Figure 4.11. Number of Firms in Manufacturing – Selected Industries
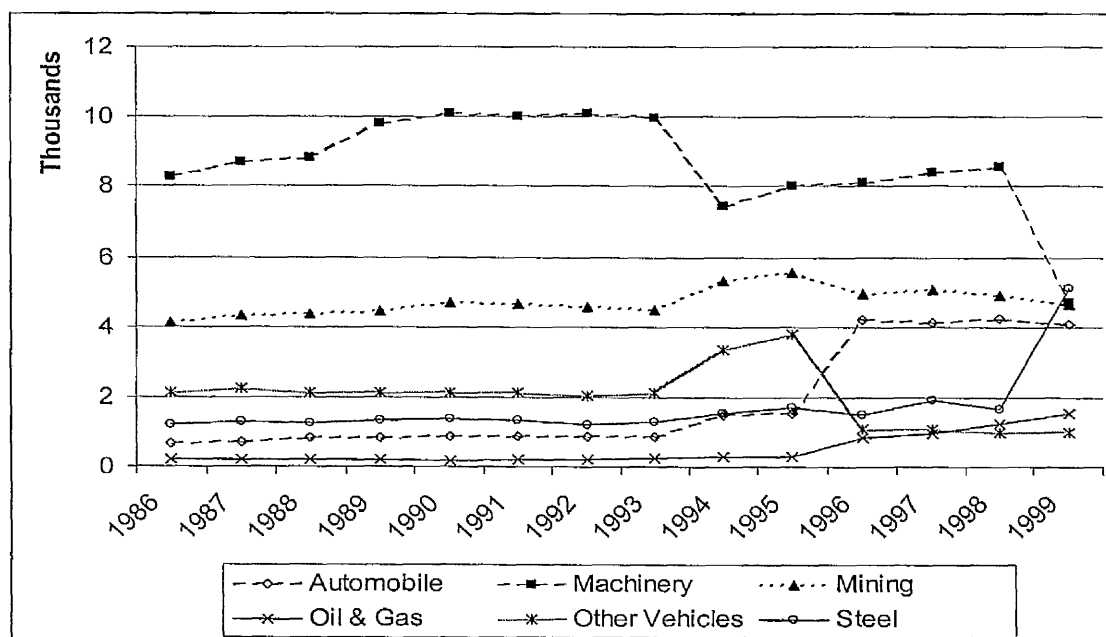
Source: (MTE, 2001b)

However, to draw a comparison between the changes in the firms' quantity and the influence that it could have in the relationship between trade liberalisation and performance, one needs to be aware that some industries are capital intensive and others are labour intensive. For instance, mining, steel and machinery are generally considered capital intensive as opposed to wood materials, timber, food products, which are labour intensive industries. The former are less likely to exit than the latter, since this kind of production factor can influence the speed of firm's creation and extinction. This situation, as discussed in the second chapter, was connected to the fact that industries are factor specific, which drives the investment according to the type factor needed to run the industry. Another consequence was that some industries were more likely to have greater entry/exit figures than others, based on the type of factor

specificity. The assumption was that capital intensive industries were less flexible and more vulnerable to shocks, since they are not prepared to change quickly, due to the high capital-labour ratio. Furthermore, in the context of manufacturing in Brazil, because of the abundance of some factors, such as labour, and the scarcity of others, such as capital, it is clear that the entry and exit which was captured by the stock of firms at the end of each year tended to reflect this kind of situation. It seems therefore justified to consider entry/exit in the analysis of the effects of trade liberalisation. Since besides the number of firms, their size was also important to define scale the next subsection will discuss the firms' size.

4.4.2 Size and Concentration

The objective of this subsection is to discuss the changes in size by the indicators often utilised in the literature, such as employment entropy, concentration index and the proportion of large firms in the industry as explained in chapter two. In this subsection a concentration index based on the industrial census, will be discussed for some industries, though there was no data for the whole period due to periodicity of the censuses in Brazil. Nevertheless, the size measure based on the proportion of large companies in each industry will be calculated for the whole period.

One of the most influential evidences of the importance of size for firms' survival was that young and small firms were more likely to exit, than old and large ones (Najberg, et al., 2000). Thus, discussing size in manufacturing became essential due to the influences that a firm's relative size can have on exit, scale of production and competition (Najberg, et al., 2000). In 1995 97.74% of failing firms were small (micro-enterprises, or firms with less than 30 employees) and 97.01% of entrants firms were also small. Entry and exit of the large firms (more than 500 employees) were similar, at 0.06% of the stock. But entries of the medium firms (between 30 and 499 employees) overcome exits, which caused an increase in the stock of firms. This information confirmed the previous findings that entry and exit rates of smaller and younger firms were higher than those of the larger and older ones (Geroski, 1995).

Since large firms were more likely than small ones to be involved in merging and takeover, they resisted better and exit less than the small ones. Moreover, small and medium firms did not have the same access to finance and lacked experience and capital. The evidence for the MTE database in Table 4.2 below shows that small and medium companies were more likely to reduce size than to increase it. The frequencies of size reducing were respectively 24% and 23.7%; and 4% and 2% for size increasing. However, the micro-firms

presented a diverse patterns, with more than 30% in both columns getting smaller, and about 20% getting larger. As a consequence of changing size and entry and exit, firms' number in manufacturing increased in 1995-97, as mentioned above. But these diminished size, as measured by the number of employees. Moreover the largest firms became larger than they were before and smallest firms became smaller than they were before or disappeared.

Table 4.2. Changes in size in manufacturing, 1995-97

(%)

	Micro			Small	Medium	Large
Number of Employees	0 to 4	5 t0 9	10 to 19	20 to 99	100 to 499	500 and more
Reduced Size	*	30.7	31.0	23.4	24.0	27.0
Unchanged	80.2	47.7	51.3	72.6	74.0	73.0
Increased Size	19.8	21.6	17.7	4.0	2.0	*

Source: (MTE, 2001a;b)

Therefore, using the database that contains the basic data for every firm, originated from the Ministry of Labour and Employment (MTE), size, as a proportion of large/small firms, in each industry, will be analysed as a manufacturing structure connected with the effects of trade liberalisation. Since scale and size could be approached as a consequence of concentration many studies have been carried out based on concentration measures. These measures are in general of three types: 4-firm index, employment entropy index and Herfindahl index. All these indexes have many variants, as explained in chapter two. In 1999 the proportion of large/small firms in most of the industries reduced as compared to the levels in 1986, as Figure 4.12 below shows.

Figure 4.12. Proportions of Large/Small Firms Index – Selected Industries

(Index 1986=100)
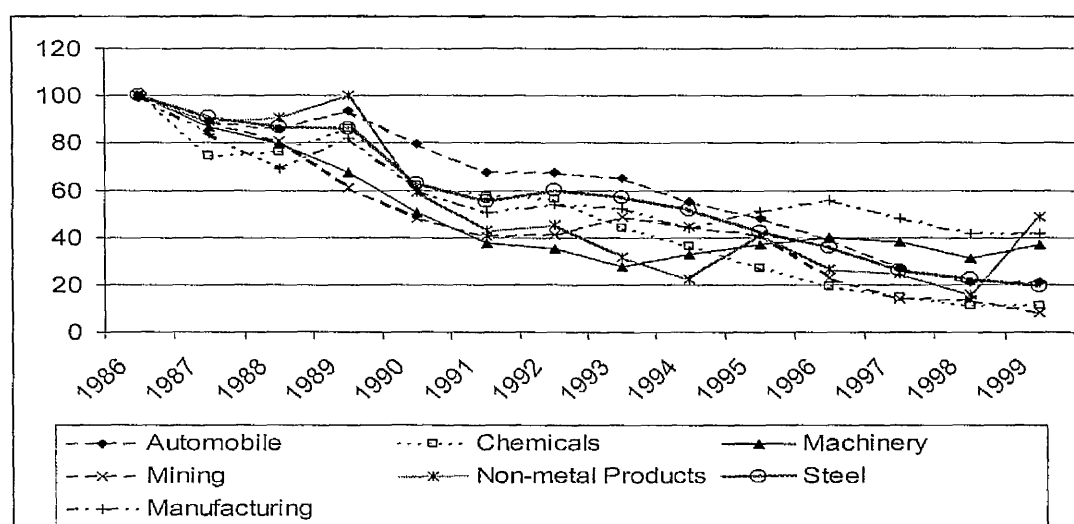
Source: (MTE, 2001b) (Calculations by the Author)

This confirmed the tendency of downsizing linked to trade liberalisation, due to the generalised a reduction in firms' size. After showing that the number of large firms in each industry, as compared to the number of small firms, defined by the number of employees, has been decreasing during the whole period. The measure used in the analysis was based on the number of employees, as an employment entropy Index, discussed in chapter two. Before 1990 protection coming from the government seemed to have kept inefficient firms working, without the necessary market scale.

Another measure of size and concentration, discussed in chapter two, was the 4-firm index, which expressed the percentage of revenues, number of employees, or value added belonging to the 4 largest firms, in each industry. Two authors, measured the concentration of Brazilian manufacturing industries, in several years, with this index. Based on the information of the Inland Revenue Agency, in 1978, the 4-firm index was calculated for 143 industries (Braga and Moscolo, 1983). Based on the industrial censuses the 4-firm index was calculated for 1980, 1995, 1996 and 1997 and summarised in Figure 4.13 below. This was based on the 2-digit classification of the Classificaçao Nacional de Atividades Industriais, or National Classification of Industrial Activities (CNAE) (IBGE, 2002a; Moreira, 1999).

Figure 4.13. Concentration in Manufacturing in Brazil (4-firm Index)
(%)
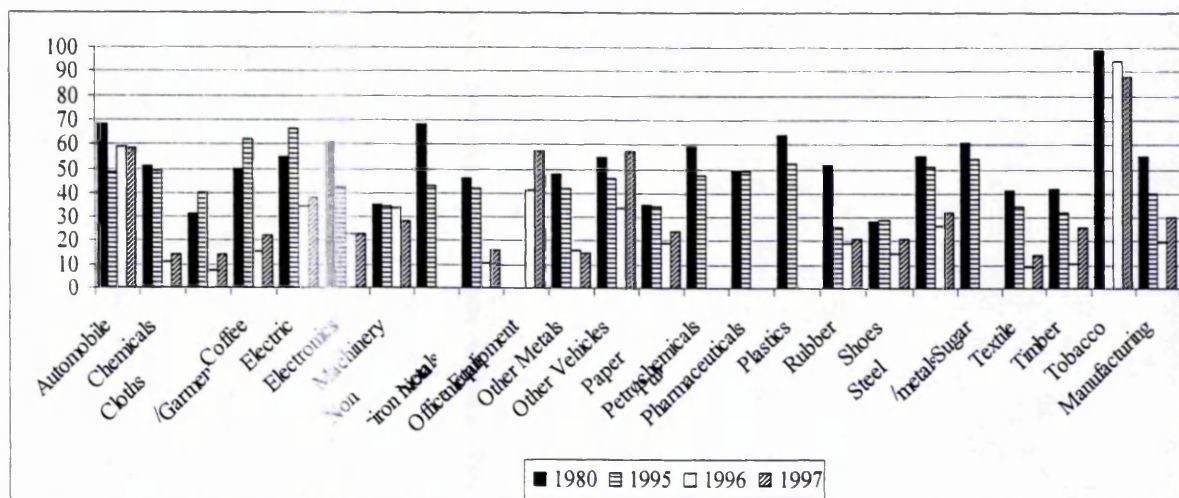
Source: IBGE (2000:60-62)

The changes in concentration showed that after 1990 firms in every industry were searching for partners in order to become stronger than they were before to face increasing competition. With trade liberalisation, other global players invested in

Brazil, which began to approach the level of concentration that TNCs were used to elsewhere. But concentration only increased after 1995 with a lag referring to trade liberalisation in 1990, which was explained by the delays that firms needed to organise partnerships. In 1996-97 every industry increased concentration with the exception of tobacco, other metals and automobile. These were already highly concentrated before 1990, which in fact motivated the inverse movement. So, with trade liberalisation TNCs, were attracted to these industries reducing concentration (IBGE, 2000).

According to the explanation above concentration reduced after 1990 seemed to be connected to trade liberalisation. But it also was linked to privatisation. for instance, the lag of three or four years in the concentration process was due to the privatisation rules, which were set up to prevent few firms of buying many state enterprises. For instance, the state owned companies in telecommunications, steel and mining were sliced in many other companies to be privatised (BNDES, 1999; Vellasco, 1997). However, privatised companies engaged in mergers and takeovers, as a second round of adjustment, with the exception of those that had strict rules to prevent concentration (Pego-Filho, et al., 1999).

Another feature, which has been confirmed for some industries, was the growing popularity of franchising and other forms of business networks. By participating in such networks, firms behave as though they were larger than they actually were (Kaplinsky, 2000). Hence, the effects of such structures in size and concentration was impressive, since by the measures, used in the literature, most of the firms would be small, but having results and behaviour as a large company. In Brazil, the integration of the shoemakers in the region of "Vale dos Sinos" in the South showed the development of small business, as a consequence of international connections with large groups. These groups were able to provide technology (mostly in the form of design) and markets to local firms (Schmitz, 1998). Another example of modernisation in Minas Gerais was that small food processors and leather producers were able to reach international partnerships to develop in the global markets (FIEMG, 2000). The effects on size and concentration, however, will not be considered in these cases, since the firms were counted isolated, without networking effects for the purpose of this research. However, these effects would not disturb the overall conclusions, since the cases were still few, although in the future, size studies should monitor these effects.

Another important issue was the participation of TNCs in concentration, since they were able to bring fresh money and technology to local partners, which contributed to change market structures. Hence the next section will focus on firms' ownership, which will be discussed mainly in terms of domestic and foreign ownership.

4.4.3 Ownership

There has been much attention paid to firms' ownership, for many years, mainly because of the TNCs influences on LDCs development. Explanatory significance was attributed to TNCs presence, The levels of FDI in LDCs were linked to profit and mark-ups among other elements (Newfarmer, 1983). In general, according to the time and methods used, the relationship between export orientation and ownership indicated that TNCs are more export oriented or more directed to internal markets. For example, in the 1960-70s in Latin America TNCs affiliates were not strong exporters, although they were mostly exporters in the 1980s (Franco and Fritsch, 1992). Based on the discussions in chapter two, the objective of this subsection is to describe the ownership of Brazilian manufacturing firms, focusing on TNCs.

To analyse ownership, the statistics based on the Central Bank reports on FDI, including takeover, joint-ventures and new plants investments. FDI flows were predominantly to manufacturing until 1995. According to the Central Bank report, manufacturing received around 55 % of total FDI flows (BACEN, 2000a;b). TNCs were also interested in deregulation, and privatisation, since the flows increased sharply after trade liberalisation and privatisation. For instance, FDI flows amounted to 42.5 billion US$ in 1995, which was more than 5% of GDP (BACEN, 2001). In terms of number of firms in 1999, there were 6,000 TNCs affiliates, with total assets of 273.6 billion US$, and gross sales of 223.1 billion US$, responding for half of Brazilian exports, and employing 1.45 million workers (BACEN, 2000b). Moreover, in 1995-99 FDI flows grew 63% in absolute terms.

Concerning the Brazilian TNCs affiliates, foreign ownership presented evidence of positive effects towards export and performance before 1980, not afterwards (Fritsch and Franco, 1994: 80). However, statistical evidence of links between import propensities and foreign ownership were rather strong, when controlling for size, knowledge, and advertising exposure (Willmore, 1987). However, foreign capital inflows kept increasing at slow pace, stopped during the debt crisis, and regained increase after 1993, due to the reforms that included trade liberalisation, as Figure 4.14 show for selectec industries.

Foreign capital combined with nationalist interests and large state intervention, as explained above, resulted in more protection to markets, and liberal treatment of foreign capital: two apparently contradictory policies, according to Fritsch and Franco (1994). These points were clarified, when the balance of payments was analysed, since the shortage of foreign currency was the main reason for the government

to engage in policies to attract FDI. Joint ventures, mergers and take-overs increased in the period 1994-97 due to the stabilisation brought by the Plan Real. As a consequence 29 operations in 1996-97 resulted in 17 TNCs establishing new affiliates in Brazil, and 6 Brazilian firms expanding abroad (Bonelli, 2000).

Figure 4.14. FDI Flows Index – Selected Industries

(Index 1986=100)
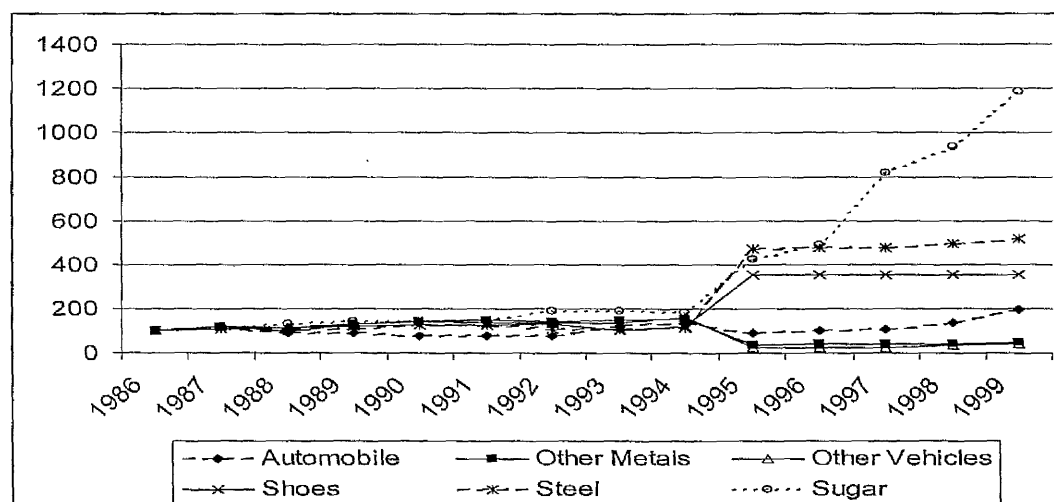
Source: (BACEN, 2001)

Privatisation in the late 1980-90s changed ownership in two ways: by attracting TNCs affiliates and by diminishing the number of firms under state ownership. For instance, in the automobile industry in 1990 -94, there has been significant increase of productivity and product innovation attributed to trade liberalisation and to the foreign ownership (Fonseca, 1996).

Summing up, the presence of TNCs was stronger in some industries, such as automobile, tobacco and pharmaceuticals, than in others. These industries still increased the FDI shares, after trade liberalisation. Based on these changes, it seemed important to control for the level of FDI, when testing for the effects of trade liberalisation. Another important characteristic of manufacturing, which also seemed important for the trade liberalisation effects on productivity and margins, according to the literature, was capacity utilisation, which will be discussed in the next subsection.

4.4.4 Capacity Utilisation

An important feature, which the literature shows as influencing productivity, was capacity utilisation, which has been the subject of theoretical and empirical studies discussed in the second chapter (Berry, 1992; Hall, 1988; Harrison, 1994). Thus the objective of this section is to describe capacity utilisation, in

manufacturing in Brazil, to enter the models, described in the next chapter, as a control variable due to its importance for changes in productivity and mark-ups.

Some authors, while studying productivity changes, used proxies for capacity utilisation, such as the energy consumption. But since the industries usually have specific patterns of energy consumption, this measure was not used in the estimations. The data came from the Fundação Getúulio Vargas (FGV) that provided a comprehensive database on capacity utilisation, which was consistent with the IBGE classifications, and was provided by the IPEADATA, a data provider from the Institute for Applied Economic Research (IPEA) (FGV, 2002). Hence, the investigation on capacity utilisation and trade liberalisation, concerning companies' behaviour, will use this capacity utilisation measure, as a control variable, which beyond indicating the changes in capacity utilisation in percentages signalled the depression phase of 1991-92, as Figure 4.15 shows.

Figure 4.15. Manufacturing Capacity Utilisation
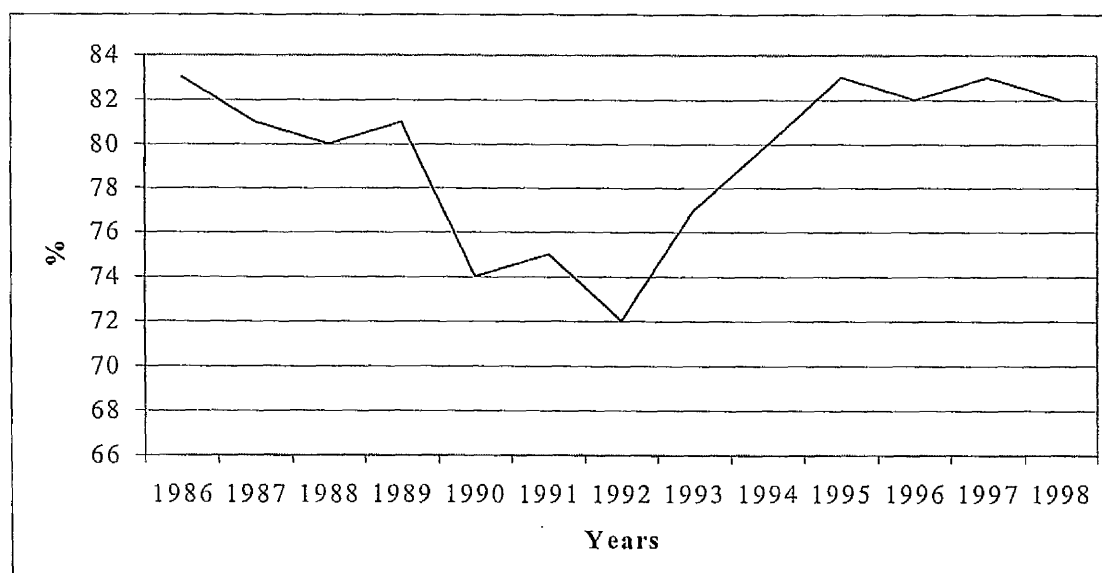
Source: (FGV, 2002)

However, the cycle influence was not homogeneous across industries, since capital goods industries, such as mechanical equipment, and electrical energy equipment were using almost 70% of their capacity, with little fall during the depression of 1991-92. But, railway equipment and shipbuilding reduced drastically the capacity utilisation in 1991-92, reaching 30% and increasing to 50% in 1994 (Amann, 2000). This situation confirmed the importance of the trade reforms, which ended up by highlighting the excess capacity in some industries that used to be harboured by protection.

In Brazil, capacity utilisation has been the subject of studies as it influenced the economic cycles. For instance, when cycles were in recession, excess capacity was likely to increase, and, in the expansion, excess capacity was much less noticeable with many industries in full capacity (Fleury, 1995). The relationship of capacity utilisation with investment and concentration in selected industries showed the importance of trade liberalisation. This highlighted the effects of subsidies that used to finance excess capacity in a protected economy, encouraging rent seeking behaviour by the firms (Haddad, 1999).

The inclusion of capacity utilisation in the analysis, as a means for controlling for cycle changes was therefore very important due to strong reduction of capacity utilisation coincided with the depression phase in 1991-92. Furthermore it will control for this extra entry barrier, as the influences of capacity utilisation on productivity measures emphasised the use of idle capacity as a trade barrier, which was suppressed by the reforms, which involved subsidies cuts.

Section 4.5   Conclusion

The structures of manufacturing, in Brazil, have been discussed in this chapter, following the pattern of previous studies on other LDCs. First, structural changes in manufacturing, during the period of industrialisation, were described, with traditional industries making room for modern ones, which were focused on intermediate and technology intensive goods. The policies in place, between 1940-1980, were based on ISI, and were meant to take advantage of the natural resources and of the various choices of plant localisation, in Brazil. Secondly, by ISI, state intervention was intended to enable local groups, and foreign based companies, to set up plants in Brazil, encouraging mostly capital and intermediate goods industries, such as transport material, and basic goods, such as chemicals and pharmaceuticals. However, some industries were granted protection by a careful selection of the TNCs admitted into the country on a case-to-case basis, such as electronics, computers and software, mining and machinery. This protection scheme ended up by protecting a few TNCs against the competition from other TNCs.

As a consequence of trade liberalisation those protection systems were eliminated causing strong changes in the manufacturing structure. Brazil's comparative advantage represented by natural resources based industries begin to attract more firms and TNCs, which was reflected in an increase in the traditional industries' shares of the

MVA. But previously targeted industries, which were focused on intermediate goods and technology, ended up by loosing MVA shares.

Employment in manufacturing was the most important structure measure to be considered, in the analysis because of the dynamics of the production function, where, on the one hand, employment was correlated with investment and technology, and, on the other hand, it was also connected to companies size and concentration. Price and quality competition, based on technical change, being an important consequence of trade liberalisation, also made employment a central issue. After trade liberalisation, manufacturing employment had a major shock, since the employment levels declined every year, reaching more then 50% losses in 1990-99. However, general employment was reduced, in the whole economy after 1990, but recovered when the depression phase of 1991-92 was over. Moreover, employment in manufacturing played a central role in companies cost levels and was fundamental to the resource reallocation process.

The calculations of the variables that will be part of the model to be described in the next chapter were summarised in behaviour variables (labour productivity, total factor productivity and margins) and structural variables (firms stocks, size, ownership and capacity utilisation). The variables reflecting companies' behaviour indicated that productivity (labour productivity and total factor productivity) increased in every industry after trade liberalisation. This was a consequence of the increasing investment and modernisation, which was enabled by importing technology goods. However, margins that were expected to reduce showed an overall stability, and some industries managed to increase them. The influence of trade liberalisation on firms' mark-ups seemed not to have been strong, since, if after trade liberalisation, the companies reduced mark-ups, most of them managed to regain the levels of mark-up later. This was enabled by the technical changes, which were supported by the sharp increase in labour productivity. This pattern was, however, expected by the competition theory, and by industrial organisation, since these theories explain that firms will make maximum effort to keep their margins. This implies that trade liberalisation, on the one hand, will force prices down by competition, and, on the other hand, it will provide technical support for the firms to introduce product quality with less costs.

Four measures of market structures that will be in the model, as control variables, were discussed: stock of firms, concentration and size, ownership and capacity utilisation. The firms' stocks, which indicated the net entry and exit changes, were described to indicate the evolution of entrepreneurship in manufacturing. The

number of firms increased up to 1990, and reduced after, as a consequence of trade liberalisation, to reach, in 1999, the same levels as in 1986. Moreover, due to the particular characteristics of manufacturing like the need of skilled workers, technology and high capital intensity, the sector as a whole was still enjoying some natural barriers to entry. Nonetheless, the expected reduction in the number of firms, as a consequence of the reallocation process, only happened in the previously overprotected industries, like machinery and electrical materials. Other protected industries, such as automobile and computers and software increased the number of firms, which was a consequence of the particular protection scheme that prevented the entry of many companies before 1990.

Size, as the ratio between large and small firms, defined by the number of employees, fell after 1990, although concentration reduced in relative terms. This indicated that size reduction was part of a downsizing policy, which was to be expected as a consequence of efficiency requirements. Size and concentration seemed crucial, since the number of employees, which was the parameter to measure relative size, fell sharply, partially due to modernisation. Concentration only increased after 1995 indicating that mergers and take-overs were delayed by other government policies, such as privatisations, financial reforms; but trade liberalisation played a major role.

Not only local investment increased, but FDI rose sharply after trade liberalisation, with some industries having their share of FDI increased five fold or more. These were coffee, meat and milk industries, steel, sugar and vegetable, which confirmed the changes in manufacturing structures. Natural resources, as the Brazilian abundant factor, attracted domestic and foreign investments, which was supported by the efficiency and trade theory of comparative advantages. FDI flows suggested that TNCs dominated some industries, like tobacco and automobile. Firms ownership in industries such as steel, paper and pulp, oil and gas and mining was also influenced by privatisation. Most of the manufacturing firms have always been in private hands.

Capacity utilisation, which reflected the level of monopoly power, according to the discussion in chapter two, also indicated economic cycles influences, since, during the recession of 1991-92, capacity utilisation fell sharply. Because of this feature this variable will be of great interest as a control variable in the model. Moreover, since by the literature, capacity utilisation affected total factor productivity measures, there was an extra reason for controlling capacity levels. Hence, the levels of capacity utilisation reinforced the theory that idle capacity before trade liberalisation was more likely to be a consequence of protection, which encouraged inefficiency

within some industries, such as machinery, electrical materials, cloths, textile and shoes. Others, however, such as automobile, electronic materials, chemicals and petrochemicals, milk and meat industry, because of investment in rising capacity just before 1990 strengthened the conclusions of idle capacity offering extra protection to the firms.

To sum up the discussion in this chapter, firms' behaviour after trade liberalisation changed in the direction of increasing productivity (labour productivity and total factor productivity). However, Brazilian manufacturing firms managed to maintain their mark-up levels, although these fell during a phase of recession, which coincided with the introduction of trade liberalisation, and increased thereafter to reach the levels of the period before and beyond. Nevertheless, the whole manufacturing sector was submitted to strong structural changes, which could have impacted on the mark-ups, since for labour productivity to increase, employment fell continuously after 1990. As for the other structures, firms' turnover did not change the overall number of firms, but firms' size reduced, in a downsizing initiative. Moreover, foreign ownership increased, since FDI rose significantly after trade liberalisation, as a corollary of the trade reforms, and privatisations, which began early before 1990 and went on until 1998. Capacity utilisation fell in 1991-92 in connection to the recession phase at that time. Nevertheless, according to the discussions in chapter two, this reduction of capacity utilization also indicated an increasing in the building-up of extra capacity, which were linked to the firms' investment strategies after trade liberalisation, since it increased again, when the expansion cycle came in 1993. Hence, it seems advisable to use a S-C-P model as detailed in the next chapter to test the hypothesis of increasing productivity, exports performance and mark-ups reduction, as a consequence of trade liberalisation, with the influences of the structural variables described above.

CHAPTER 5. METHODOLOGY

Section 5.1   Introduction

Following the previous discussion on manufacturing productivity, and the structural changes in the Brazilian manufacturing sector after trade liberalisation, this chapter aims to explain the methods that will be used for the analysis to be carried out in subsequent chapters. The option was for a multi-approach with quantitative and qualitative methods, based on statistical analysis of published data, on the one hand, and visits to firms in the field for primary data collection, on the other hand.

As for the statistical and econometric approach, the proposed model will be developed on the basis of the S-C-P methodology, as discussed in the second chapter (Kirkpatrick, et al., 1984; Lee, 1992). Hence the description of the surveys that provided the published data and the consistency of the data sources will be discussed in this chapter. For the qualitative research with structured questionnaires and interviews, the case study will concentrate on six industries chosen for belonging to a line of supply, to highlight the importance of trade liberalisation and the transmission of costs from a firm to another. Hence the methods for data collection and the interpretation of the questionnaires and interviews will also be discussed in this chapter.

The decision to combine quantitative and qualitative analysis was based on the nature of the subject, which depends on company behaviour and decision motivations. The industrial organisation theory discussed in chapter two allows for companies' behaviour to be framed as a dilemma: making every effort to become a market leader and maintain this position or becoming a follower. In fact, the position chosen opens a range of options from technological choices to market targets, plant location and production scale. Hence it is worth looking into the motivations for these actions in detail, which will be possible by visiting the firms and interviewing the board members. This chapter has three further sections. The second discusses the statistical analysis of published data, the third introduces the sectoral case studies based on visits to companies, and the fourth concludes the chapter.

Section 5.2   Statistical Analysis

Trade liberalisation happened with a policy change, therefore changing companies' behaviour from that date into the future. Hence, considering that the

hypothesis to be tested was about trade liberalisation effects on manufacturing firms' productivity, a reference point for comparisons was needed. To test the hypothesis, the proposed method needed a reference as a way of falsifying the hypothesis, which was carried out by using a counterfactual, and collecting evidence of the changes that happened to the basic case with the hypothesis tests (Smith, 1998). According to Smith (1998), quoting Popper (1971), the importance of falsifying to test an hypothesis can be defined as:

> "falsification rather than verification becomes the criterion on which scientists should find ways of disproving their working hypothesis and theories"
>
> (Smith, 1998:108).

Thus the researcher could use a counterfactual that allows for comparisons of the results verified when such policy is in place, with those in its absence. By analysing the gaps between the two situations the tests of the previous theoretical assumptions might be confirmed or rejected. The difficulty of forming a control group or another kind of counterfactual in the economic context have been discussed in the literature (Goldstein, 1986; Goldstein and Montiel, 1986). First after the adoption of a policy such as trade liberalisation, other changes also happen and the reference becomes less evident. Some solutions substituted the previous situation with proxies or neutral situations derived from other countries or industries as a counterfactual, to compare the results with in cross-section comparison.

In the case at hand, cross-country comparisons will be substituted by cross-sector comparisons, which by comparing the average changes in the industries subjected to the same policies, at the same time, will provide an appropriate framework. For instance, the cross-sector comparisons will be run against the liberalisation level measured by variables such as tariffs, which varied across the industries. However, a point in time for the counterfactual to test the hypothesis will be chosen. Thus after this date trade was assumed to have become liberalised, and the changes across industries will be also compared before and after trade liberalisation. The methodology here will be more sophisticated since most of the elements measuring trade liberalisation will vary over time and across industries. In a partial equilibrium estimation, which will rely on regression analysis, which by the dynamics of comparing means and variations, the methodology proposed will be able to capture the effects of trade liberalisation on firms' behaviour, allowing for the interpretation of the direction and intensity of these effects, under the "ceteris paribus" assumption.

Economists have proposed other factors that are likely to affect the relationship between trade liberalisation and productivity, or between trade and export performance, which were related to market structure, as discussed in chapter two. Some of these studies proposed an economic behaviour model, which takes into consideration structural elements to analyse policy outcomes. Thus a model based on market structure, the S-C-P model, as discussed in chapter two, will be used as a tool to analyse companies' behaviour (Kirkpatrick, 1994). The test of hypothesis using S-C-P models relied on a behavioural framework, including industries structural variables following the production function. The next subsection describes the methodological framework of the hypothesis test and the proposed S-C-P models.

5.2.1 The Models for Testing the Hypothesis

This subsection aims to introduce the mechanisms for hypothesis testing, which will be used to verify the relationship between trade liberalisation and performance. The general approach followed the basic "before and after" method with its main elements; but it was not possible to find sectors that suited for a "control group", in order to have the neutral counterfactual according to the method "before and after with control group" (Goldstein and Montiel, 1986). Thus the before and after comparisons will be based on a qualitative variable, indicating the beginning of trade liberalisation in 1990. Thus the method of statistical analysis, in order to satisfy the "ceteris paribus" condition, will be a cross-section analysis, with a panel data from the manufacturing sector, most of them gathered annually, with 30 sectors and 14 years. The regression will provide the appropriate conclusions for econometric data analysis (Sayrs, 1989).

The most important characteristic of hypothesis testing for micro-economic studies was the possibility of doing the analysis using behavioural model, which can take into consideration structural variables (Kirkpatrick, 1992; Lee, 1992). Hence, choosing the Structure-Conduct-Performance (S-C-P) model to analyse the effects of trade liberalisation, according to the description in chapter two, seemed to be appropriate. This model complied with the before and after scheme, and allowed for structural variables, and control variables to be included in the equations, following the techniques in Sayrs (1989). In line with the theory and empirical works discussed in chapter two, the description of how the S-C-P model will be applied, the variables and the interpretation of the results will be presented in the following discussion. The assumption was that government policies influenced the firms' economic behaviour

according to market structure (Krishna and Mitra, 1998; Krugman and Obstfeld, 1996; Levinsohn, 1993). Since firms' economic behaviour and performance strategies were not directly observable, the models will rely on behaviour variables to indicate the firms' behaviour.

Based on the S-C-P applications, many authors have proposed variations of the S-C-P model to analyse structural influences, which were captured by some indicators, such as the level of profits and the rate of mark-ups. Thus the models proposed below are along those lines, where the S-C- P methodology will guide the assessment of the effects of trade liberalisation in Brazilian manufacturing in 1986-99. The advantage of S-C-P was the ability to capture a wide range of influences, linked to the basic theory to be tested. The behaviour indicators will particularly indicate the changes in productivity, exports performance, and mark-ups, which according to the definitions in chapter two will enter the models as dependent variables.

Equation 5.1. The General S-C-P Equation

$$Perf = f(TL, PI, ST)$$

Where:

$Perf$ = Performance

TL = Trade Liberalisation Indicators

PI = Production Function Elements

ST = Industries Structural Elements

The performance measures were: total factor productivity (F) and labour productivity (LI), exports levels (X), and mark-ups (M), as a measure of market discipline, as presented in the table below.

Table 5.1. Performance or Behaviour Variables

Variable	Description
F	TFP (Total Factor Productivity Index)
LI	Labour Productivity Index, with basis in 1986
M	Price Cost Margins Changes
X	Exports values

Based on Equation 5.1 above, the measures indicated will enter the equations as performance measures, where the coefficients of each independent variable will be analysed after the estimation of the models. The variables below will describe the changes in trade policy, measured by nominal tariffs, effective rate of protection, real exchange rates, terms of trade and non tariff barriers, which according to the discussions in chapter three had a decline after trade liberalisation in Brazil.

Table 5.2. Direct and Indirect Trade Liberalisation Variables

Variable	Description
E	ERP (measured in %)
NI	NRP index (1986=100)(NRP was measured as 1+r, with r=NRP in %)
I	Imports values
D	1990 Dummy to signal the ban of NTBs in this year
R	Real Exchange Rate Index
T	Terms of Trade Index (ratio of Export import prices)

Note: R and T entered the equations as control variables, since they are only indirect trade liberalisation variables.

Following the S-C-P model described in chapter two, structural variables, which were expected to have affected the companies' behaviour, will be added to the equations according to the definitions in Table 5.3 below.

Table 5.3. Structural Variables

Variable	Description
S	Stock of Firms Index
P	Proportion of large to small firms Index (downsizing index)
G	Capacity utilisation (%)
O	FDI index (proxy for firms' foreign ownership)

Since the S-C-P formulation was based on the Cobb-Douglas production function, the basic variables from the production function, namely, labour intensity (L) and capital intensity (K) will also enter the equations. The other variables, Z and TS also detailed in Table 5.4 below entered the equation to capture the fixed effects according to the methods for cross-section pooled analysis (Sayrs, 1989).

Table 5.4. Production Function and Fixed Effects Variables:

Variable	Description
L	Labour costs over total production costs (Labour Intensity measure)
K	Capital per worker
TS	Sector Effects Dummy
Z	Fixed Effects Dummy

Based on the formulation of Equation 5.1 and on the description of the variables above, the details of each equation presented below, which are expected to explain the behaviour variables (F, LI, X and M) by the same set of independent variables (E, NI, I, K, L, R, D, T, Z, TS, S, P, G, and O) are coherent with the basic formulation in chapter two.

The method consists in running regressions with the models below, across 30 industries, in order to estimate the coefficients, which will be central for answering the first research questions, i.e., whether trade liberalisation affected the firms behaviour measured by the four variables in Table 5.1 above and at what levels. After checking the validity of the regressions, the coefficient signs and values will be discussed according to the theory and evidence in the literature (Krugman and Obstfeld, 1996; Krishna and Mitra, 1998; Levinsohn, 1993). The second research question on the effects of market structures will have similar treatment, since the models had also four variables to measure market structure as detailed in Table 5.3. The models to be tested are as follows:

Model 1. (Total Factor Productivity)

$$F_{it} = a_0 + a_1E_{it} + a_2NI_{it} + a_3I_{it} + a_4K_{it} + a_5L_t + a_6R_{it} + a_7D_t + a_8T_{it} + a_9Z_t + a_{10}TS_i + a_{11}S_{it} + a_{12}P_{it} + a_{13}G_{it} + a_{14}O_{it} + e_i$$

Model 2. (Labour Productivity)

$$LI_{it} = b_0 + b_1E_{it} + b_2NI_{it} + b_3I_{it} + b_4K_{it} + b_5L_t + b_6R_{it} + b_7D_t + b_8T_{it} + b_9Z_t + b_{10}TS_i + b_{11}S_{it} + b_{12}P_{it} + b_{13}G_{it} + b_{14}O_{it} + e_i$$

Model 3. (Exports)

$$X_{it} = c_0 + c_1E_{it} + c_2NI_{it} + c_3I_{it} + c_4K_{it} + c_5L_t + c_6R_{it} + c_7D_t + c_8T_{it} + c_9Z_t + c_{10}TS_i + c_{11}S_{it} + c_{12}P_{it} + c_{13}G_{it} + c_{14}O_{it} + e_i$$

Model 4. (Margins)

$$M_{it} = d_0 + d_1E_{it} + d_2NI_{it} + d_3I_{it} + d_4K_{it} + d_5L_t + d_6R_{it} + d_7D_t + d_8T_{it} + d_9Z_t + d_{10}TS_i + d_{11}S_{it} + d_{12}P_{it} + d_{13}G_{it} + d_{14}O_{it} + e_i$$

The method of estimation implied, in spite of being very popular in econometrics, some restrictions on the variables such as the linearity of the relationship, constant coefficients, non stochastic regressors, normality of distribution, non-autocorrelations and non-multicolinearity of the explanatory variables, which can be summarised as independence of the explanatory variables (Ramanathan, 1998). Some of these assumptions can be satisfied by the application of the production function, in logarithm form, with measures of trade liberalisation tested as a residual, representing productivity changes. However, some assumptions were more difficult to meet when the subject involves economic behaviour, since the explanatory variables, as exposed in the equations above, are theoretically likely to be co-related, although the sampling procedures were designed to insure a high degree of independence (IBGE, 2000;2001a;b). The most important technique do deal with this will be re-scaling the

variables, by calculating the first differences and transforming them into an index, which in the cross-section panel is an appropriate solution for autocorrelation and colinearity problems (Ramanathan, 1998; Sayrs, 1989).

The interpretation of the results will be based on the statistical significance and on the sign of the coefficients. Hence, the validity of parameters estimations for hypothesis test will rely on the "t" tests for this statistic measures the significance of the coefficient values obtained from regressions. The fitness indicator R^2 measured the adequacy of the equation.

Summing up the interpretation of the results of the tests will provide the appropriate answers to the research questions by the values of the coefficients, that will indicate the extent of the elasticity relating the performance measures to each one of the explanatory variables. To interpret the elasticities, which will be denoted by the values of the coefficients and the signs of each coefficient, which will be crucial. The signs will inform whether or not the behaviour variable in the model increased or reduced when the explanatory variable in question increased. The "t" values corresponding to each coefficient will indicate whether the elasticity of that variable had any statistical significance. In the next section the variables will be described in more detail, in order to run the tests based on the appropriate information.

5.2.2   The Variables for Estimating the Proposed Models

The objective of this subsection is to present the variables used to test the hypothesis which states that trade liberalisation increased firms' efficiency, and productivity, subject to the market structure. The inclusion of fixed effects with dummy variables (Z and TS) will indicate changes in time, and across sectors respectively. The hypothesis underlying their inclusion in the regressions was that trade liberalisation may perhaps influence productivity, and performance, differently across industries, which will be captured by TS, which varied across sectors in a fixed basis, and over time, which will be captured by Z (Sayrs, 1989). Since the changes during the period of analysis have already been discussed in chapters three and four, this subsection will concentrate on the explanatory power of each of variable and how they fit in the models, giving also details of their acquisition that have not been yet discussed.

The variables indicating performance and productivity were used in the models as dependent variables to express how trade liberalisation affected the changes in firms' behaviour. The first productivity measure in the equations will be total factor productivity. According to the calculation in chapter four it was measured as the

residual increase of production after accounted for the changes in factors' use. The importance of total factor productivity as a measure of productivity has been highlighted by many authors, particularly to capture trade liberalisation effects (Kim, 2000;Jenkins, 1995;Weiss,1992;Weiss and Mulaga, 1998). The second productivity measure is labour productivity index (LI), which will indicate changes in sales per worker, in each industry as discussed in chapter four. It had strong relevance for manufacturing since the number of employees or working hours fell sharply after trade liberalisation. Labour productivity has the advantage of indicating the technical progress, since using advanced machinery was linked to reductions in the number of employees (Kim, 2000; Weiss, 1992). As a consequence, since changes in technology are strongly correlated to trade liberalisation by the use of imported machinery. Thus this variable is expected to give an interesting indication of the firms' behaviour as a consequence of trade liberalisation.

Export performance (X), measured by manufactured exports levels, showed the performance of each industry, during the period, with the advantage of indicating also competitiveness and quality, since a product needed to match international standards to be exported. As a performance indicator, margins (M) concentrated the information about firm behaviour in a manner that reflected not only the firm's effort to maintain its market share and its profit levels, but also the results of its cost reduction strategy. For instance, margins indicated the firms' responses to incentive policies and the effectiveness of such a policy. Hence, changes in margins expressed the extent of the company's success or failure, since having negative mark-ups was the route to collapse. Mark-up measures were calculated as the difference of average prices and average operational costs, in each industry.

The group of independent variables indicating direct trade liberalisation measures will be effective rates of protection (E), nominal tariffs (NI), imports levels (I) and the elimination of non-trade barriers (D) as shown in Table 5.2. Since trade liberalisation took three years from 1988 to 1990 the simple method of comparing the situation before and after was insufficient to provide adequate results. Hence, to take advantage of the proposed methodology the variables measuring trade liberalisation varied in time due to their quantitative characteristics, with the exception the variable "D", a dummy variable to capture the shock of trade liberalisation in 1990. Although their variations have already been discussed in chapter three, the possible interpretations and fitting to the models will be detailed below.

The effective rate of protection (E) was based on the cross-border price differences, accounting for the imported components of domestic produced goods, as explained in the calculations in chapter three. This measure enabled each industry to show a wide protection range with the advantage of relying on the adding-up of different protection schemes that reflected changes in prices of intermediate goods and inputs. The effective rate of protection was seen in the literature as a comprehensive way of measuring protection (Greenaway and Milner, 1993). Although there are many possibilities of interpreting the changes in E, the basic interpretation in the models above will be that when E increased trade liberalisation falls and vice-versa.

Nominal tariffs index (NI) indicated the directly measurable changes in the protection level, which was a strong measure of trade liberalisation. Nominal tariff reductions were the most visible way of introducing trade liberalisation, as discussed in chapters two and three (Bhagwati, 1980; Krueger, 1984; Krueger and Rajapatirana, 1999). Although "NI" was a simplified measure of trade liberalisation as compared to "E", it had the advantage of measuring trade liberalisation directly by the differences in tariffs. Reducing tariffs was the most visible way for governments to express willingness to change trade policies, together with the elimination of the non-trade barriers. The possible collinearity with "E" was eliminated by re-scaling nominal tariffs as index. Although by definition nominal tariffs and effective rates of protection had different origins, Chi-square and F tests for arithmetical linearity failed, which induced the re-scaling procedure to address the problem, according to the technique explained in Ramanathan (1998). The interpretation of the changes in NI, as in the case of E, will be that tariff reduction will be associated with increasing trade liberalisation, and vice-versa.

Imports (I) can be considered a trade liberalisation measure, since when it increases there is a positive amount of imports that actually jumped any kind of barrier by entering the country. Hence an increase in imports clearly indicates that trade was effectively liberalised, since companies were actually importing more. Thus, the interpretation of imports will be that when it increased trade liberalisation also increased, and vice-versa.

The fourth trade liberalisation measure is the qualitative dummy variable (D), which was set up in 1990, aiming to capture the structural changes in the importing regulations, which influenced the dependent variables, and were not captured by the previous variables. The dummy variable "D" would pick up the effects of the import prohibitions ban, quota eliminations and other changes in NTBs in 1990, as

discussed in chapter three. Besides prohibitions and quotas, there was a long list of subsidies to local producers and tax exemptions for TNCs and local groups' that were suppressed to reflect market prices and eliminate distortions. The use of a dummy variable to capture the elimination of NTBs was due to the nature of NTBs that are difficult to measure and inconsistent with quantitative measures (Greenaway and Milner, 1993). Hence this variable's interpretation will be as the absolute changes in the behaviour variables that occurred in 1990.

Beside the four measures of trade liberalisation described above, the models included two indirect trade liberalisation variables: real effective exchange rate (R) and the terms of trade (T). "R" entered the models because of the crucial influence of foreign exchange rate on trade flows, which indicated that R affected firms' behaviour, as a protection parameter. Devaluations functioned as a protection barrier by increasing imports' prices. Thus an increase in R will be interpreted as an increase in protection. The terms of trade have been calculated in index form, reflecting the relationship between the prices of exports and imports by industry, which indicated the degree of competition of exports related to imports. The possibility of numerical collinearity between terms of trade (T) and REER (R), due to nominal exchange rates being correlated to both measures, was dealt with by re-scaling "T" to diminish numerical collinearity (Ramanathan, 1998). The interpretation will be that an increase in "T" will be associated to an increase in the degree of trade liberalisation, and vice-versa.

Since the definitions and variations of the market structure variables have already been discussed in chapter two and three, their fitness to the models and their interpretation will be detailed now. The chosen structural variables were entry/exit, size, ownership, and capacity utilisation. To indicate the changes in entry/exit by industry, the stock of companies at the end of the period was considered. Since the MTE database, which was used to generate this variable, was the basis to the IBGE companies' register, consistency with the rest of the data was granted (MTE, 2001a;b).

Among the different measures of size and concentration discussed in chapters two and four, the most popular were based on the number of employees per firm and per industry. Due to effects of downsizing concerning trade liberalisation, the chosen measure to express company's size was employment concentration, which was defined as the ratio of the number of large firms over the number of small firms.[9] The

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[9] Large firms being defined as the firms with more than 500 employees and small firms those with less than 30 employees (cf. chapter four). the medium firms were separated into 2 categories: 30 to less than 100 employees and 100 to less than 500 employees and added to the small or large categories (MTE, 2001).

interpretation of this variable showed the influence of downsizing on the behaviour variables, which affected the way that trade liberalisation has been perceived by the firms. The assumption was that the higher the ratio of large/small firms the less the industry had been submitted to downsizing. Since ownership status of a firm had a close relationship with the decision procedures, it constituted a crucial variable for behaviour studies. To measure ownership the assumption was of a bipolar concept with foreign and domestic firms, taking FDI stock as proxy of foreign ownership. Although collapsing into domestic ownership the public and private categories, this concept had the advantage of fitting in a scale instead of categories. The interpretation was that the higher the FDI share, in the industry, the higher the foreign ownership.

Although capacity utilisation, as discussed in chapters two and four, seemed interesting for empirical studies on total factor productivity and competition, state intervention and the closed nature of the Brazilian economy did not emphasise its importance. However, there were some policy implications connected to capacity utilisation, since government intervention by subsidies and other protection schemes encouraged building up excess capacity. Furthermore, since empirical studies suggested that idle capacity indicated indirect protection by adding extra difficulties to newcomers, this variable will be added to the models to test for this theory in the Brazilian manufacturing context. The interpretation will be that increasing capacity utilisation indicated less protective support for firms, and vice-versa. The next subsection discusses the data requirements to analyse these variables using the above approach.

5.2.3   Data Requirements to Run the Proposed Model

The objective of this subsection is to define the data to be used in the models, according to the descriptions and interpretations in the previous subsection. Some details of the official surveys in Brazil will be discussed to clarify the explanatory power of the models based on these surveys. The data gathered for the analysis were organised according to the patterns of the Annual Industrial Survey (PIA) from the Brazilian Institute for Geography and Statistics (IBGE), which provided the basic data, as Table 5.5 shows. The other data sources were the Ministério do Trabalho e Emprego or Ministry for Labour and Employment (MTE), the Fundação de Comércio Exterior (FUNCEX), the Fundação Getúlio Vargas (FGV) and the Central Bank. Their data came already on the same classification used in the PIA or were easily translated into that, which increased the consistency of the analysis. Hence, the data structure will be

based on the IBGE's classification CNAE Nivel 100[10] (Classificação Nacional de Atividades Industriais Nivel 100) used since 1986[11]. Based on two principles: simplicity and direct explanatory power, the purpose built database was developed with the Brazilian statistics on firms and industries.

The dataset has been submitted to a detailed process of checking and verification, which in some cases had a limiting effect on the research scope due to the lack of precise information, which were overcome by the use of proxy variables. Hence, describing some details of PIA surveys, which was the major data source, particularly concerning the methodology became essential. Moreover, the other sources were based on the same classifications and methodologies. The PIA survey series began in 1966, have been upgraded in 1978, and 1996, producing data on production, intermediate consumption, wages and number of employees, sales and number of firms in manufacturing and extractive industries.

Table 5.5. Data Sources and Surveys

Measure	Variable	Survey	Source
TFP	F	PIA (IBGE, 2001)	Author calculations
LP	LI	PIA (IBGE, 2001)	Author calculations
Exports	X	FUNCEX	FUNCEX, 2001
Margins	M	PIA (IBGE, 2001)	Author calculations
ERP	E	I/O Matrix (IBGE, 2001)	Kume 1998, 2000
Nominal Tariffs	NI	Excise Services	Kume 1998, 2000
Imports	I	FUNCEX	FUNCEX, 2001
Entry/Exit	S	MTE	MTE, 2001
Size	P	MTE	MTE, 2001
Capacity Utilisation	G	FGV	FGV, 2002
Ownership	O	Central Bank	FDI Census
Capital Intensity	K	PIA (IBGE, 2001)	Author calculations
Labour Intensity	L	PIA (IBGE, 2001)	Author calculations

Note: The data gathered were all for the period of 1986 to 1999.

After 1978, the survey underwent two methodology changes, aiming to adapt its results to UNIDO-ISIC patterns (Moreira and Saboia, 1996). The first was in 1986, which generated a survey design based on the Cadastro Brasileiro de Empresas (CEBRAE) or the firms' registry, which was initially based on the industrial census,

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[10] The CNAE Nivel 100 fits between UNIDO 2 and 3 digit classifications and became consistent with UNIDO release 3 after 1996.

with the scope of registered companies in 31st December of each year in both: Ministry for the Economy and Finance (MEF) and Ministry for Labour Employment (MTE). Thus, the PIA methodology insured basically the adequateness of its representation for the manufacturing sector, and provided strong consistency with the other surveys providing data.

The PIA sample was based on a panel of companies extracted from the CEBRAE with double extracts: a probabilistic extract of small and medium enterprises, and a true extract of large enterprises, called leader companies. From 1985, the definitions were that the probabilistic extract represented the small and medium manufacturing enterprises and the true extract covered the totality of enterprises with more than 1000 employees or total sales of Cr$500 million (1985 values) and more. The true extract comprehended around 800 companies and 17,000-20,000 establishments, responding for 67 to 80 % of the total manufacturing value added. The part of small and medium firms is covered by the probabilistic extract (IBGE, 2000;2001b; Saboia and Carvalho, 1997).

This panel design had a fixed structure, which meant that new products, and new industry classifications had to be fitted in the pre-existing categories. The revision in 1992 only simplified the data collection procedures eliminating questionnaire redundancies, which did not influence the interpretation of the resutls (Saboia and Carvalho, 1997). During the whole period of the research, the number of companies in the panel ranged between 40,000 in the last years and 45,000 in the earlier years. The sample was formed in a sampling mechanism without reposition and bound by rules that maintained the coefficient of variation at less than 12%, at the confidence interval of 95%, in each analysis unit (the state, the locality and the classification). The last changes in the PIA in 1996 had impressive effects, because IBGE introduced more detailed classification to be conformable to UNIDO-ISIC (Release 3). The industrial census of 1995 provided the basis for a new panel of companies, where the main change was the scope of the PIA survey redefined as the firms with 5 employees and more which falls into the CNAE C and D sections dealing with the UNIDO industrial classifications (IBGE, 2000). As explained earlier, the data from 1996 onwards were translated into the "Nivel 100" classification for consistency with the data from previous years.

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[11] IBGE produces other industrial surveys that had not entered the estimations because of their different scope, since they do not contain company data, such as margins, investment or costs.

Hence, the purpose built database was based on the PIA published and unpublished data from the IBGE system, for 14 years (1986-1999), with a lack in 1991 that has later been linearly interpolated. The deflated sales values were used as a proxy for MVA, since its estimation faced data inconsistencies, particularly in the values classified as "costs and outgoings", which were basic for calculating production costs, by showing large amounts of "outgoings", as compared to costs. Moreover the inventories fluctuations were taken in values instead of quantities, which misled the interpretation, in periods of high inflation (1986-89, and 1992-93). Another problem in estimating the MVA was the difficulty in separating raw material values from work in progress values. However, the operational costs value were accurate as a measure of the expenditures in producing the output, since they were collected at establishment level, which enabled the calculations of labour intensity (L) and capital intensity (K).

To estimate the labour costs, the measures were the net stock of employees and total wages taken from the PIA and used to calculate the labour productivity index (LI) and total factor productivity (F), as described in chapter four. However, due to the changes during the year, these measures are to be treated with some caution when expressing the actual productivity values due to the fact that they are end-of-year levels rather than year averages. However, the estimates for the firms' capital stock were accurate, because they were based on the Brazilian strict rules for dealing with inflation and capital assets, which were aimed to have an appropriate basis for taxation at the end of each year.

As mentioned earlier, the data coming from other sources were consistent with the PIA classification, although there has been some translations from different versions into the "CNAE Nivel 100", that was used in the database. Two market structures variables, size (P) and number of firms (S),which were taken from the MTE database, were converted to the CNAE Nivel 100, which implied regrouping some industries, to reach the CNAE Nivel 100 definitions. The third market structure variable: capacity utilisation was the yearly average of utilisation of the capacity, in each industry measured in percentage of the total capacity at the end of the year, according to the statistics from the Fundação Getúlio Vargas (FGV), which were also based on the CNAE Nivel 100 (FGV, 2002). The FDI values were used as a proxy for the variable expressing the firms' ownership and were originated from the Central Bank database, which also had a classification based on CNAE Nivel 100.

To correct values for inflation, price indexes were taken from the gross price index (IPA) for each industry and applied to sales, costs, intermediate

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consumption, assets and wages values (FGV, 2001). Imports and exports were already measured in US$ FOB prices, which were not influenced by transport costs, and export or import taxes, which did not need correction for Brazilian inflation. Since the quantitative approach will be followed by a qualitative sectoral approach, based on case studies of six manufacturing industries, the next subsection will present the approach adopted for these case studies.

Section 5.3　Qualitative Case Studies

The case studies based on six industries will emphasise individual company's decisions and the influence that government policies might have on them, as a means of reinforcing or challenging the conclusions that may come out from the econometric analysis. Since the emphasis was on the influences that market structure might have on the relationship between trade liberalisation and efficiency, case studies seemed to be appropriate because, according to many authors, case studies enable the researcher to understand issues that have been faced or are presently being faced by the players (Curry, 1993). These issues can be the interpretation and deep understanding of events and decisions such as the confrontation of theoretical assumptions with empirical evidence The objective of this section is to present the sectoral case studies that were surveyed in-depth to analyse the consequences of the trade liberalisation on the companies with direct information from the field. The intention was also to access different source of information, e.g. trade associations, firms reports and the perception of those in charge of the companies' boards and plant directors.

The reasons for developing case studies based on qualitative research came from three elements, which together influenced the companies' decisions. First, the human development skills and organisation models for human resources that varies from company to company. Second, the technology element since the way of spreading learning and knowledge within an industry influenced firms' behaviour. Thirdly, this approach suits in-depth research on organisations' motivations and attitudes better than quantitative methods, which are based on secondary data (Yin, 1994). The objective of such research will be to pick up the differences that could explain the pattern of trade in selected industries. There will be a discussion on the possibility of some of these features being a consequence of trade liberalisation.

Questionnaires were distributed during visits to firms, scattered in five regions to give an accurate idea of their reactions to trade liberalisation. For qualitative

work helped to clarify some points, instead of checking for broader theoretical generalisation. Hence, the choice of this method seemed appropriate as a complementary technique to the quantitative analysis (Yin, 1994).

The adoption of this qualitative approach beside checking the findings from the quantitative analysis has the objective of researching for the elements of causality that moved the firms to respond to trade liberalisation. Particularly, it should be able to point out the nature and the intensity of the reallocation of resources within the firms and industries. The research in the field also aims to find out if the driving forces behind this were linked to trade liberalisation. In addition, it will be of interest to check the idea that in Brazilian manufacturing dynamic efficiency was not only the result of technical changes but came about through reorganisation and modernisation of the processes of production (Amann, 2000). These case studies will seek the links between trade liberalisation and such modernising techniques, which were in line with the industrial organisation theory.

Furthermore, this qualitative approach aims to describe the efforts by the firms towards product quality improvement, which was a key factor for rising exports and competitiveness. Product quality improvement was one of the dynamic effects from trade liberalisation that came about by the channel of easing imports of raw materials and capital goods, according to the theory discussed in chapter two. The output of such research will be based on companies' decisions and business environment, rather than an analysis of data that could be obtained from published sources. Next, the design of the fieldwork survey will be discussed, stressing the points above to find qualitative information on behaviour and decision making, inside companies.

5.3.1 Research Design

It became clear, for budget and time constraints, that the fieldwork would not be able to cover every manufacturing subsector with the details that were needed, for checking the links between trade liberalisation and performance. Nevertheless, an appropriate research design could highlight the requirements of an in-depth research to trace the causalities and the elements of interaction between trade liberalisation and efficiency gains, which ended up by reinforcing the productivity gains.

To ensure the required number of interviewees in the sample, the approach was to concentrate the visits to firms in six industries, instead of trying to visit

firms in every industry. Since the dynamic effects of trade liberalisation are assumed to be transmitted by the process of linkage between the firms, in the cost of inputs and intermediate goods, the firms were chosen as they were part of a supply chain. For instance, any technical or competition improvement in an upstream industry that would allow for price reduction would affect the others downstream, in terms of price and quality. Thus, the objective of such qualitative research was to trace the effects of trade liberalisation on the firms' behaviour by interviewing firms, which were part of a supply chain. Hence six industries were chosen with the first group: mining-steel-aluminium supplying automobile, and aviation. Computer and software industry was also chosen for two main reasons: it produces intermediate goods that supplies every industry and it has been one of the most protected in the previous period. Thus it had a potential to demonstrate the importance of trade liberalisation as a means of integrating price, costs and product quality.

Beside the reasons above, the objective of this subsection is to provide some more detail of the chosen industries and describe the plan for the field visits. The importance of the chosen industries was also due to their shares in manufacturing exports and imports, which made them key industries for trade. Hence, Figure 5.1 below shows the figures to confirm the importance of trade in the selected industries, highlighting their shares in manufacturing exports. These industries represented almost 50%of total manufacturing exports and 20 to 30% of total manufacturing imports, during the period analysed.

Figure 5.1. Shares of Total Manufacturing Exports and Imports (Selected Industries)

(%)
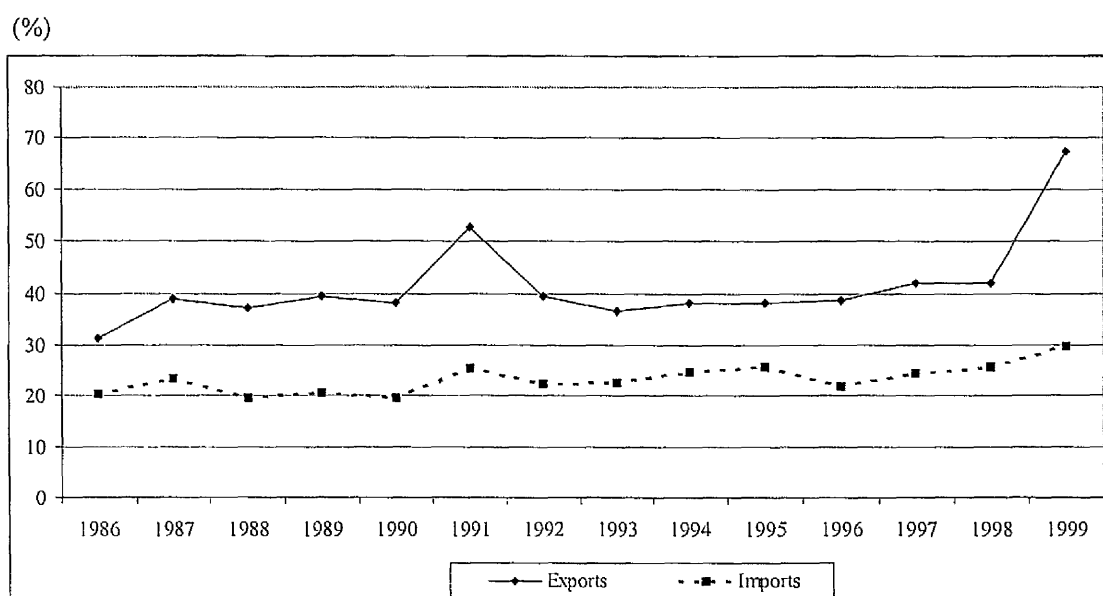
Source: FUNCEX (2001)

Following the principle of choosing industries ranged in the same supply chain, mining is situated at the bottom line of two industries, steel and aluminium. Thus, any technical improvement or price reduction in mining would affect the steel prices and supply, which by the transmission mechanisms would affect spare parts, cars and planes. Although mining did not seem to be an important industry due to the focus on extraction of primary goods, it was appropriate to visit firms in this industry, to seek the influences of trade liberalisation on manufacturing, because it was the basis of price formation for many other industries.

Moreover, there was an hypothesis that trade in Brazil would concentrate on sectors with comparative advantage, which by the common understanding about the LDCs, should coincide with natural resources intensive sectors. Hence this hypothesis will be tested by the questions that will be asked about increasing investment in the mining sector after trade liberalisation, among others. The importance of mining to the Brazilian exports was also considered, since it became essential to trade liberalisation because of the elimination of anti-export bias. Nevertheless, the basic reason for including mining was to have a complete chain of supply, which was thought to be the transmission mechanisms for the firms' behaviour as a consequence of a policy change such as trade liberalisation.

Three characteristics were essential for including steel in the sample: it was part of the "basic industries" , has been state owned, and was based on natural resources, which was one of the hypothesis to be tested for trade liberalisation. Initially most of the large steel firms were state owned, being privatised after 1988. For this combination of trade liberalisation with privatisation, the choice of a qualitative approach to study the effects of trade liberalisation seemed to be the most appropriate. Interviewing firms in an individual basis would help to disentangle the consequences of such policies. Moreover, alternative data from the steel companies and from the Instituto Brasileiro de Siderurgia (IBS), or Brazilian Steel Institute, were crucial to complement the analysis (IBS, 2000).

In the same way as the steel industry the aluminium sector has been chosen because of the important linkages between industries and for being also part of the basic industries. The definition of basic industries came from the government to allow for cheap credit and other official support under the PND II, which was oriented by ISI policies in the 1970-80s (Bonelli, et al., 1997). The importance of aluminium exports was similar to that of mining industry, which also justified its choice.

The reasons for choosing automobile firms, which included carmakers and car-parts producers, were of triple interests: first the sector meant the user-end producers for the previous industries that were concentrated in producing inputs from mining to steel and aluminium. Second, this was a technology intensive industry, which added the possibility to test the hypothesis of trade liberalisation as a cause of improving technology and product quality, besides the increasing competition from imports. Thirdly, automobile as opposed to steel and mining, which included many state owned firms, has been developed under TNCs investment and technology. Hence the hypothesis of increasing FDI to develop product quality and markets after trade liberalisation will also be discussed. For instance, the Brazilian car producers have taken advantage from the closeness of the economy during more than 30 years (1958-1990), at the expense of keeping their domestic products in a old fashion look and performance, as discussed in chapter three.

The second industry chosen for testing the enhancing technology hypothesis of trade liberalisation was aviation. The plane and plane spare-parts constructors will be asked questions on the importance of imported technology for their development, in order to check for trade liberalisation effects on the processes of productivity and product quality improvement. Another possibility to be discussed with the companies concerns the advantage of being under infant industry protection before trade liberalisation. Besides being an important sector for Brazilian exports, aviation has been chosen because of the capacity of generating knowledge and spill over the rest of the industry due to high technology levels and the need of strong integration of industries. The fact that there is only one large plane constructor, the EMBRAER, suggested that technology transfers and linkages effects would converge to that firm from the basis of the supply chain. This constituted a good opportunity for testing the hypothesis of transmission of technology progresses and efficiency.

The inclusion of aviation was also motivated by the literature, to check on the previous conclusion of net public transfer to the company (EMBRAER). By hearing the company's board, and its suppliers, the alternative hypothesis of making social profits by technology improvement and reducing knowledge opportunity costs will be discussed (Baldwin, 1992). Moreover, the objective was also to check the firms' production, product quality and organisation, by published or unpublished information, to understand the channels of increasing productivity and competitiveness by technology transfers.

Finally, the computer and software industry was one of the most protected industry until 1991, which encouraged including it in the qualitative study. Moreover, its characteristics of advanced technology and vector for technology transfer also encouraged its inclusion in the sample. Nevertheless, computer and software should mirror the learning effects from trade liberalisation by the dynamic effects, discussed in chapter two, due to the basic characteristic of being intermediate goods. Hence, the importance of computers and software as intermediate goods and components of other goods, such as automobile, planes, electrical materials or electronic appliances were the reasons for surveying it.

The choice of regions to visit resulted from the combination of the better reactions to trade liberalisation and the reported performance change in each industry. First, the plants were concentrated in the two biggest areas: São Paulo and Rio de Janeiro. But, nowadays manufacturing firms spread to other regions in response to local and national investment incentives, which encouraged the companies to build factories in other regions. As a result of this plant distribution and the need for visiting the firms and plants in their locations, the decision was to choose a selection of plants beyond the large cities of Rio de Janeiro and São Paulo. This included Belo Horizonte, Varginha, Uberlândia, Vitória, Porto Alegre, Caxias do Sul, São Leopoldo, Canoas, Fortaleza, Recife, Salvador, Volta Redonda, Petrópolis, Taubaté, Rezende, São José dos Campos, Campinas, and Brasilia.

5.3.2 Questionnaires and Interviews

The questionnaires (cf. appendix 10) were designed to take advantage of the secondary data already analysed and to provide complementary information on the hypothesis tested. The visits also provided the opportunity for the players themselves to explain their role, to talk about the firms' efforts to overcome the increasing competition from imports, and to discuss the advantages of importing inputs. Moreover, the conclusions drawn from the official data might be complemented by a close look into the firms, who were the actual actors in this scenario.

The questions to be asked to test the hypothesis were derived from the conclusions in chapter six and from the literature on trade liberalisation, concentrated on the static and dynamic effects of trade liberalisation. The particular design of the structured questionnaires will also capture the information on product quality improvement and technology changes due to trade liberalisation. Moreover the suppression of non-trade barriers will also be apprehended by the changes in paperwork

and delays for licensing imports, beside the information given by the firms on import quotas and other barriers that they use do face. Based on the assumption that trade barriers did affect homogeneously the companies because of the imports special regimes, the hypothesis that import barriers were biased against newcomers and small firms will be tested by the questionnaires, since size and time in the business will be asked to compare with the import possibilities (Franco and Fritsch, 1994).

In accordance with the theory discussed in chapter two, the structured questionnaires were built in a way that they could guide the companies to answer whether they have changed their investment and employment levels, as a consequence of trade liberalisation. This was meant to test for the resource reallocation. Second, the dynamic effects of trade liberalisation will be tested by asking the firms about their change in technology and whether they increased the use of imported inputs and machinery after trade liberalisation. Comparing the answers from the firms on the static and dynamic benefits will give an idea of the changes. Hence, the hypothesis of TNCs being more export-oriented that domestic firms will be tested by the questionnaires, since ownership and level of exports will be asked, to assess the firms position, which was already discussed in the literature (Moreira and Pinheiro, 1998).

These interviews aimed to get an insight of the firms decisions on prices, cost reductions and other behaviour that they could have when competition increased. Previous studies were scrutinised over the questionnaires, which are used as a guideline for the semi-structured interviews and have formally been answered by many company boards and directors according to the purpose assigned to them.

5.3.3 The Interpretation of the Questionnaires and Interviews

The quantitative analysis, as described in the previous section, was designed to search for the nature and the forms of the companies' reactions to trade liberalisation by adapting their production scheme. It was based on case study since this methodology provided the appropriate flexibility to analyse different angles and new data from the participants (Yin, 1994). In this study the possibilities of analysing the questionnaires in a dynamic flexible way intended to explore the companies' visions about the markets, trade liberalisation and their connections with other companies. Before detailing the qualitative analysis, which will be carried out in chapter seven, some details of the questionnaires and the interpretations of the possible answers, will be discussed. (In the next paragraphs, the numbers in brackets indicate the question numbers in the questionnaire, which is in Appendix 10).

The first questions are the firms' basic characteristics to ensure that the survey earned meaningful results. Hence, the variables of interest will be: industry (2), and the objective questions on the trade liberalisation effects. Location (1), Size (3), ownership (5), market shares (7), and the time in the activity (4) will also be analysed.

The questions about the performance measures: exports (9,10,11,12) output increase (30) and productivity (38,39), mark-ups (42) will be analysed, in the first place, by comparing the answers to the results of the estimations by the models, described in the previous section. Based on the analysis of the changes in the performance variables, the questions on the changes in the capital reallocation (13,14,15,16,17,18) and labour movements, such as creation and extinction of employment (19,20,21,22) will be surveyed together with the reasons for the firms' decisions. The reasons will indicate whether their decisions were or not a consequence of trade liberalisation.

As for the expected dynamic effects of trade liberalisation, the focus will be on the proportions of firms that added new products (24,25) and excluded old products (26,27), which will denote the changes in product competition and product quality after trade liberalisation. Further discussions on new machinery and the reasons for buying it (28,29). The decision of importing new machinery, inputs and raw material (31) and the reasons for this (32,37) together with the changes in the shares of imported inputs in the products before and after trade liberalisation (33,34) will give an idea of the changes in the production schemes caused by trade liberalisation. The reasons given for any decision related to dynamic effects of trade liberalisation will be classified as tariff-static effects trade related, learning/dynamic effects trade related, and other reasons.

To confirm the results of static and dynamic effects from trade, there will be questions about the reasons for productivity increase, which will also be classified as related or not to trade (39). The influences of trade liberalisation on competition (41) will also be asked. Most of the questions will be detailed by industry (2), to allow for comparisons of the results for each industry to test the hypothesis of trade liberalisation affecting the industries differently. For consistency with the quantitative analysis, the questions followed the structures of static and dynamic effect of trade liberalisation. But a wider degree of flexibility will be allowed by the technique of qualitative research with interviews and structured questionnaires. Other information that was not foreseen when preparing the questionnaires will be collected during the interviews and visits to the firms.

Section 5.4 Conclusion

This chapter proposed a model, based on the S-C-P model discussed in chapter two, to test for the effects of trade liberalisation on productivity, export performance and margins in manufacturing in Brazil. Since trade liberalisation was introduced in 1990, there was enough time for the firms to have reacted by resource reallocation and by the introduction of new technology, improving learning and enhancing product quality. So the empirical results may reflect these changes.

The data on the subject were from different sources and the option for using annual data was due to the availability of this kind of data in Brazil. Hence, to be complete and consistent with the objectives of analysing published data at firm level and to emphasise the effects of trade liberalisation on firms' behaviour, annual data from 1986 to 1999 will be used. Moreover, in the context of trade liberalisation and productivity analysis, it became crucial for the application of the S-C-P models to have data on operational costs, profits or margins, which also was possible annually. The level of inflation, which was severe in many years before and after trade liberalisation could bring some uncertainty to the estimates, which will be dealt with by using an inflation index for each industry. This index approximated as much as possible the inflation effects in the Brazilian context. So the estimations run at constant prices at the 1999 levels.

The possibility of testing the hypothesis by using a multi-method approach led to a qualitative survey, which was directed to a sample of firms in six industries, to collect the companies' reactions to trade liberalisation, in a round of interviews in the field. The interviews have the advantages of complementing the data analysis by clarifying the firms' initiatives to cope with increasing competition after trade liberalisation. The objective of the case studies will be to determine the extension of the changes in the companies' behaviour after the trade liberalisation and the links of trade liberalisation to these changes. The target industries were ranged in a chain of suppliers to emphasise linkage elements. Computer and automobile industries had another extra reason to be surveyed, which was the high level of non-trade barriers that these industries were submitted to, before trade liberalisation. In the next chapter regressions based on the models described in this chapter will be run. Another chapter with the qualitative analysis of the questionnaires and data gathered from the visits in the field will follow the next one.

CHAPTER 6. TRADE LIBERALISATION AND MARKET STRUCTURES

Section 6.1   Introduction

This chapter's objective is to discuss the tests of hypothesis run with the data descriptions and the methodology announced in chapter five. The discussion of the tests' results and the possible interpretations will be based on the descriptions of each variable. It is useful to remember the research questions to be analysed:

- Did Brazilian manufacturing companies improve their productivity, export performance and mark-up discipline after trade liberalisation in 1990?
- Did structural elements affect the relationship between trade liberalisation and productivity; export performance and mark-up discipline?

To answer these research questions, which framed the hypothesis to be tested, the discussion of the of results the econometric models proposed in chapter five will be carried out in this chapter. In the benefit of clarity, some repetition of the discussions in chapters three and four and of the models formulated in chapter five will also occur in this chapter. The models will run on a purpose built database, originated from Brazilian manufacturing data, organised according to the national industrial classification, in order to maintain data consistency. Hence, although the recent CNAE (industrial classification used in Brazil after 1996) matches with ISIC release 3, the data were in line with "Nivel 100" classification, to which data referring to periods after 1996 has been translated.

Due to the lack of consistency for the data before 1986, there was difficulty to include more time series data, which would increase the significance of the time series tests. Hence, although full time series might have earned more accurate results, the short period before 1990 motivated the use of a technique of panel data with cross-section analysis. However, the analysis of Brazilian trade liberalisation policies that were introduced in 1990 had a challenging appeal, since few studies have been carried out on that issue. Basically the 1990 trade reforms in Brazil acquired special importance by the fact that this was the first time that such reforms were established in Brazil and was not reversed. This occurred after almost forty years of ISI and high level of protection, as explained in chapter three. Thus, the decision has been made to overcome the limitations and to carry on the analysis, in spite of the limited published data.

The models were estimated by OLS regressions based on the classic Cobb-Douglas production function, which had, as main components, labour intensity (L) and capital intensity (K). These measures were expressed by the proportion of labour costs to total costs, and capital per worker, respectively, according to the techniques in the literature (Bruton, 1989; Ramanathan, 1998). The variables used in the tests of hypothesis were as follows: effective rates of protection (E) in percentages; an index of nominal tariffs (NI), which was an index (1986=100) resulting from nominal tariffs in percentages in order to avoid linearity; imports (I) in values; and a dummy variable (D) for absorbing the shock effect of eliminating NTBs in 1990. The structural variables referring to market structure elements, as discussed in chapter two and four, were ownership (O), stock of firms (S), size (P) and capacity utilisation (G). They were introduced in the models to capture possible effects of market structure on productivity, exports performance and mark-ups according to previous empirical literature on other countries (Berry, 1992;1996; Lee, 1997; Roberts, 1996). Other variables to control for real effective exchange rate (R) and terms of trade index (T) were introduced. For capturing fixed effects, two other qualitative variables were added: Z, for time fixed effects, and TS, for sector fixed effects.

The variables K and L were taken from the PIA with monetary values deflated by the annual average whole prices index for each industry (IPA), as explained in chapters three and four (FGV, 2001; IPEA, 2001). As for the structural variables, stock of firms (S) and size proxy (P) were based on data from the MTE surveys, containing the yearly creation and closure of firms and employment (MTE, 2001c). Capacity utilisation (G) was based on the FGV industrial data bases (FGV, 2002; IPEA, 2001). Foreign ownership (O) was represented by the level of FDI in each industry, taken from the Brazilian Central Bank Statistics (BACEN, 2001).

The variables indicating trade liberalisation (TL-variables) were based on the measures of effective and nominal rates of protection (Kume, 1998). To strengthen data consistency the calculations of productivity total factor productivity (F), labour productivity index (LI) and margins (M) were also based on the PIA (IBGE, 2001b). Exports and imports were taken from FUNCEX (FUNCEX, 2001). Hence the analysis will be carried out, with cross-section and time-series data with 420 observations to estimate the proposed models.

The inclusion of the structural variables as mentioned above was supported by previous studies, as discussed in chapter two. For instance, stock of firms and entry and exit flows had evidence of influencing productivity after trade

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liberalisation in Chile and Bolivia (Tybout and Westbrook, 1993; Tybout and Westbrook, 1996). Capacity utilisation was an element for indicating imperfect competition, since maintaining idle capacity was an strategy used to increase entry barriers. Size was included as an scale indicator, based on other studies of competition and trade liberalisation (Berry, 1992;1996; Tybout, et al., 1991). Before running the regressions, it is worth looking at the regression lines of each dependent variable cross-plotted with the trade liberalisation variables in Figure 6.1 below.

Figure 6.1 Regression Lines Dependent and Trade Liberalisation Variables
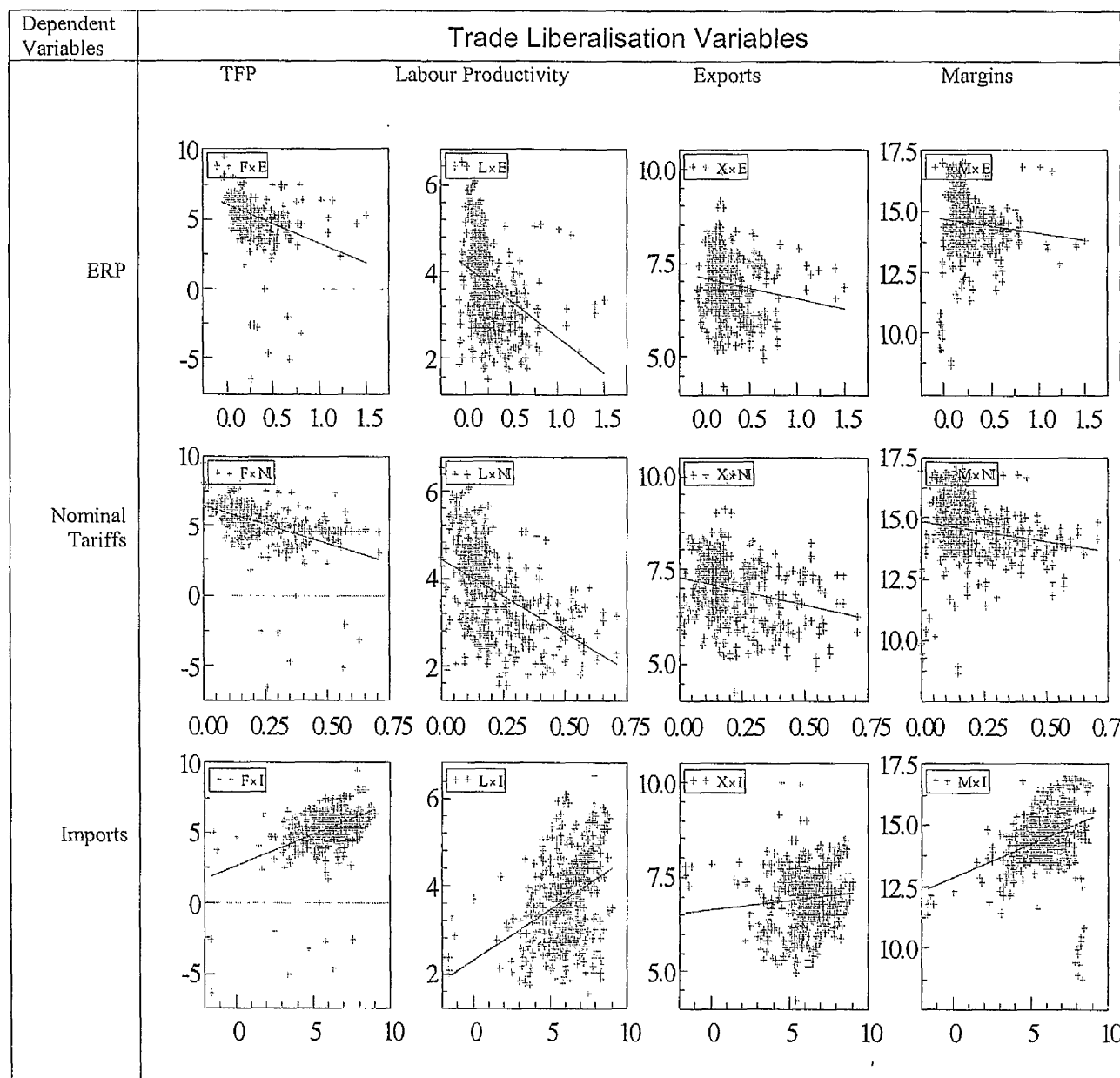
Source: IBGE, 2001a,b (calculations by the author).

The dependent variables - Total Factor Productivity (F), Labour Productivity (LI) and Exports (X) - decreased with increasing effective rate of protection (E) and increasing nominal tariffs (NI), and increased with increasing imports (I). This

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confirmed the expected effects of trade liberalisation on productivity and export performance, according to the trade theory, discussed in chapter two. However, the graphs showed margins (M) decreasing with increasing effective rate of protection (E), and increasing nominal tariffs (NI) and increasing with increasing imports (I). This was not expected, since according to the trade theory margins were expected to reduce when protection was reduced. But the appropriate formal tests might reveal details of such relationship, when the control and structural variables will be added to the equation. Thus, the models described in chapter five to run the regressions, in order to quantify these relationships will be used as established.

Companies were believed to implement efforts to increase performance and productivity as a consequence of trade liberalisation. Increasing product quality and reducing prices at the same time as aiming to increase profits will be tested by behaviour variables in connection with trade liberalisation variables and structural variables. Hence, companies' management will also be tested by the models, while looking for the achievement of their objectives in these terms, since the behaviour variables will reflect the changes in productivity, export and margins.

According to the discussions in chapters three and four, export and productivity performance could be a consequence of government policies, such as subsidies, training and education programmes, or coming from external causes, such as increasing competition. The effects of the government policies and company efforts that were emphasised in Brazil after trade liberalisation, such as educational and training initiatives to modernise the companies, are likely to be picked up by the regressions. The most popular government programme was the Brazilian Programme for Quality and Productivity (PBQP) which encouraged changes in industrial structures, as discussed in chapter three (Bonelli and Fonseca, 1998; Bonelli, et al., 1997). Changes in the scope of previous programmes from inward to outward orientation were observed, such as the technology transfers projects financed by the Financiadora de Estudos e Projetos (FINEP). These might indicate less government intervention and reduced protection, which is intended to be tested for.

In the process of testing the hypothesis, Hendry's general to simple approach was followed, i.e., the regressions began with the full range of variables and the non-significant ones were dropped one by one in successive estimations, until the final specification became significant (Ramanathan, 1998). This step-by-step method was useful due to the large number of explanatory variables and the difficulty of determining those which influenced every behaviour variable. The remainder of this

chapter has three sections: the second details the models to test the hypothesis of trade liberalisation effects, the third discusses the results of the tests of hypothesis, and the last concludes the chapter.

Section 6.2   Modelling the Effects of Trade Liberalisation with Market Structure

The objective of this section is to describe the econometric models introduced in chapter five to refresh the readers' memory on the variables used and to present the interpretation of the results. The regressions will run according to the models on 30 manufacturing industries and 420 observations, to test the hypothesis of increasing productivity, exports and market efficiency as a consequence of reducing protection. As discussed in chapter five, the models were constructed to capture the trade liberalisation effects on productivity, margins and export performance together with structural effects, according to the details in the next subsection.

6.2.1   Formulation of the Models

For the tests of hypothesis, each model enters one of the four behaviour variables as a dependent variable in a cross-section regressions to estimate the effects of trade liberalisation on these variables. According to the formulation in chapter five, the equations below show the regression models for each behaviour variable, i.e., model 1 (total factor productivity); model 2 (labour productivity); model 3 (exports) and model 4 (margins).

- **Model 1:**

$F_{it} = a_0 + a_1 E_{it} + a_2 NI_{it} + a_3 I_{it} + a_4 K_{it} + a_5 L_t + a_6 R_{it} + a_7 D_t + a_8 T_{it} + a_9 Z_t + a_{10} TS_i + a_{11} S_{it} + a_{12} P_{it} + a_{13} G_{it} + a_{14} O_{it} + e_i$

- **Model 2:**

$LI_{it} = b_0 + b_1 E_{it} + b_2 NI_{it} + b_3 I_{it} + b_4 K_{it} + b_5 L_t + b_6 R_{it} + b_7 D_t + b_8 T_{it} + b_9 Z_t + b_{10} TS_i + b_{11} S_{it} + b_{12} P_{it} + b_{13} G_{it} + b_{14} O_{it} + e_i$

- **Model 3:**

$X_{it} = c_0 + c_1 E_{it} + c_2 NI_{it} + c_3 I_{it} + c_4 K_{it} + c_5 L_t + c_6 R_{it} + c_7 D_t + c_8 T_{it} + c_9 Z_t + c_{10} TS_i + c_{11} S_{it} + c_{12} P_{it} + c_{13} G_{it} + c_{14} O_{it} + e_i$

- **Model 4:**

$M_{it} = d_0 + d_1 E_{it} + d_2 NI_{it} + d_3 I_{it} + d_4 K_{it} + d_5 L_t + d_6 R_{it} + d_7 D_t + d_8 T_{it} + d_9 Z_t + d_{10} TS_i + d_{11} S_{it} + d_{12} P_{it} + d_{13} G_{it} + d_{14} O_{it} + e_i$

As suggested by the specifications above, each behaviour variable (dependent) will be regressed on trade liberalisation measures, structural variables,

qualitative variables indicating fixed time and sector changes and the elimination of NTBs. The models will be estimated twice. First as stated above, and second with lagged trade liberalisation variables (E_1, NI_1, I_1) to test for a delay in the effects of trade liberalisation to the behaviour measures. The argument for introducing lags of the trade liberalisation variables was that such policies' effects were meant to last for several periods, and were not expected to produce effects immediately.

There were at least three reasons for expecting delays for trade liberalisation to yield results according to the industrial organisation theory discussed in chapter two. First, psychological reasons, because habits and culture could make people, and companies to wait a certain time before reacting to any policy change. Second, technological reasons, since machinery and inputs needed a certain delay to be imported and local plants also needed time for their adaptation due the learning process. Thirdly, institutional reasons, which had the power to reduce the adaptation speed or even reverse an established policy, by the reactions of social and economic groups (Edwards, 1989; Krueger, 1978). Thus, for these reasons tests with lagged trade liberalisation variables will also be carried out.

It is useful to consider the real effective exchange rate measures in Brazil, as explained in chapter three, since it will be vital to understand the meaning of the variable "R" in the models. Eventually "R" was based on formula below, since the expression of real effective exchange rate (REER), in the databases, indicated the value in local currency of a basket of foreign currencies (Amann, 2000; Weiss, 1988).

Equation 6.1. Real Exchange Rate [12]

$$REER_{it} = r_t \times \frac{P_{xit}}{P_{dit}}$$

The REER is based on the export prices, expressed in a basket of foreign currencies, converted in local currency (P_{xit}) divided by the domestic prices of the sector goods, (Pd_{it}) and multiplied by "r" which is the nominal exchange rate. As a result of that formulation, the interpretation was that when the local currency devaluated R increased, and when it appreciated R decreased. Hence R was interpreted as a protection indicator, since devaluation lent extra protection to domestic producers by making imports more expensive.

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[12] Equation borrowed from Amann (2000: 156) that alerts to the fact that either a nominal devaluation (rise in "r") or a rise in Pxit/Pdit may result in a rise in REER. As a consequence of the variation of R before 1990, which coincides with appreciation, and in 1990-91 with devaluation, Brazil followed the advice for trade liberalisation to be accompanied with devaluation (Michaely, et al., 1990).

Table 6.1. Variables Definitions

Variable	Description
F	TFP (Total Factor Productivity Index)
LI	Labour Productivity Index with basis in 1986
M	Price Cost Margins Changes
X	Exports values
L	Production per worker (Labour Intensity)
E	ERP (percentage effective rates of protection)
NI	NRP index (percentage tariffs, transformed in index, with 1986=100)
R	Real Exchange Rate Index
K	Capital per worker (capital intensity)
I	Imports values
S	Stock of Firms Index
P	Proportion of large to Small firms Index (downsizing index)
G	Capacity utilisation (in %)
O	FDI Shares index (proxy for firms' foreign ownership)
T	Terms of Trade Index (ratio of export import prices index)
TS	Sector Dummy, indicating possible sector fixed effects
Z	Fixed Effects Dummy
D	1990 Dummy (indicating NTBs suppression)

The interpretation of the results, as mentioned in chapter five, will follow the trade theory, highlighting the effects on productivity, exports and market discipline in line with the industrial organisation theory. The estimations results were obtained from a log form regression that implies the interpretation as elasticities of the firms' behaviour measures with respect to the appropriate trade liberalisation variables. The exception is the year dummy (D) that indicates absolute change in the dependent variable after trade liberalisation. The interpretation of the elasticity of the behaviour variable with each structural variable will occur in the light of the studies mentioned above. To clarify the importance and the qualifications of the results, the next subsection will comment on the econometric tests carried out on the regressions.

6.2.2   Comments on Econometric Tests and Data

This subsection has the objective of discussing the econometric tests to which the data and the equations were submitted. The tests and econometric estimations were carried out in the software PcGive® 10.1 (Hendry and Doornik, 1996). Together with Hendry's general to specific method for model specification that supported the conclusions, the average economic regression (AER) was the guide for the interpretation of the results, which relied on the basic statistics: R^2, F values, d values

for Durbin Watson statistics, AIC information criteria for testing the validity of estimations and "t" values for testing the validity of the coefficients (Gujarati, 1995; Hendry and Doornik, 1996).

The analysis relied on cross-section panel data, including intertemporal effects, which were picked-up by dummy variables, which were unlikely to show stationarity problems as the information criteria (low AIC index) showed. The Regression Specification Tests (RESET) was applied with success in every equation, although with low F value for the equations in model 3. Heterocedasticity, X-heterocesdasticity, and Normality Chi-square tests also earned the appropriate results for the estimations. The R^2 and F tests for regressions appropriateness confirmed the validity of the regressions, in which every estimation passed. For instance, model two (labour productivity) had the highest R^2 (around 0.90) and F values (around 63-89), model three (exports) had the lowest R^2 (around 0.31) and F values (12-18). Moreover DW (Durbin-Watson) tests for autocorrelation were computed, with values 1.53-1.93. The models with lags were not reported DW, since this statistic is known to be biased in such circumstances (Ramanathan, 1998). However, the test for autoregressive problems relied on the AIC information criteria, which had the absolute values as low as 0.6 for models 1, 3 and 4, and 3.0 for model 2.

The conclusions relied on the "t values" corresponding to the coefficients of the appropriate variables, indicating trade liberalisation effects on the behaviour variables, since this statistic measured the level of significance of each coefficient. Hence "t" tests were the basic instrument to validate the results, relying on 5% significance level, which meant 95% of probability of the coefficients having significant non zero values. Hence, the technical procedures allowed for the results appropriateness and the next section summarises the tests of hypothesis.

Section 6.3   The Regressions Results

The objective of the section is to present the regressions' results, with the interpretation based on the statistics described above. The tables with the results show the coefficients and the "t" values referring to trade liberalisation and market structure variables, which were significant in each successive estimation by the Hendrix method. Beside the coefficient for these variables the tables show the tests values of R^2, F, Durbin-Watson (DW) and AIC information criteria for each estimation. The detail of

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each estimation with the coefficients of every variable can be found in Appendices 2 to 9. First the results for total factor productivity will be discussed.

6.3.1 Effects on Total Factor Productivity

The analysis of total factor productivity estimations indicated more generally the results of companies' efforts to increase productivity, according to the measures explained in chapter four. Total factor productivity (F), as a behaviour variable, had significant elasticity measures with the three trade liberalisation variables, as Table 6.2 below shows for five successive estimations:

Table 6.2. Total Factor Productivity Model Estimation (Model 1)

Estimations		Constant	E	NI	I	R	T	S	P	G	R2	F	DW	AIC
1	Coefficient	-9.13	-0.77	-0.09	0.26	2.02	0.25	-0.11	0.18	0.24	0.41	20	1.81	0.62
	t Values	-3.22	-1.97	-2.35	5.49	3.94	1.68	-1.93	1.54	1.60				
2	Coefficient	-9.23	-0.77	-0.09	0.26	2.03	0.24	-0.11	0.18	0.24	0.41	22	1.81	0.62
	t Values	-3.29	-1.98	-2.35	5.49	3.91	1.68	-1.96	1.62	1.53				
3	Coefficient	-9.07	-0.75	-0.09	0.26	2.02	0.24	-0.11	0.19	0.24	0.41	22	1.81	0.61
	t Values	-3.24	-1.93	-2.37	5.47	3.96	1.69	1.95	1.67	1.95				
4	Coefficient	-9.36	-0.72	-0.09	0.26	2.03	0.24	-0.11	0.19	0.23	0.41	25	1.80	0.61
	t Values	-3.36	-1.96	-2.41	5.46	4.03	1.95	-1.96	1.69	1.99				

Source: Regressions
Legend: (E=Effective Rate of Protection, NI=Nominal Tariffs, I=imports, R=Real Effective Exchange Rate, T=Terms of Trade, S=Number of firms, P=Size, G=Capacity Utilisation).

The table above shows that total factor productivity elasticities regarding effective rate of protection (E), nominal tariffs index (NI) and imports (I) were significant and expected, according to the theory. For instance, for 1% reduction in nominal tariffs (NI) and effective rate of protection (E), total factor productivity increased by 0.09% and 0.69% respectively. For 1% increase in imports total factor productivity increased by 0.26%. The dummy variable "D" was not significant and indicated that total factor productivity (F) had no significant absolute increase in 1990. Sector fixed effects were significant, i.e., total factor productivity changed significantly across the industries.

Market structure variables were significant, with the exception of ownership (O). This result meant that 1% reduction in the number of firms (S) implied 0.11% increase in total factor productivity, and 1% increase in size (P) and capacity utilisation (G) implied 0.19% and 0.24% increase in total factor productivity. This outcome seemed coherent with the trade theory, since reducing the number of firms was associated with firms exit overcoming entries, which was a result of increasing competitiveness. Only the more productive firms stayed. It followed that industries with

more exits than entries were those increasing total factor productivity, as previous research mentioned in chapter two also found for Chile and Colombia.

The positive elasticity with size confirmed that the industries populated with more large than small firms were more productive. The same interpretation was valid for capacity utilisation, since those that utilised more their capacity were more productive, which was expected. Thus, the expected turnover and reallocation processes accelerated when the industries were submitted to increasing competition by trade liberalisation, as in Chile and Colombia (Tybout and Westbrook, 1996). However, the elasticity of total factor productivity with foreign ownership became non-significant, although positive. If significant it would mean that TNCs seemed to have higher productivity than domestic firms, which was expected and consistent with other researches, referred to in chapter two for Mexico (Weiss, 1992).

Table 6.3. Total Factor Productivity Estimations (Model 1 with Lags)

Estimation		Constant	E	E_1	NI	NI_1	I	R	T	S	P	R2	F	AIC
1	Coefficient	-9.10	-0.86	-0.48	-0.12	-0.09	0.28	2.17	0.24	-0.12	0.20	0.42	17	0.615
	T Value	-3.25	-2.18	-1.24	-2.91	-2.32	5.82	4.17	1.64	-2.04	1.64			
2	Coefficient	-9.10	-0.86	-0.46	-0.11	-0.09	0.28	2.17	0.24	-0.12	0.20	0.42	19	0.612
	T Value	-3.26	-2.16	-1.24	-2.93	-2.32	5.86	4.17	1.62	-2.04	1.64			
3	Coefficient	-9.30	-0.80	-0.47	-0.12	-0.08	0.27	2.20	0.24	-0.11	0.20	0.42	20	0.606
	T Value	-3.42	-2.16	-1.48	-2.93	-2.30	5.90	4.27	1.95	-2.00	1.96			
4	Coefficient	-9.32	-0.80	-0.48	-0.12	-0.09	0.27	2.24	0.23	-0.12	0.20	0.42	21	0.602
	T Value	-3.41	-2.15	-2.30	-2.96	-2.32	5.91	4.41	1.96	-2.07	1.97			
5	Coefficient	-8.44	-0.78	-0.46	-0.12	-0.09	0.27	2.25	0.24	-0.11	0.20	0.42	23	0.599
	T Value	-3.31	-2.09	-1.96	-3.02	-2.43	5.92	4.42	1.94	-2.04	1.97			

Source: Regressions

Legend: (E=Effective Rate of Protection, NI=Nominal Tariffs, R=Real Effective Exchange Rate, T=Terms of Trade, S=Number of firms, P=Size, Variable_1=lag).

The elasticities with real exchange rates indicated that 1% increase in R implied on 2.04% increase in total factor productivity, with the same interpretation for terms of trade, with 0,24% total factor productivity rise for 1% increase in terms of trade.

When model 1 was run with lags for trade liberalisation variables, only the elasticity of capacity utilisation changed, by becoming non-significant. Among the lagged trade liberalisation variables, only lagged nominal tariffs (NI_1) was significant and had similar coefficient as nominal tariffs (NI). Hence the interpretation of the previous estimations could be applied to the lagged model, since no discrepancies were found as Table 6.3 shows.

Summing up the results for total factor productivity, the theory has been well supported, since only one of the six trade liberalisation variables, the dummy for

1990 NTBs elimination (D) became non significant. But none rejected the hypothesis of trade liberalisation leading to increasing total factor productivity. As for the structural variables, three of them came out significant and had the expected elasticity. Thus, the hypothesis of trade liberalisation being a reason for increasing total factor productivity was supported. In the next subsection the discussion turns to its effects on labour productivity.

6.3.2 Effects on Labour Productivity

This subsection's objective is to discuss the effects of trade liberalisation on labour productivity (LI), which has been set up as an index for the changes in labour productivity, measured by sales in constant values per worker. Table 6.4 below shows the result of model 2 estimations, with the significant trade liberalisation variables and five successive regressions.

Table 6.4. Labour Productivity Model Estimations (Model 2)

Estimations		Constant	E	I	R	T	S	P	O	R2	F	DW	AIC
1	Coefficient	-0.34	-0.01	0.01	0.10	0.03	0.04	-0.04	0.01	0.95	63	1.90	-3.02
	t Values	-0.75	-1.80	1.71	1.84	1.96	4.60	-1.84	1.53				
2	Coefficient	-0.44	-0.01	0.01	0.09	0.02	0.04	-0.04	0.01	0.90	68	1.90	-3.03
	t Values	-1.04	-1.28	1.92	1.83	1.97	4.58	-1.89	1.56				
3	Coefficient	-0.44	-0.03	0.01	0.09	0.02	0.04	-0.04	0.01	0.91	73	1.91	-3.03
	t Values	-1.05	-1.48	1.91	1.83	1.95	4.49	-1.97	1.67				
4	Coefficient	-0.44	-0.03	0.01	0.09	0.02	0.04	-0.04	0.02	0.95	80	1.90	-3.03
	t Values	-1.08	-1.88	1.91	1.90	1.99	4.50	-1.99	1.86				
5	Coefficient	-0.44	-0.03	0.01	0.09	0.02	0.04	-0.04	0.02	0.90			-3.01
	t Values	-1.09	-1.99	1.91	1.93	1.99	4.51	-1.99	1.90		89	1.90	

Source: Regressions

Legend: (E=Effective Rate of Protection, I=imports, R=Real Effective Exchange Rate, T=Terms of Trade, S=Number of firms, P=Size, O=Ownership).

The elasticities of labour productivity index (LI) with effective protection (E), and imports (I) were significant and had the expected sign. For 1% increase in effective protection, labour productivity index reduced -0.03%, and for 1% increase in imports, it increased 0.01%. Furthermore, labour productivity had significant elasticity with real effective exchange rate (R) and terms of trade (T), meaning that for 1% of increase in R and T, labour productivity would increase by 0.09% and 0.02% respectively. Sector fixed effects (TS) were significant and signalled that the changes in labour productivity across the sectors were significant.

The elasticities of labour productivity with structural variables were significant for number of firms (S), size (P) and ownership (O). So, for 1% increase in the number of firms, labour productivity would increase by 0.04%, which was expected, according to the discussion in chapter four. In chapter two, empirical evidence for Chile

and Colombia in 1985-90 indicated that exiting firms were less productive than the entrants, which matched with the results above. So, having increasing number of firms or entering firms being more numerous than exiting implied increasing labour productivity (Tybout and Liu, 1996).

The positive elasticity with foreign ownership, which indicated that 1% increase in FDI implied 0.02% of increase in labour productivity, was also expected. By bringing in modern technology and investment TNCs improved productivity, as discussed in chapter two for Mexico (Weiss, 1992). The interpretation of size negative elasticity, which indicated that 1% rise in size (predominance of large firms in the industry) implied 0.04% reduction in labour productivity, was consistent with the competition and efficiency theory. According to that, as discussed in chapter four about the Brazilian labour structures, large firms had additional labour costs that would reduce labour productivity, when measured in values. This situation was also consistent with empirical evidence for Chile and Mexico (Tybout and Westbrook, 1993).

Thus, three structural variables supported the theory as performance was measured by labour productivity index. The elasticity of labour productivity with capacity utilisation was not significant, although it had the expected sign, which indicated that reducing capacity utilisation would have increase labour productivity. This was consistent with the explanation that using less capacity implied less wage costs.

Including lagged trade liberalisation variables in the equation gave the results in Table 6.5 below, which almost repeated the previous estimations' coefficients, confirming the interpretation above. Effective protection and imports lagged elasticities were significant, meaning that for 1% increase in effective protection or in imports labour productivity fell by 0.18% and 0.03% in the following year, which was expected. Importers were supposed to pay higher prices for inputs and equipment for more than one year, as a consequence of rise in protection. Sector fixed effects (TS) were significant, but absolute increase of labour productivity measured by the dummy (D) was not significant. Hence the estimation with trade liberalisation lagged variables confirmed the previous results for labour productivity. Every structural variable was significant, to which can be attributed the same interpretations as in the previous results. The coefficient for capacity utilisation indicated that for 1% rise in capacity utilisation, labour productivity would reduce by 0.03%, which could be interpreted as increasing labour costs by using more capacity. In fact, according to the explanation about the

labour costs in Brazil in chapter four, by using more capacity implied more hours of work, which added labour costs and reduced labour productivity.

Table 6.5. Labour Productivity Model Estimations (Model 2 with Lags)

Estimation		Constant	E_1	I	I_1	R	S	P	G	O	R2	F	AIC
1	Coefficient	-0.32	0.19	0.01	0.02	0.05	0.05	-0.04	-0.03	0.01	0.90	54	-3.04
	t Values	-0.72	3.07	1.28	3.23	0.64	5.38	-2.29	0.90	1.43			
2	Coefficient	-0.32	0.19	0.01	0.02	0.05	0.05	-0.04	-0.03	0.01	0.90	57	-0.31
	t Values	-0.71	3.07	1.26	3.24	0.63	5.39	-2.27	-0.89	1.46			
3	Coefficient	-0.32	0.19	0.01	0.02	0.53	0.05	-0.04	-0.03	0.01	0.90	61	-3.05
	t Values	-0.71	3.18	1.29	3.27	0.64	5.50	-2.28	-0.90	1.96			
4	Coefficient	-0.33	0.18	0.01	0.02	0.05	0.05	-0.04	-0.03	0.01	0.90	65	-3.06
	t Values	-0.73	3.19	1.31	3.31	0.63	5.50	-2.29	-0.87	1.94			
5	Coefficient	-0.29	0.18	0.01	0.03	0.06	0.05	-0.04	-0.03	0.01	0.90	70	-3.06
	t Values	-0.67	3.23	1.29	3.42	0.69	5.49	-2.25	-0.85	1.99			
6	Coefficient	-0.29	0.18	0.01	0.03	0.06	0.05	-0.04	-0.03	0.01	0.95	76	-3.00
	t Values	-0.66	3.18	1.29	3.43	0.68	5.48	-2.31	-1.89	1.93			
7	Coefficient	-0.29	0.18	0.01	0.03	0.06	0.05	-0.04	-0.03	0.01	0.90	84	-3.06
	t Values	-0.66	3.18	1.96	3.43	0.69	5.48	-2.31	-1.98	1.99			

Source: Regressions

Legend: (E=Effective Rate of Protection, I=Imports, R=Real Effective Exchange Rate, T=Terms of Trade, S=Number of firms, P=Size, G=Capacity Utilisation, O=Ownership, Variable_1=lag).

To sum up the results, the hypothesis of trade liberalisation motivating an increase of labour productivity has been supported well, since none of the trade liberalisation variables had non-expected elasticities. So, reducing protection by any of the measures used in the models implied increasing labour productivity. However the absolute increase of labour productivity measured by the dummy "D" became non-significant. An explanation for this was that employment reductions were combined with increasing wages, because of the need of better skilled employees after trade liberalisation, as discussed in chapter four.

The argument of trade liberalisation being a factor of exporting jobs has been discussed, concluding that after trade liberalisation some labour intensive industries lost part of their jobs with plant closures (Moreira and Najberg, 2000). By the results above, the effects of "exporting jobs" seemed connected to real effective exchange rates, which by appreciation made domestic relative wages expensive, and reduced labour productivity, as the model showed. The consequences were that jobs in some labour intensive industries were lost to other countries. In chapter two, when discussing ownership structures, there was the case of firms searching for "quota bonuses", which indicated that some textile, footwear and similar industries reduced

jobs in Brazil, in favour of countries with exceeding export quotas. Since competition from imports was also expected to encourage increasing productivity and exports, as a means of outward orientation needs to be analysed. Hence the next subsection will discuss the effects of trade liberalisation on exports.

6.3.3 Effects on Exports

An advantage of having exports as a behaviour measure was that it might be a test for outward orientation, since it can evaluate whether trade liberalisation achieved sufficient levels as to encourage exports by increasing competitiveness of domestic industries. Thus, this subsection's objective is to discuss the results of model three, which had exports as a dependent variable, as summarised in Table 6.6 below. Exports had the expected and significant elasticities with imports and nominal tariffs, confirming the hypothesis tested according to the trade theory. This indicated that trade liberalisation would result in increasing exports, since domestic firms would be able to compete in the world market place. The variables expressing real effective exchange rates (R) and terms of trade (T) also had significant and expected elasticities, since reducing REER or terms of trade implied increasing exports.

Table 6.6. Exports Model Estimations (Model 3)

Estimations		Constant	NI	I	R	D	T	S	P	R2	F	DW	AIC
1	Coefficient	1.74	-0.11	0.02	-0.81	-0.04	-0.15	-0.22	0.08	0.30	12.60	1.93	-0.66
	t Values	4.95	-5.47	1.80	-2.87	-1.33	-1.91	-7.55	1.50				
2	Coefficient	1.78	-0.11	0.02	-0.81	-0.05	-0.15	-0.22	0.08	0.30	13.50	1.93	-0.67
	t Values	7.96	-5.47	1.86	-2.97	-1.64	-1.92	-7.50	1.71				
3	Coefficient	1.77	-0.11	0.02	-0.80	-0.05	-0.15	-0.22	0.08	0.30	14.00	1.93	-0.67
	t Values	8.47	-5.49	1.80	-2.98	-1.64	-1.92	-7.56	1.70				
4	Coefficient	1.77	-0.11	0.02	-0.79	-0.05	-0.15	-0.22	0.08	0.30	16.00	1.93	-0.67
	t Values	8.40	-5.49	1.81	-2.98	-1.63	-1.94	-7.60	1.92				
5	Coefficient	1.75	-0.11	0.02	-0.78	-0.05	-0.15	-0.22	0.08	0.30	18.00	1.95	-0.68
	t Values	8.48	-5.74	1.81	-2.94	-1.89	-1.99	-7.61	1.99				

Source: Regressions

Legend: (NI=Nominal Tariffs, I=Imports, R=Real Effective Exchange Rate, D=Dummy Indicating NTBs elimination, T=Terms of Trade, S=Number of firms, P=Size).

To quantify the results in Table 6.6, for 1% reduction in nominal tariffs, there was 0.11% increase in exports; and for 1% increase in imports, exports increased by 0.02%. For 1% reduction in real effective exchange rate, which meant appreciation, exports values increased by 0,78%; and for 1% reduction in terms of trade, there was 0.15% increase in exports, which supported the hypothesis of market discipline, as explained above. The variable indicating sector effects (TS) being significant indicated that changes in exports were significant across industries. Furthermore, there was 5% absolute reduction in overall exports after 1990, as the coefficient of the dummy

variable "D" indicates. This was consistent with the long cycle of increasing domestic demand, which prevented many firms from exporting during the 1990s, as explained in chapter three.

Turning to the structural variables, stock of firms (S) was negatively related to exports, which meant that for 1% increase in the number of firms, exports reduced by 0.22%, which was expected, since exporter industries were less crowded and expected to perform better. Moreover, industries with less firms were assumed to be capital intensive, which led to higher export performance due to the technology learning process. Size indicated by "P" had a positive elasticity, which was expected. For 1% increase in size exports increase by 0.08%. Industries with more large than small firms were likely to export more due to the tendency of the Brazilian exports to be concentrated in large firms. This confirmed that outward orientation in manufacturing, as discussed in chapter three, had a bias against small companies, which was not fully eliminated by the suppression of NTBs in 1990. The model estimations with lagged trade liberalisation variables are in Table 6.7 below.

Table 6.7. Exports Model Estimations (Model 3 with lags)

Estimation		Constant	NI	NI_1	I	I_1	R	T	S	P	R2	F	AIC
1	Coefficient	11.94	0.10	-0.05	0.02	-0.03	-0.72	-0.15	-0.23	0.09	0.32	12	-0.667
	T Value	8.11	4.43	-2.68	0.99	-1.78	-2.62	-1.90	-7.06	1.58			
2	Coefficient	11.94	0.10	-0.05	0.02	-0.03	-0.72	-0.15	-0.23	0.09	0.32	12	-0.670
	T Value	8.12	4.43	-2.68	0.99	-1.88	-2.62	-1.99	-7.29	1.58			
3	Coefficient	11.94	0.10	-0.05	0.02	-0.03	-0.71	-0.15	-0.23	0.09	0.32	14	-0.676
	T Value	8.13	4.44	-2.69	0.99	-1.87	-2.63	-1.92	-7.64	1.86			
4	Coefficient	11.83	0.10	-0.05	0.02	-0.03	-0.71	-0.15	-0.23	0.09	0.32	14	-0.687
	T Value	5.58	4.46	-2.68	0.99	-1.97	-2.63	-1.99	-7.66	1.99			
5	Coefficient	11.78	0.10	-0.52	0.03	-0.04	-0.71	-0.15	-0.23	0.09	0.32	15	-0.683
	T Value	8.56	4.46	-2.73	1.91	-1.93	-2.62	-1.99	-7.66	1.94			
6	Coefficient	11.76	0.10	-0.05	0.02	-0.03	-0.69	-0.15	-0.23	0.09	0.32	16	-0.689
	T Value	8.56	4.69	-2.73	1.96	-1.95	-2.54	-1.99	-7.67	1.99			
7	Coefficient	11.70	0.10	-0.06	0.02	-0.03	-0.72	-0.15	-0.23	0.09	0.31	17	-0.696
	T Value	8.58	5.14	-2.92	1.96	-1.92	-2.71	-1.95	-7.71	1.99			

Source: Regressions

Legend: (NI=Nominal Tariffs, I=Imports, R=Real Effective Exchange Rate, T=Terms of Trade, S=Number of firms, P=Size, Variable_1=lag).

The model with lagged trade liberalisation variables showed similar coefficients as in the previous estimation. Lagged coefficients, which referred to nominal tariffs and imports, were found significant. This could be interpreted as delayed effects of trade liberalisation on exports. The elasticity for FDI-exports ended non-significant, which can be interpreted as a non-export preference of the TNCs. Although a previous study concluded that foreign firms (TNCs) had higher propensity to export than national firms, TNCs in that occasion had also negative elasticity with exports,

although non-significant (Moreira and Pinheiro, 2000). According to the results above, the explanation is that manufacturing TNCs in Brazil were more interested in the domestic markets than in exports, although the reasons for that preference are yet to be established.

Summing up for exports, the estimations of model three confirmed the hypothesis tested, as it was positively elastic with imports, and negatively elastic with nominal tariffs. Protection by depreciation of real effective exchange rates and terms of trade also had the appropriate elasticity, and confirmed import discipline. Moreover, the introduction of trade liberalisation was combined with devaluation, following the best practice on trade policy reforms (Papageorgiou et al., 1991a; Thomas, 1991). Market structure variables had the expected elasticities too, since industries with more firms were exporting less, but industries with large firms were exporting more, which confirmed the hypothesis of bias against small firms. The results suggested that manufacturing TNCs in Brazil were more interested in the domestic market, a possible reason is that TNCs were seeking high profits in domestic markets. The next subsection by discussing the level of mark-ups in connection with trade liberalisation will perhaps shed some light on this.

6.3.4   Effects on Mark-ups

Mark-ups were chosen as a behaviour variable to take advantage of the meaningfulness of this measure, which indicated not only firms' cost effectiveness, but also firm's level of adequacy to the competitive environment. Diminishing mark-ups would be a signal of profit cuts to maintain market shares. So, when a firm was constrained to reduce margins, the assumption was that the steps for reducing costs, such as employment cuts, production reorganisation and investment had already been undertaken. Hence, margins reduction was the last resource for private firms to keep their market shares before bankruptcy.

For instance, to test for market discipline as a consequence of trade liberalisation, in competitive Turkish manufacturing industries, mark-ups were regressed on trade liberalisation measures, such as tariff reduction. The results were that in the industries where competition increased mark-ups declined (Levinsohn, 1993). By a similar estimation criterion, the hypothesis of imports as a market discipline was tested in India, with conclusive results. In that study, trade liberalisation measures were regressed on margins, which were calculated from stock market data (Krishna and

Mitra, 1998). Hence, margins levels seemed to be a major indicator of effective market discipline, justifying the discussion in this subsection.

The assessment by the estimation of model four accepted partially the hypothesis of market discipline, as the coefficient of effective protection was expected and significant. However, the sign of nominal tariffs was non expected and significant, but imports coefficient came out non-significant. Hence, for an increase of 1% in effective protection, margins increased by 0.13%, which was expected, according to the trade theory. However, with 1% increase of nominal tariffs, margins would decrease by 0.03%, which did not confirm the hypothesis of trade liberalisation as a market discipline. There has been an indication of 3% margins increase after 1990, as indicated by the coefficient of the dummy variable "D", as shown in Table 6.8 below.

Table 6.8. Mark-ups Model Estimations (Model 4)

Estimations		Constant	E	NI	D	T	S	P	O	R2	F	DW	AIC
1	Coefficient	4.80	0.13	-0.03	0.04	0.03	-0.01	-0.03	0.01	0.31	14	1.53	-3.51
	t Values	13.50	2.60	-5.92	1.34	1.64	-1.72	-1.85	2.11				
2	Coefficient	4.79	0.13	-0.03	0.03	0.03	-0.01	-0.03	0.01	0.31	14	1.53	-3.50
	t Values	13.50	2.66	-5.95	1.45	1.63	-1.72	-1.83	2.04				
3	Coefficient	4.80	0.13	-0.03	0.03	0.03	-0.01	-0.03	0.01	0.31	15	1.53	-3.50
	t Values	14.30	2.67	-5.98	1.45	1.63	-1.72	-1.84	2.05				
4	Coefficient	4.87	0.13	-0.03	0.03	0.03	-0.01	-0.03	0.01	0.31	17	1.53	-3.51
	t Values	4.60	2.72	-5.99	1.68	1.66	-1.79	-1.89	2.10				
5	Coefficient	4.86	0.13	-0.03	0.03	0.03	-0.01	-0.03	0.02	0.31	18	1.59	-3.52
	t Values	14.00	2.78	-5.98	1.99	1.96	-1.89	-1.89	2.11				

Source: Regressions

Legend: (E=Effective Rate of Protection, NI=Nominal Tariffs, R=Real Effective Exchange Rate, D=Dummy Indicating NTBs elimination, T=Terms of Trade, S=Number of firms, P=Size, O=Ownership).

Mark-ups (M) elasticity became non significant with real effective exchange rates (R) although it had the appropriate significant elasticity with terms of trade. So, when protection by increasing terms of trade by 1% margins increased by 0.03%. The coefficient of TS was significant, indicating that sector differences were important for mark-up changes.

Among the structural variables, the number of firms (S) and size (P) had negative elasticity with margins, which were expected results. First, industries with more firms meant increasing competition by the classic competition definition, which forced margins reduction. In terms of measures, 1% increase in the number of firms would lead to a reduction of 0.01% in mark-ups. The negative elasticity of margins with size seemed to indicate that industries with predominantly large firms became more competitive after trade liberalisation, which forced them to reduce margins. It may have been due to the elimination of the protection bias of the import licensing system,

according to the literature discussed in chapter three (Franco and Fritsch, 1994). Hence, the outcome was consistent with that previous finding, since these industries had to reduce margins further. To quantify the impacts, for 1% increase on the large/small firms ratio, mark-ups reduced by 0.03%. Capacity utilisation (G) became non-significant, although it had the expected sign, since increasing capacity utilisation was linked to increasing margins.

Mark-ups had positive elasticity with foreign ownership, which meant that TNCs had higher margins than domestic groups. This outcome suggested that the reasons for TNCs being focused into domestic markets, as the findings in the previous model showed, were linked to domestic margins being higher than international markets margins. This was consistent with the discussion of TNCs margins in chapter two, which indicated that TNCs margins were the average margins in the markets where they operate (Pugel, 1980). By this argument TNCs would be more interested in the domestic markets, due to the margins premium, which increased the average margins. Measuring the effects of foreign ownership, for 1% increase on FDI mark-ups increased by 0.02%.

The inclusion of lags of trade liberalisation variables, following the pattern used for the previous estimations, showed similar results, i.e., stable coefficients, which have already been discussed. Lagged effective protection (E_1) and imports (I_1), became significant as Table 6.9 below shows. For instance, for 1% increase in effective protection in one year, margins would have increased 0.27% in the following year; and for 1% increase in imports, margins also would have increased 0.02%, in the next year, which was not expected as a market discipline, and was, possibly, a result from the dynamic effects from trade liberalisation, as explained above.

Table 6.9. Mark-ups Model Estimations (Model 4 with Lags)

Estimation		Constant	E	E_1	NI	I_1	D	T	P	O	R2	F	AIC
1	Coefficient	4.85	0.13	0.27	-0.02	0.02	0.03	0.02	-0.04	0.02	0.37	14	-3.56
	t Values	14.10	2.64	5.75	-3.74	3.37	1.06	1.25	-2.43	2.22			
2	Coefficient	4.84	0.13	0.27	-0.02	0.02	0.03	0.02	-0.04	0.02	0.37	15	-3.58
	t Values	14.10	2.65	5.89	-3.75	3.41	1.60	1.52	-2.44	2.22			
3	Coefficient	4.85	0.13	0.27	-0.02	0.02	0.03	0.02	-0.04	0.02	0.37	16	-3.07
	t Values	15.00	2.65	5.87	-3.75	3.41	1.99	1.95	-2.45	2.23			
4	Coefficient	4.82	0.02	0.27	-0.02	0.02	0.03	0.02	-0.04	0.01	0.37	17	-3.06
	t Values	15.00	2.68	5.91	-3.76	3.41	1.99	1.92	-2.44	2.22			
5	Coefficient	4.80	0.13	0.28	-0.02	0.02	0.03	0.02	-0.04	0.01	0.37	18	-3.05
	t Values	15.00	2.67	6.15	-3.86	3.50	1.94	1.95	-2.49	2.26			
6	Coefficient	4.58	0.13	0.27	-0.02	0.02	0.03	0.02	-0.04	0.01	0.37	20	-3.06
	t Values	15.80	2.60	6.11	-3.92	3.47	1.97	1.90	-2.42	2.17			
7	Coefficient	4.55	0.13	0.27	-0.02	0.02	0.03	0.02	-0.03	0.01	0.36	21	-3.07
	t Values	15.60	2.70	6.05	-3.99	3.58	1.97	1.97	-2.32	2.17			

Source: Regressions

Legend: (E=Effective Rate of Protection, NI=Nominal Tariffs, R=Real Effective Exchange Rate, D=Dummy Indicating NTBs elimination, T=Terms of Trade, S=Number of firms, P=Size, G=Capacity Utilisation, O=Ownership, Variable_1=lag).

Summarising the results for mark-ups, the theory of trade liberalisation as a market discipline was only partially supported, since imports and nominal tariffs indicated that the dynamic effects of trade liberalisation were stronger than the disciplining effects. For instance, after trade liberalisation firms were able to access international suppliers of inputs and machinery. The competition and disciplining effects were not visible before one year, and the models, by the short time series available, were not encouraging to test for more than one lag. The next subsection summarises the results of the models estimations.

6.3.5 Summarising the Results

Summarising the analysis, trade liberalisation played a central role as a stimulus for increasing productivity, exports and, at a less extent, controlling for mark-ups. Based on the regressions, two summary tables will be constructed with the results of the final estimations to give a general idea of the analysis. The assessment of the coefficients of the trade liberalisation variables in the summary table will show "E" for the expected sign, according to the theory, and "NE" otherwise. Significance will be indicated by "S", and non-significance by "NS", based on the "t" test for each coefficient, with minimum level of significance at 95%. Table 6.10 below shows the assessment indications.

Table 6.10. Assessment Indications

Indication	
ES	Expected and Significant Value
ENS	Expected and Non- Significant Value
NES	Non-Expected and Significant Value
NENS	Non-Expected and Non- Significant Value

The indications in Table 6.10 above to summarise the assessment of the results for each coefficient referring to the trade liberalisation and market structures variables will make up the summary of the hypothesis tests in Table 6.11 and Table 6.12 below.

Table 6.11. Summary of the Regressions

Model	Dependent Variable	E	NI	I	R	D	T	S	P	G	O
1	TFP	ES	ES	ES	ES	ENS	ES	ES	ES	ES	ENS
2	LP	ES	ENS	ENS	ES	ENS	ES	ES	ES	ENS	ES
3	Exports	ENS	ES	ES	ES	NENS	ES	ES	ES	ENS	ENS
4	Margins	ES	NES	ENS	ENS	NES	ES	ES	ES	ENS	ES

Source: Regressions
Legend: (E=Effective Rate of Protection, NI=Nominal Tariffs, R=Real Effective Exchange Rate, D=Dummy Indicating NTBs elimination, T=Terms of Trade, S=Number of firms, P=Size, G=Capacity Utilisation, O=Ownership).

The estimations are detailed in the tables above after five successive regressions for all models without lags, and seven estimations for models 2, 3 and 4 with lags. The results of the tests of hypothesis confirmed that trade liberalisation was linked to productivity gains, and to exports, since the variables measuring total factor productivity, labour productivity and exports had the expected and significant elasticity with almost every trade liberalisation variable, in models 1, 2 and 3. However, for margins, which measured market discipline, the results seemed less confident, since margins increased after trade liberalisation, and had positive elasticity with imports and negative with nominal tariffs, rejecting the hypothesis. Hence, only effective protection confirmed the hypothesis of trade liberalisation as a means of increasing market discipline.

Table 6.12. Summary of Models with Lagged Trade Liberalisation Variables

Model	Dependent Variable	E	E_1	NI	NI_1	I	I_1	R	D	T	S	P	G	O
1	TFP	ES	ENS	ES	ES	ES	ENS	ES	ENS	ES	ES	ES	ENS	ENS
2	LP	ENS	ENS	ES	ES	ES	ES	ENS	ENS	ES	ES	ES	ES	ES
3	Exports	ENS	ENS	ES	NENS	ES	NENS	ES	ENS	ES	ES	ES	ENS	ENS
4	Margins	ES	ES	NES	NES	NENS	NES	ES	NES	ES	ES	ES	ENS	ES

Source: Regressions

Legend: (E=Effective Rate of Protection, NI=Nominal Tariffs, R=Real Effective Exchange Rate, D=Dummy Indicating NTBs elimination, T=Terms of Trade, S=Number of firms, P=Size, G=Capacity Utilisation, O=Ownership, Variable_1=lag).

As shown in Table 6.12 above the four models with added lagged trade liberalisation variables confirmed the previous estimations, with few significant lags, such as lagged nominal tariffs, and imports, in models 1, 2 and 3, and lagged effective tariffs in model 4, with lagged imports (I_1) being significant in model 2. This situation has not changed the previous significance of other variables, with the exception of capacity utilisation, which became significant in model 2.

This has not changed the previous interpretation based on the fact that using more capacity implied less labour productivity, by the use of more employees to fulfil the capacity. So using more capacity implied extra costs and reduced margins. In general, the estimations came out stable, due to the few changes from the results without and with lagged trade liberalisation variables. Hence, the hypothesis tested had strong support for productivity and exports increase, and only a partial support for margins. The ability of buying inputs and equipments from foreign markets may have given the firms alternative ways of keeping or increasing their margins.

Section 6.4　Conclusion

This chapter has examined two main questions. The first was whether Brazilian manufacturing companies increased productivity, export performance and improved market discipline after trade liberalisation. The second was whether structural elements affected the relationship between trade liberalisation and productivity, exports performance and margins.

In spite of some scepticism in the literature about trade liberalisation effects on productivity, and its ability of disciplining the domestic market by increasing imports possibilities, the results so far supported import competition as stimulating productivity and exports with catching-up technology. Considering the indications from the explanatory trade liberalisation variables, regressed on four behaviour variables, the conclusions were based on the assumption that non-expected and significant results for a variable led to the rejection of the theory tested, and expected and significant results indicated non-rejection of the hypothesis.

The hypothesis tested was not rejected in six estimations. The exceptions were the estimations for mark-ups, in model four, where one trade liberalisation variable (nominal tariffs) rejected the hypothesis, another (effective rate of protection) did not reject it and two others (imports and dummy "D" for NTBs elimination) became non-significant. Hence, there was evidence of trade liberalisation in the period analysed to determine total factor productivity, labour productivity, and exports increase, which answered the first question.

To quantify the results in terms of intensity of such effects, for 1% reduction in effective protection, total factor productivity increased by around 0.70%, labour productivity decreased by 0.03%, exports had no significant increase, and margins reduced by 0.13%. For 1% reduction in nominal tariffs, total factor productivity increased by 0.1%, labour productivity had no significant increase, exports increased by 0.1%, and margins increased by 0.03%. For 1% increase in imports, total factor productivity increased by 0.26%, labour productivity increased by 0.01%, exports increased by 0.02%, and margins had not significant change. Thus, trade liberalisation, measured by these variables had an impact on total factor productivity, labour productivity, exports and margins.

To answer the second question on the influences of market structures on productivity, export performance and margins, the models included four structural measures, and three of them became significant, in almost every estimation. Thus, the answer is that market structure affected firms behaviour in terms of productivity,

exports and margins. Considering the first structural variable, the number of firms by industry, the more firms an industry had, the lower was total factor productivity, exports performance, and margins, and the higher was labour productivity. By definition, high number of firms was associated to high competition, which made the falling margins an expected result. Exports negative elasticity with the number of firms was explained by the high investment that a company needed to export, which was harder for small than for large ones. The positive elasticity of labour productivity with number of firms was explained by low labour costs of small firms, as the discussion in chapter four explained. So, by attracting more small firms, the industries with more firms had falling labour productivity. Quantifying the effects, for 1% increase in the number of firms there was 0.1% decrease in total factor productivity, 0.22% decrease in exports, and 0.01% decrease in margins; and 0.04% increase in labour productivity.

The second structural variable was size, measured by the proportion of large/small firms in each industry and had significant elasticities with the behaviour variables in every model. Hence, industries with a predominance of large firms had high total factor productivity, exported more, had lower labour productivity, and lower margins. The explanations were connected to the level of investment and scale. For exports performance, size coefficients confirmed the hypothesis that import regulations were biased against small firms before trade liberalisation, since large firms exported more than small ones. This might be a consequence of their better importing possibilities. The negative elasticity of labour productivity and margins with size, in models 2 and 4, was explained by the level of investment and scale. Small firms used more labour, which reduced labour productivity and margins. To quantify the effects of size, for 1% increase in the relative proportion of large firms by industry, total factor productivity increased by 0.19% and exports by 0.08%, labour productivity decreased by 0.04% and margins by 0.03%.

The third significant market structure variable was foreign ownership, measured by the stocks of FDI in each industry. It had positive elasticity with labour productivity, and margins, which meant that TNCs had higher labour productivity, and profits than domestic firms, which was expected by the discussion in chapter two. For instance, TNCs were expected to be more productive and larger than domestic firms. So they had the appropriate scale to have lower margins and higher labour productivity. The elasticity with exports, although being non-significant was also positive, which would mean that TNCs exported more than domestic firms. Total factor productivity also had non-significant elasticity with foreign ownership, although the sign was

positive, which indicated that TNCs were more productive. To quantify the results, for 1% increase in the stock of FDI, labour productivity increased by 0.02% and margins, also by 0.02%.

The fourth market structure variable was capacity utilisation, which had significant elasticity with total factor productivity, signalling that the more capacity was used, the higher total factor productivity was, which was expected according to the literature (Harrison, 1994; Moreira and Correa, 1998). However, in an estimation of model 2, labour productivity had negative elasticity with capacity utilisation, which was explained by the need to increase the number of employees to use the extra capacity, which increased labour costs. Exports and margins had non-significant elasticity with capacity utilisation, which was perhaps linked to the long expansion cycle, after trade liberalisation, as described in chapter three. This enhanced domestic demand and forced the firms to maintain full capacity. Quantifying the results, for 1% increase in the use of capacity, there was 0.24% increase in total factor productivity and 0.03 decrease in labour productivity.

The results for the control variables real effective exchange rates (R) and terms of trade (T) had significant coefficients in almost every model. Total factor productivity, labour productivity and exports increased with increasing real effective exchange rate and terms of trade. Quantifying the effects, for 1% devaluation, or increase of real effective exchange rate, total factor productivity increased by 2.04%, labour productivity by 0.09% and, for 1% reduction in R, exports increased by 0.78%. For 1% increase in terms of trade, total factor productivity increased by 0.24%, labour productivity by 0.02%, and margins by 0.03%, and exports decreased by 0.15%. This was perhaps a consequence of increasing exports prices, by terms of trade effects. These results highlighted the importance of real exchange rate, as a macroeconomic feature that was reflected in imports and exports prices. The importance of real effective exchange rate also indicated that macroeconomic management was essential for the effects of trade liberalisation to be transmitted through the channels of productivity, exports performance and import discipline, as the literature in chapter two emphasised (Rodrik, 1995a;b; Weiss, 1999).

The explanation for non-reduction of margins after trade liberalisation was the fact that the firms were able to increase efficiency up to the point of increasing profits, in spite of keeping prices stable. The reason was that they were able to import inputs, equipment and raw material at international prices, which entered the operational costs of the goods produced to be sold to the domestic market. This conclusion matched

the results of Amann and Nixon (1999) who concluded that trade liberalisation was one of the main reasons for the improvement in performance and productivity, although the industry competitiveness had not reached international standards, partially because of remaining technology weakness. Hay (2001) studying Brazilian large manufacturing firms in 1988-94 suggested that to force profit reductions there was a need for stronger competition from imports to overcome the dynamic effects of trade liberalisation while it allowed for importing inputs and technology (Hay, 2001).

Given that the differences among industries and firms contributed to the findings discussed above, the next chapter will approach the effects of trade liberalisation at firm and establishment level, by visiting a number of firms and plants. The aim of these visits will be to examine the levels of resource reallocation, the reasons for resource movements and the improvement in product quality after 1990 in association with trade liberalisation.

CHAPTER 7. THE EFFECTS OF TRADE LIBERALISATION: EVIDENCE FROM FIRMS IN SELECTED INDUSTRIES

Section 7.1   Introduction

The objective of this chapter is to discuss the effects of trade liberalisation in selected manufacturing industries, by qualitative research based on field visits to companies in Brazil, from April to July 2001. The interviews and structured questionnaires were directed to companies' boards, CEOs and plant managers to collect their views on the consequences of trade liberalisation for performance and productivity. The findings will be supported by further in-depth analyses of the channels that could be used to transmit the effects of trade liberalisation into the firms' behaviour. Since such detailed surveys were impossible to be undertaken with every industry, given the time and budget constraints, we proceeded with a selection of industries. First, the industries were selected as part of value-chains, in a way that one group of firms would be the suppliers for the next group, assuring the connection between them to be reflected in the cost-price transfers, so their answers would add to the interpretation of linkages between them. Furthermore, choosing industries from among those protected before 1990 provided an opportunity to check for the changes that trade liberalisation brought to them. Hence, the selection was for the steel and aluminium value chain, which includes mining, steel, aluminium, automobile, and aircraft constructors. Computers and software industry were chosen basically due to the history of high protection enjoyed by this industry. The analysis of trade liberalisation connections to performance measures follows the theory, in chapter two, which is recalled briefly with the diagrams below.

Figure 7.1. Model of Static Effects from Trade
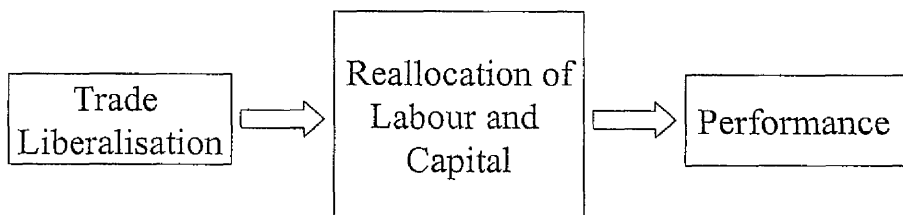
Source: Based on Krugman and Obstfeld (1996)

After inquiring about the static benefits that companies were supposed to gain from trade liberalisation by resource reallocation (Figure 7.1), the following step will be to discuss the dynamic effects from trade, as in Figure 7.2. In both schemes, the

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first boxes state that by eliminating NTBs, reducing tariffs and increasing imports trade liberalisation was introduced, which has been confirmed by the firms. The other two boxes, in these figures, will be discussed in the remainder of this chapter: the third box, concerning the firms' changes in performance will be discussed in Section 7.2. The second box concerns the firms' behaviour as a consequence of trade liberalisation and constitute the main focus of this chapter, since the firms' reactions to trade liberalisation are central to the analysis.

Figure 7.2. Model of Dynamic Effects from Trade
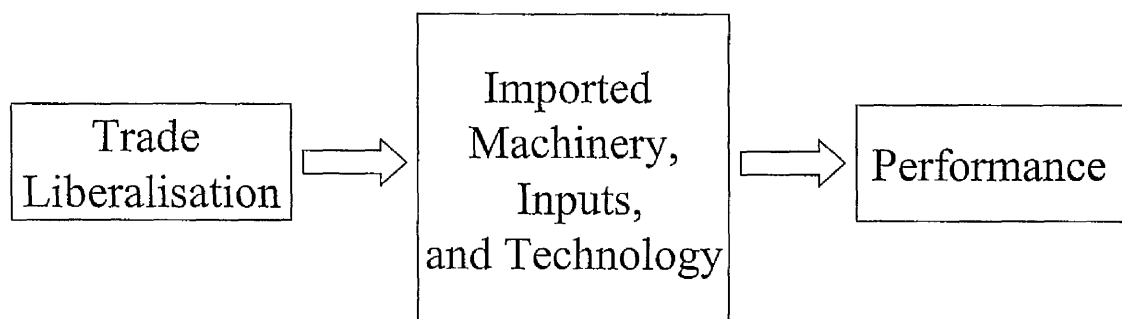
Source: Based on Krugman and Obstfeld (1996)

The survey was designed to go a step further as compared to the econometric tests carried out in the previous chapter, since it researches on the nature and the reasons of the influences of trade liberalisation on the firms' performance and productivity. The research questions that are to be answered after the analysis of the questionnaires and the interviews are as follows:

a) Did trade liberalisation influence companies' behaviour after 1990?
b) Were the reasons for the reallocation processes and importing inputs and machinery after 1990 linked to trade liberalisation?
c) Were changes in productivity and performance attributed by the firms to trade liberalisation?
d) Has competition increased after trade liberalisation?
e) What kind of initiatives had the firms adopted to face competition from imports?

To answer these questions based on the questionnaires completed in the fieldwork, the descriptive characteristics of the sample will be first discussed. The proportion of firms by industry in Figure 7.3 coincided with other surveys, such as Maiores e Melhores with Chi-square tests at 95% significance (EXAME, 1998;1999). Since most of the discussions will be focused on the firms grouped by industry, it can be noted that the Chi-square test for "industry" (question 2) had a level of significance of 99%, which indicates that the values taken from the sample were not likely to be

obtained by chance, confirming that the industries as a group of firms were likely to produce meaningful results.

To clarify another important feature of the firms distribution, in a large country like Brazil, the firms' regions in Figure 7.4 showed that the most important regions, in terms of industrialisation, such as S. Paulo and Rio, Belo Horizonte and Porto Alegre were well represented. Moreover the test on the cross tables of industries and ownership showed 99% Chi-square significance, with the exceptions of private national aluminium, and private foreign mining, and state owned computer.

Figure 7.3. Sample Firms by Industry
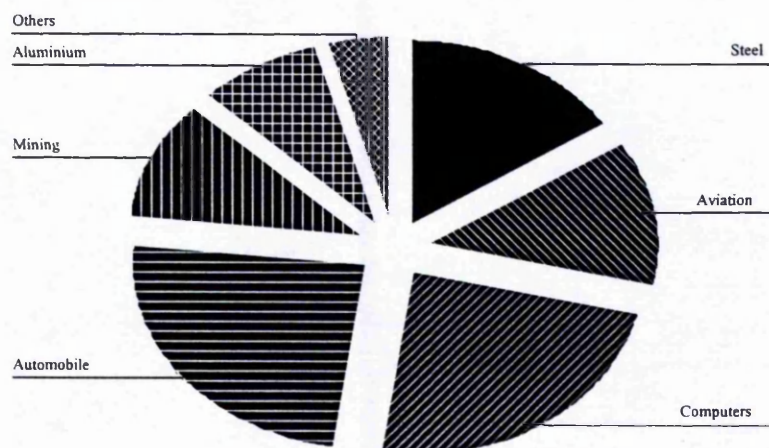
Source: Question 2

Because of this non-normality, the analysis of ownership for these industries will not be considered. Other Chi-square and binomial tests will be added, when the questions treated will be discussed. Hence, the sample had 94 firms, in six industries, distributed in seven regions, which matched the distribution of similar surveys (EXAME, 1999;2000). A question on time of existence of the firms was also asked to make sure that they have experienced the period before trade liberalisation in order to validate the evaluation that they may elaborate in the following questions. The answers satisfied the minimum necessary since 93 sample firms declared that they had started their business before 1990. Another question on the market shares did not earn the appropriate information, since most of the firms interpreted market shares in connection to their main product, prevailing product differentiation. Hence they declared very large levels of market share, which indicated that they have not considered the substitutability of their products, which prevented the use of such

evaluation. Thus the analysis by industries that will be carried out in the rest of this chapter can provide significant conclusions.

Figure 7.4. Regional Distribution of the Sample Firms
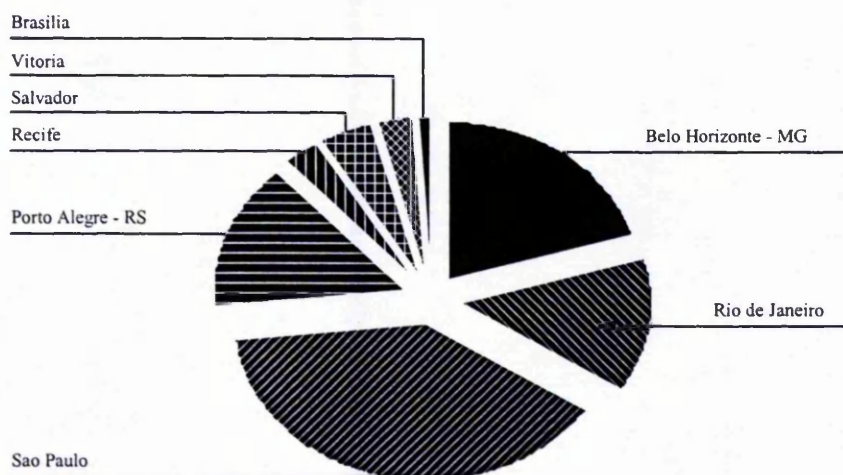
Source: Question 3

In the analysis of the questionnaires the changes in product quality and the process of learning and technology will also be considered, according to the reasons given by the companies to increase the use of imported machinery and materials. The assumptions, which came from the trade theory discussed in chapter two, were that by adding more imported inputs to their production lines the firms became able to improve product quality, technology and also to learn new skills. This approach was meant to point out the main links of companies' results and behaviour with trade liberalisation. As a result, the questions for the analysis were organised in three groups: the first was about their views on trade liberalisation and performance links, highlighting their reactions to the introduction of such policy; the second was about the effects of trade liberalisation on their decisions on investment and employment; and the third was about the adoption of imported machinery and inputs, and about the process of their adaptation in the environment of trade liberalisation.

The chapter consists of six sections: the second compares the information on the four performance measures gathered from the firms with the previous discussion in chapter six. The third section discusses the firms' answers about the influences of trade liberalisation on their behaviour; the fourth describes the changes in technology and leaning processes as a result of trade liberalisation, the fifth discusses the modernisation and reorganisation processes that followed trade liberalisation and the sixth concludes the chapter.

Section 7.2   Performance Changes in the Sample Firms

This section's objective is to summarise the previous findings on the productivity levels discussed in chapter six in connection with the analysis of the questionnaires and interviews from the visits during the fieldwork. The questionnaires were designed to obtain comprehensive answers about the firms' productivity and to capture the management's perceptions, since their decisions were a result of their interpretations of these measures rather than a result of theoretical analysis (Tirole, 1988). In doing so, the research question that will be treated is recalled below:

- Did trade liberalisation influence companies' behaviour after 1990?

Automobile, mining, electronics, non-iron products, other vehicles and steel were chosen to compare the questionnaire answers with the analysis in chapter six, for these the industries embedded the firms visited. First the changes in labour productivity will be described.

7.2.1   Labour Productivity

The objective of this subsection is to compare labour productivity indicated by the firms with the levels measured with the PIA data, for the industries embedding the companies in the sample (IBGE, 2001a;b). The changes in labour productivity were emphasised in the analysis, in chapters four and six, as Figure 7.5 below shows. When asked about increasing output after trade liberalisation, all the firms answered positively. So based on this certainty and on the confirmation that all industries but computers reduced employment, one must conclude that labour productivity increased. This seems consistent with the results in Figure 7.5.

Figure 7.5. Labour Productivity (Sales per Worker)

R$ millions

Source: (IBGE, 2001a;b)

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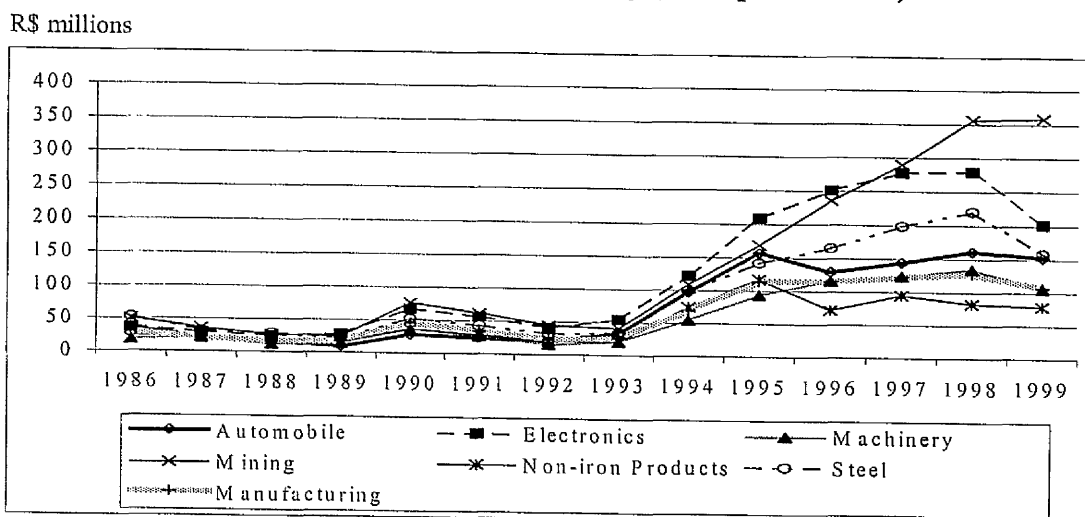
The 1980s figures for automobile labour productivity were 10-20 cars produced per employee per year; but in the 1990s this amounted to 100-150, which shows a high level of labour productivity (Ramiro, 2002). Looking at the firms' answers, only non-iron products, which include aluminium, showed labour productivity lower than the average manufacturing. Mining, electronics, steel and automobile were above the average, with mining showing the highest labour productivity which was confirmed by the interviews.

It seemed important to ask about the changes in employment structures to figure out the causes that may have affected labour productivity. When asked about the changes in employment structures, the firms indicated that, beside layoffs, labour cost reduction was a consequence of changes in gender structures, age average and localisation. For instance, most manufacturing firms introduced women workers, which had many benefits, including reducing the wage-bill. To give an idea of the changing gender structure at the begin of 1990, female employees were less than 1% in automobile plants. However, the visits to the plants confirmed that during the 1990s this proportion increased to 30-40% in three leader automobile companies. According to the managers interviewed, introducing women to the plant floor had multiple advantages, such as improving work organisation, reducing absences, etc. The explanation was linked to the low age of the women employees and the relative high level of education at the entry level.

A large automobile firm, however, still did not employ women in the plants, which was explained as a consequence of local traditions by the industrial affairs director. But in the Ford project called Amazon there has been a complete change in employment structure, since the Camaçari plant employs 40% of the female workers recruited locally and having secondary schooling background (11 years). They also received 900 hours initial training (Ford do Brazil, 2001). The interviewed director in the field confirmed the crucial importance of trade liberalisation for this project, basically due to importing electronic parts and to export part of the production.

A second aspect of the labour changes, influencing labour costs, was the employees' age, since the firms indicated that the average workforce age of 45 years in the 1980s has dropped to 30 years in the 1990s. Moreover, this move was only possible because of trade liberalisation, since the adoption of modern machinery, new products, and computer based management allowed for a new wave of employees.

A third aspect of labour change concerned plant locations, which had strong downside impact on wage costs, since the firms moved from the two large

centres (São Paulo and Rio) to other states, seeking low cost labour and tax benefits. For instance, the south of the state of Minas Gerais attracted many electronic/computers firms that left São Paulo due to competition pressures. Added to this there were fiscal incentives by some states and regions to attract investments. Summing up the reasons for rising labour productivity, such as wage costs cutting, technical modernisation and plant location were in many ways linked to trade liberalisation. As these changes also affected total factor productivity increase, it will be discussed in the next subsection

7.2.2 Total Factor Productivity

The objective of this subsection is to discuss total factor productivity linked to trade liberalisation based on the information gathered from the companies, in comparison with the data analysed in chapters four and six. To analyse the answers given by the firms Figure 7.6 shows the levels of total factor productivity. The figures were calculated in chapter four concerning the industries embedding the surveyed firms and emphasising that TFP increased more after 1990 than it increased before. For instance, the rise of total factor productivity matched with the information from the questionnaires, because every firm admitted to have increase productivity. Steel, non-iron products and mining had high total factor productivity index, in 1999 (8 to 9 times the level of 1986) and automobile increased it 5 times. But other vehicles and electronics increased total factor productivity less than the average manufacturing, which also matched with the questionnaires. Computers and software, which was embedded in electronics seems to have increased more than the secondary data shows.

Figure 7.6. Total Factor Productivity Index

(1986=100)

Source: (IBGE, 2001a;b)

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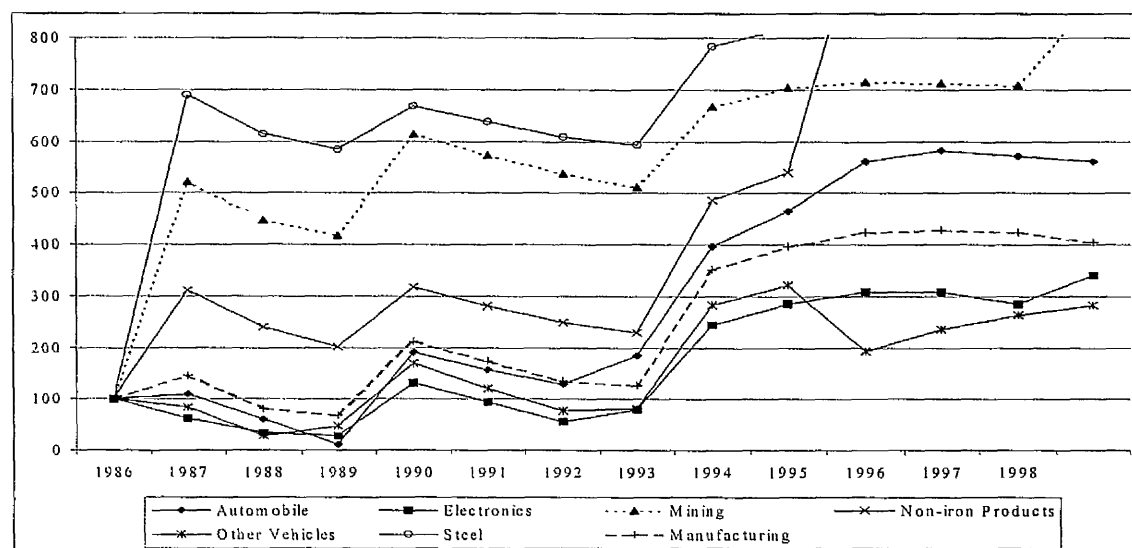
Although a list of reasons was provided to interviewees, some of them added other reasons, like ISO 9000 initiatives, which have been coded and added to the analysis. Hence, Table 7.1 includes ISO 9000 programmes as one of the reasons of increasing productivity. Most of the reasons for productivity growth privileged exports (35,1%) and cost reduction (25.5%), which clearly emphasised international markets and trade as a main cause of productivity changes. The industries that emphasised international trade were computers, aluminium and mining that clearly indicated exports/imports and cost reduction as important reasons for productivity increase.

Table 7.1. Reasons for Productivity Increase in the 1990s

Number of Firms

Industry	Increasing Exports		Cost Reduction		Privatisation		Product Quality		ISO 9000		Consumer Needs		No Answer		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Steel	4	26.7	5	33.3	2	13.3	4	26.7							15
Aviation	2	16.7	4	33.3	2	16.7	3	25.0			1	8.3			12
Computers	12	54.5	3	13.6	1	4.5	4	18.2			2	9.1			22
Automobile	6	26.1	6	26.1			6	26.1	3	13.0	1	4.3	1	4.3	23
Mining	3	30.0	2	20.0			1	10.0	2	20.0	2	20.0			10
Aluminium	4	50.0	3	37.5	1	12.5									8
Others	2	50.0	1	25.0			1	25.0							4
Total	33	35.1	24	25.5	6.0	6.4	19	20.2	5	5.3	6	6.4	1	1.1	94.0

Source: Questions 2x39

Summing up, the sample firms confirmed that productivity increased as a consequence of trade liberalisation, with exports performance being the most important reasons for them to pursue productivity rise. Hence exports will be discussed in the next subsection.

7.2.3 Exports

The objective of this subsection is to describe the firms' exports, and compare their performance with the exports data analysed in chapters three and six. According to the data on exports, every industry increased exports after 1990, as Figure 7.7 shows. Non-iron products exports had a steady increase, mining had a sharp increase in 1991 and 1999, and steel and electronics exports peaked in 1999, which was partially attribute to devaluation.

These results were compared to the information from the sample firms that indicated increasing exports after 1990 as Figure 7.8 shows. Particularly other vehicles' exports increased sharply due to aeroplanes exports by the EMBRAER, which during the interviews attributed its success to trade liberalisation among other elements.

Figure 7.7. Selected Industries Exports

(US billion)
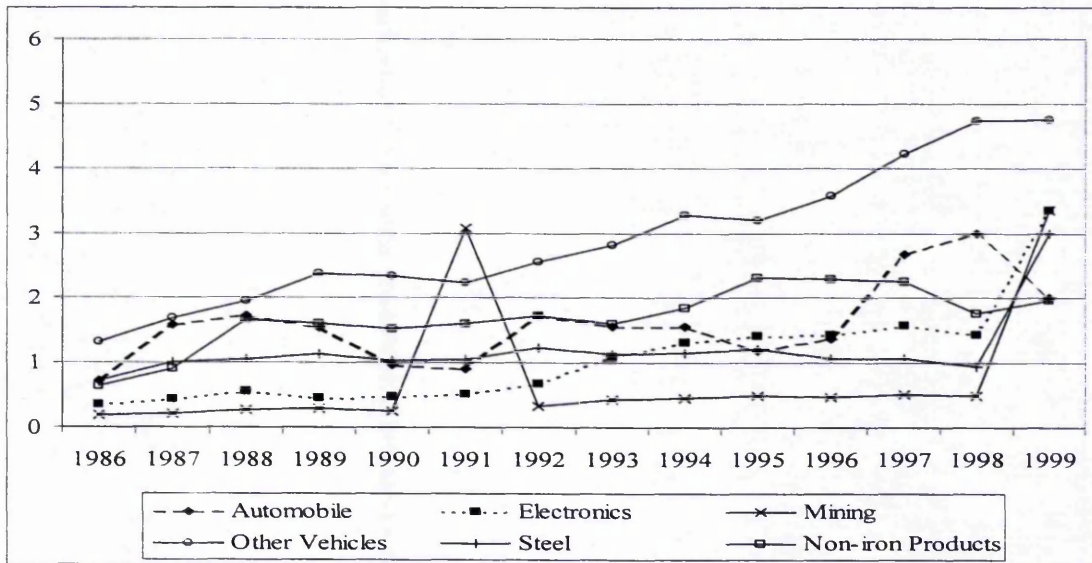
Source: (IBGE, 2001a;b)

Figure 7.8. Average Exports before and after Trade Liberalisation

US $ millions
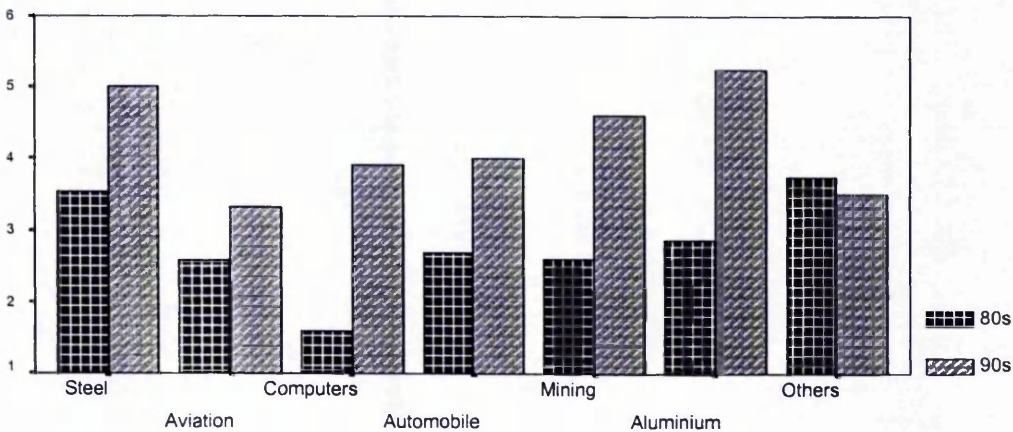
Source: Questions 10 and 12

For instance, the category of "500 millions US dollars and above" had had two companies after 1990, and none before, as Figure 7.9 shows. Crossing the export categories by industry showed that in the 1980s exports appeared distributed evenly within five industries, concentrating in the category "US$ 5 to 9.9 million". This confirmed that import licensing previously had a pro-incumbent bias, as explained in chapter four, otherwise the distribution would have been more skewed. But, in the 1990s the distribution of the number of exporting firms became closer to normal distribution, with concentration in the middle of the exporting categories: "US$ 10 to

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49.9 million" and US$ 50 to 499.9 million". The charts in Figure 7.9 and Figure 7.10 clarify the sample firms exports levels in the 1980s and 1990s. Although the categories described the company's perception of the exports, the figures show that these companies exports performance rose dramatically after trade liberalisation, since the number of firms in the top categories increased significantly. The discussion in this chapter will explore the reasons for this exports increase.

Figure 7.9. Number of Firms Exporting by Level of Exports (Before 1990)

Number of Firms
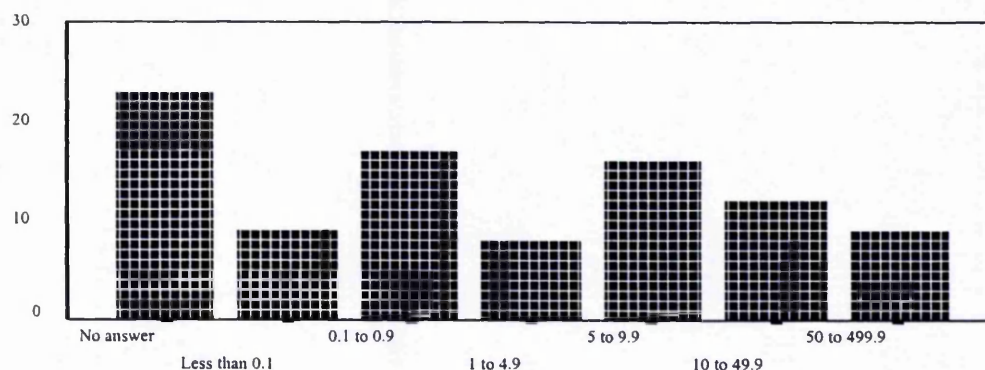
Source: Questions 2X12
Note: Categories in US$ million

Figure 7.10. Number of Firms Exporting by Level of Exports (After 1990)
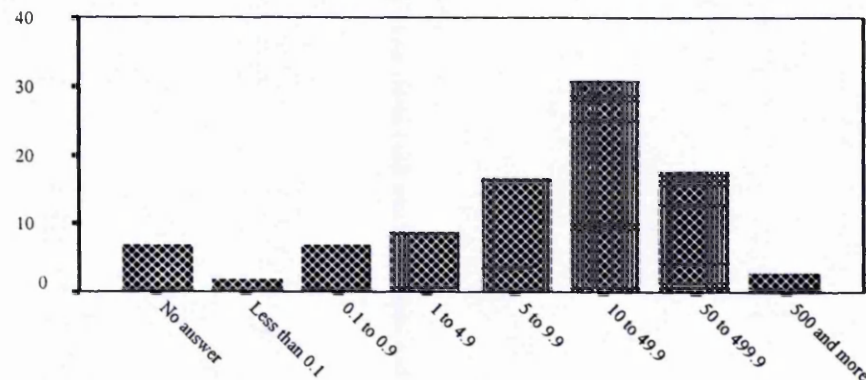
Source: Questions 2X10
Note: Categories in US$ million

The answers to the questions on the exports evolution before 1990 are detailed in Table 7.2, and after 1990 in Table 7.3. These figures confirmed the previous information showing that steel, mining, and aluminium increased the most. Aeroplanes and parts exports were distributed evenly among the categories. Although the reasons for increasing exports were not directly asked, the discussion about productivity rise and cost reduction provided some evidence of trade liberalisation influencing exports. First, the sharp rise on exports shows that the firms matched international price and quality

requirements. This indicated that the firms were taking advantage of trade liberalisation to succeed in cost efficiency and product quality.

Table 7.2. Exports Levels in the 1980s (USD Millions)

Number of Firms

Industry	< 0.1		0.1 to 0.9		1 to 4.9		5 to 9.9		10 to 49.9		50 to 499.9		No answer		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Steel	2	13.3	5	33.3			1	6.7	5	33.3	2	13.3			15
Aviation	3	25.0	4	33.3			1	8.3	2	16.7	1	8.3	1	8.3	12
Computers	2	9.1	5	22.7	5	22.7	2	9.1					8	36.4	22
Automobile	1	4.3	2	8.7	3	13.0	6	26.1			4	17.4	7	30.4	23
Mining	1	10.0	1	10.0			3	30.0	1	10.0	1	10.0	3	30.0	10
Aluminium							3	37.5	1	12.5	1	12.5	3	37.5	8
Others									3	75.0			1	25.0	4
Total	9	9.6	17	18.1	8	8.5	16	17.0	12	12.8	9	9.6	23	24.5	94

Source: Questions 2x11
N = Number of Firms

For instance, non-exporters that were 24.5% before 1990 dropped to 7.4% after. According to the questionnaires, seven firms, three from automobile, three from computers and one from others admitted that they did not export yet. Firms' competitiveness was very often mentioned in interviews, emphasising that the companies considered that meeting international standards and requirements was one of the most important targets after trade liberalisation.

Table 7.3. Exports in the 1990s (USD Millions)

Number of Firms

	< 0.1		0.1 to 0.9		1 to 4.9		5 to 9.9		10 to 49.9		50 to 499.9		500 & >		No answer		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Steel					1	6.7	3	20.0	6	40.0	5	33.3					15
Aviation	1	8.3	4	33.3	3	25.0	1	8.3	1	8.3	1	8.3	1	8.3			12
Computers	1	4.5					6	27.3	11	50.0	1	4.5			3	13.6	22
Automobile			3	13.0	2	8.7	4	17.4	4	17.4	5	21.7	2	8.7	3	13.0	23
Mining					2	20.0	2	20.0	4	40.0	2	20.0					10
Aluminium					1	12.5			3	37.5	4	50.0					8
Others							1	25.0	2	50.0					1	25.0	4
Total	2	2.1	7	7.4	9	9.6	17	18.1	31	33.0	19	19.1	3	3.2	7	7.4	94

Source: Questions 2x10
N = Number of Firms

The assumption that companies would need to spend some time preparing themselves to make a successful introduction to the international markets due to technology and learning processes was accepted by most of the interviewees. After 1990 to speed their technical upgrade most firms opted for buying technology abroad to adapt to local circumstances rather than developing their own.

To focus on the restrictions that might have barred Brazilian exports, the firms were asked about the world regions that they targeted for exports, based on the assumption that developing new markets would be more effective than trying to increase exports to traditional markets. Since the export targets were concentrated on Mercosul, NAFTA and Europe, not pursuing market diversification was another reason for exports not to increase more. Since 40% of the steel, automobile and aluminium firms indicated the NAFTA and 13% indicated Europe as their target, it seems that their exports became vulnerable to protectionist measures from these markets. A car-parts producer mentioned that environment rules was a reason for market losses, since some firms were still using the banned asbestos to produced brakes and friction material.

Summing up, the firms exported more after 1990 because of their acquired ability to develop products with world-class quality, which was enabled by importing inputs, machinery and technology, as a consequence of trade liberalisation. Next, the firms' initiatives to overcome increasing competition after trade liberalisation will be discussed.

7.2.4   Mark-ups Changes and Other Reactions to Trade Liberalisation

The objective of this subsection is to describe the firms' reactions to trade liberalisation, which included mark-ups and other initiatives to cope with competition. The comparison will be with the margins index discussed in chapter four and six. The industrial data analysed indicated that mark-ups increased before 1990, reduced after, and after a sharp increase in 1995, reduced again, as Figure 7.11 shows. However, after 1995, mark-ups increased due to a combination of exchange rate appreciation and trade reforms, such as the automobile regime and incentives to encourage TNCs to install plants in Brazil. This system also encouraged the firms to modernise the production systems as explained above. In fact the firms initiatives to face competition from imports were split between mark-up reduction (48.4%) and others, as Figure 7.12 shows.

Since more than 50% of the firms took other initiatives, such as product quality and technology improvement, mark-ups reductions were not decisive although very important. In the interviews, the firms admitted that the increasing competition by imports led them to reduce costs in order to maintain the price levels. According to them, imports were the key for mark-ups targets, since importing parts or machinery reduced cost, which matched with mark-ups having negative elasticity with nominal tariffs, in chapter six. For instance, even after trade liberalisation, imports in automobile were mostly realised by the carmakers instead of dealers (ANFAVEA, 2000). An example of the reactions to the announcement of trade

liberalisation will shed some light on the mechanisms of price and mark-ups before trade liberalisation and the changes afterwards. Some companies' of the aluminium sectoral chamber reported the companies' reactions to the government announcement of trade liberalisation.

Figure 7.11. Mark-ups Index

(1986=100)
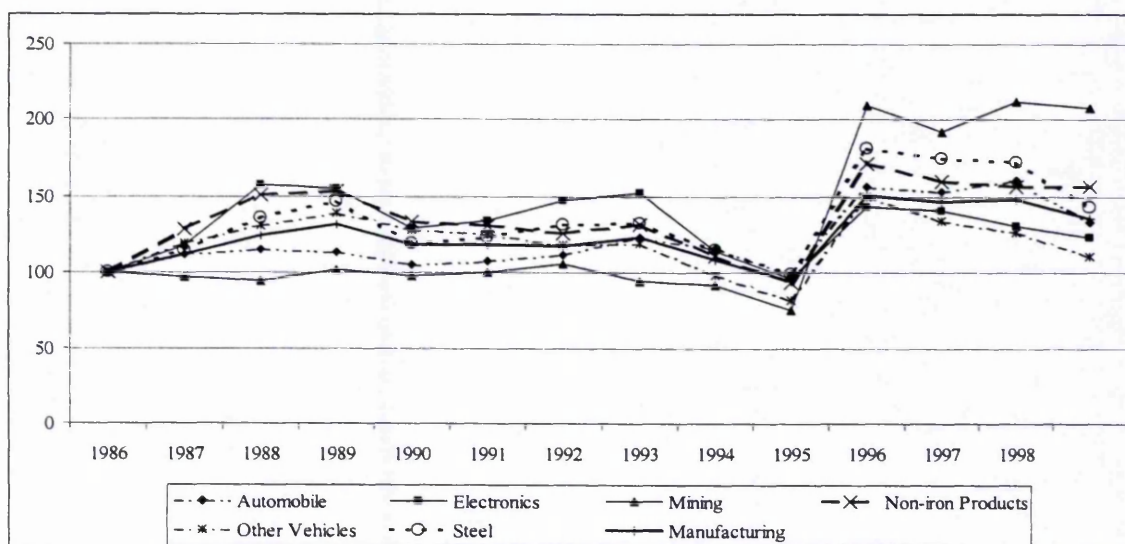
Source: (IBGE, 2001a;b)

In 1990, the sectoral chamber was informed of the government decision of liberalising prices at the beginning of a meeting with the officials from the Ministry of Economy and Finances (MEF). Being aluminium and steel essential commodities, the government agency for prices (CIP), which had been suppressed by the reforms, used to impose tight price control to their sectoral chambers, where the prices were decided. Thus, the decision of liberalising prices, which worried the aluminium end-users in the meeting, worried the aluminium producers by the afternoon, when the government announced the decision of eliminating tariffs and NTBs on aluminium imports.

Figure 7.12. Responses to Trade Liberalisation by the Firms

Number of Firms
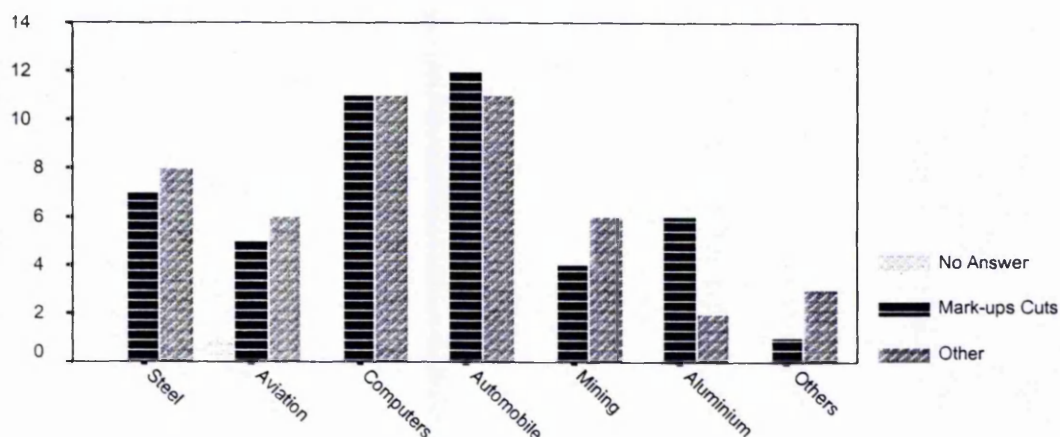
Source: Question 42

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The results were that the producers, who used to compromise to a price at 1800 US$ per metric ton, accepted 1500 US$, which was, in fact, the spot price in the Merchandise Future Market (BMF) at that time. Hence, in the short term the shock of trade liberalisation reduced aluminium prices by 17%, supporting the theory of import as market discipline for that commodity. With the appropriate adaptations, mining and steel companies also told similar histories, since the government liberalised imports of most intermediate goods, and reduced final goods' tariffs as explained in chapter three.

However, the overall mechanism to cope with increasing competition provided evidence of imports as market discipline, in spite of various ways that the firms had to curb with the burden of competition, before cutting their margins and actually reducing profits. The most important of them was the increasing access to cheap imported intermediate goods as explained earlier. Thus, it seems that the econometric results in the previous chapter were not totally unexpected, since product quality and productivity improved as a consequence of management improvements, according to the firms.

Summing up, the intensity of tariffs reduction and NTBs elimination was not enough to force the firms to reduce mark-ups, although market discipline was achieved by improving productivity and efficiency. The firms' efforts to improve management skills and to reorganise the administration paid off, since more than 50% of them were able to maintain price-cost margins, as compared with the 48.9% that reduced margins as a consequence of trade liberalisation. The other important initiatives of modernisation and reorganisation were undertaken by 30.9% of the firms. Taking partnerships was introduced by less than 10% of the firms. Hence, the discussion in this section answered to the question whether trade liberalisation influenced firms' behaviour, since the interviews indicated that the firms reduced mark-ups, increased efforts towards reorganisation and modernisation and took partnerships due to trade liberalisation. To study the effects of trade liberalisation on the changes in productivity and efficiency, the discussion in the next section turns to the nature and the intensity of such effects.

Section 7.3   The Influence of Trade Liberalisation

Now the analysis turns to the companies' answers about trade liberalisation effects, to determine the intensity of these effects, such as capital and labour reallocation. Furthermore, the links that the decisions of improving product

quality might have with trade liberalisation will be discussed as an evidence of the dynamic effects of trade liberalisation. First, Table 7.4 below shows the firms' answers to the question on the intensity of the trade liberalisation effects.

Table 7.4. Effects of Trade Liberalisation to the Firms

<div align="right">Number of Firms</div>

	No Effects		Weak Effects		Strong Effects		No Answer		Total
	Count	%	Count	%	Count	%	Count	%	Count
Steel	1	6.7	4	26.7	10	66.7			15
Aviation	3	25.0	3	25.0	6	50.0			12
Computers	3	13.6	5	22.7	14	63.6			22
Automobile			9	39.1	13	56.5	1	4.3	23
Mining	2	20.0	3	30.0	5	50.0			10
Aluminium	3	37.5	3	37.5	2	25.0			8
Others			1	25.0	3	75.0			4
Total	12	12.8	28	29.8	53	56.4	1	1.1	94

Source: Questions 2x 8

Since for this purpose Chi-square tests require a minimum of five cases per cell, and in Table 7.4 some cells have less than 5 firms, regrouping weak with strong effects will provide a robust analysis. This procedure isolates the cases of firms with "no effects" from those that had weak or strong effects, which gives more than 85% of the firms. Mining and aluminium had respectively 20% and 37.5% firms admitting "no effects", which could be attributed to extra protection going to these industries. This protection might come from the superior quality of Brazilian minerals, low extraction costs, etc, i.e., natural resources endowment.

In the rest of the sample almost every firm agreed on weak or strong effects, and recoding the variable into 2 categories, as it has been done, had a binomial test of 22% probability for the weak or no effects and left "strong effects" as the most likely outcome with 78% probability.

Analysing the cross-tabulation of trade liberalisation effects and market structures in Table 7.5 showed that 88.57% of the industries with predominantly large firms experienced strong or weak effects rather than "no effects". But 85.71% of small and medium firms in the sample agreed that trade liberalisation had weak or strong effects. The same proportion (88.57%) in industries populated with small firms also agreed on strong or weak effects of trade liberalisation. Hence, in every case only few firms admitted that trade liberalisation had no effects for them, although the industries with predominance of large firms strong and weak effects had the highest proportion.

Table 7.5. Effects of Trade Liberalisation According to Market Structures

<div align="right">Number of firms (%)</div>

	No Effects	Strong or Weak Effects	No Answer
Predominance of Large Companies	11.43	88.57	
Predominance of Medium and Small Companies	14.29	85.71	
Predominance of Small Companies	7.14	85.71	7.14
No Answer	33.33	66.67	
Total	12.77	86.17	1.06

Source: Questions 2x40

To analyse the links between trade liberalisation and the firms' initiatives, e g., resource reallocation decisions, a framework will be used as an analytical tool. The model in Figure 7.13 below will guide the analysis of the companies' behaviour that could be captured by the questionnaires.

Figure 7.13. Model for Analysing Trade Liberalisation Effects
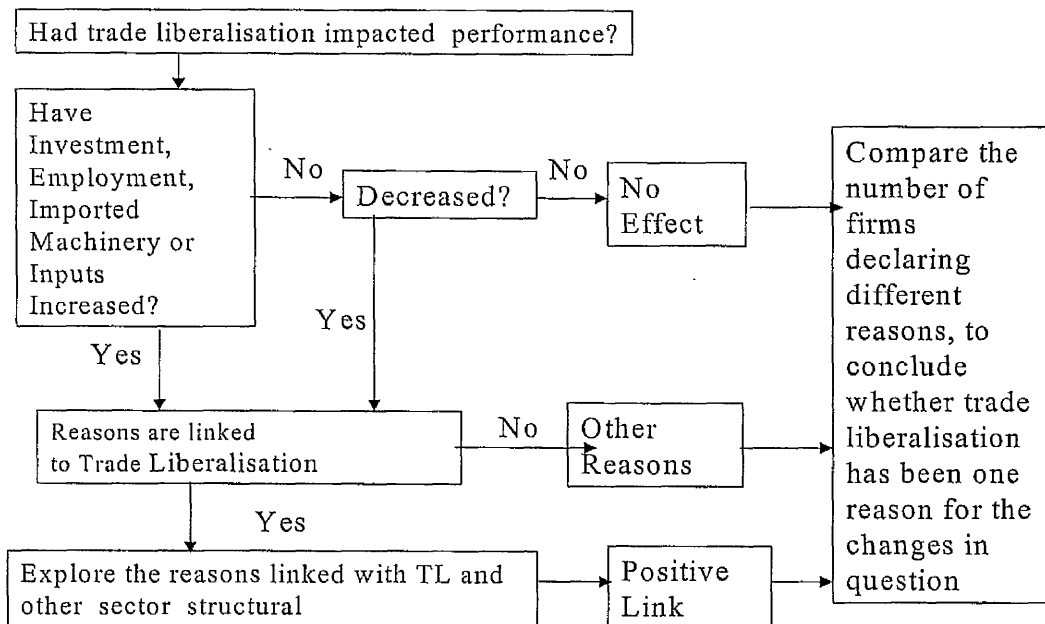
Source: Based on the Trade Theory (Krugman and Obstfeld, 1996)

Based on the trade theory this framework highlights the reasons given by the firms for initiating resource reallocation, imports of machinery and materials. It is intended to answer the initial questions that are recalled below.

- Were the reasons for the reallocation processes and importing inputs and machinery, after 1990, linked to trade liberalisation?
- Were changes in productivity and performance attributed by the firms to trade liberalisation?

The analysis in this section will be based on the questionnaires and interviews conducted with the firms, and on the reports made available to the author. The reallocation process will be discussed next.

7.3.1   Static Effects of Trade Liberalisation

This subsection will analyse the static effects that are linked to the reallocation of capital and labour amongst firms and industries as a consequence of the shifts in relative prices. The variables to indicate the reasons given by the firms for the changes in investment and employment were recoded into two categories: reasons related with trade liberalisation, and other reasons. Among the other reasons, the most common were privatisation and domestic markets expansion, which could also be argued as having indirect links with trade liberalisation. Market expansion was partially due to increasing imports, which forced domestic firms to reduce costs and prices, increasing demand and exports.

In order to trace the changes in investment and labour, together with the reasons that encouraged the firms to undertake such changes, the model in Figure 7.13 will now be filled with the percentages of changes in each flow, according to the answers to the questionnaires. The first question was whether the firms had increased the level of investment after 1990, whose answers are summarised in Figure 7.14 below.

In the diagram, after 1990 93% (88 firms) increased investment, and only 9.7% firms decreased investment. Interviews confirmed that increasing investment was the preferred way to cope with competition. The firms' initiatives were acquiring modern production equipment and machinery and adapting the production lines to new products, materials and technology. However, few firms reduced investment, which indicated the need for renewing the production schemes. Two automobile firms declared in the interviews that reducing investment was also linked to trade liberalisation, since plant closures were a cost cutting strategy, in response to increasing competition.

Having discussed the directions of the capital reallocation processes, it is important to discuss the reasons given by the companies. As Figure 7.14 showed, 68 % of the firms indicated that trade liberalisation was the first reason of increasing investment. The exception was the aviation sector, where the major plane producer (EMBRAER) indicated privatisation as the major cause of increasing investment. However, since half of the aviation companies still attributed increasing investment to trade liberalisation, it was yet the main cause of capital reallocation in every industry. Summing up, almost every company agreed that trade liberalisation played a central role in the process of capital reallocation, which was expected by the theory as an static benefit from trade liberalisation. So the hypothesis of imports as a cause of productivity and efficiency was supported.

Figure 7.14. Changes in Investment after 1990
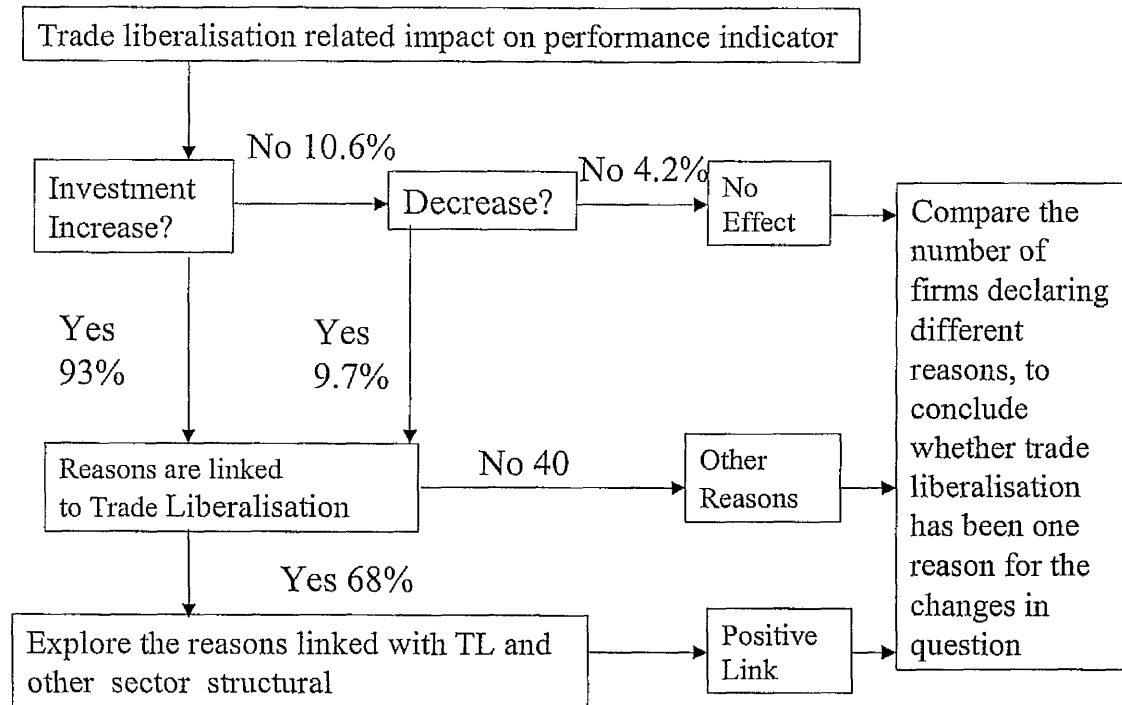
Source: Questionnaires
Note: A few firms overlapped answers.

Now the discussion turns to labour reallocation, since the theory also stated that labour reallocation was a consequence of firms seeking efficiency after trade liberalisation. The firms in every industry, with the exception of computers and software, indicated that they reduced employment, which implied labour cost reduction and efficiency increase. The computers and software exception was explained by the high level of protection that this industry had before trade liberalisation. Thus, with the openness to imports new firms were created and international agreements for technology transfers implemented, resulting in employment creations rather than extinctions.

Figure 7.15 shows that the most common reasons for the firms to reduce or even expand employment were related to trade liberalisation (70%). Particularly, steel and automobile industries had an impressive employment contraction, which was consistent with the discussion, in chapter four. The automobile regime discussed in chapter three encouraged modernisation and the introduction of new plants; but it could not avoid job losses as a consequence of the modernisation processes. Hence, automobile and computer and software industries showed labour changes in both directions with some firms increasing and other reducing employment. But in both cases employment changes were a consequence of trade liberalisation.

Figure 7.15. Changes in Employment after 1990

```
┌─────────────────────────────────────────────────────────────┐
│ Trade liberalisation related impact on performance indicator │
└─────────────────────────────────────────────────────────────┘
                        │
                        ▼  No 53.1%          No 37.2%
┌──────────────┐    ┌───────────┐    ┌──────────┐    ┌────────────────┐
│ Employment   │───▶│ Decrease? │───▶│ No       │───▶│ Compare the    │
│ Increase?    │    │           │    │ Effect   │    │ number of      │
└──────────────┘    └───────────┘    └──────────┘    │ firms declaring│
                                                       │ different      │
    Yes            Yes                                 │ reasons, to    │
    40.4 %         63.7%                               │ conclude       │
                                                       │ whether trade  │
         ▼              ▼   No 40%    ┌──────────┐     │ liberalisation │
┌──────────────────────┐             │ Other    │────▶│ has been one   │
│ Reasons are linked   │────────────▶│ Reasons  │     │ reason for the │
│ to Trade Liberalisation│           └──────────┘     │ changes in     │
└──────────────────────┘                              │ question       │
         │     Yes 70 %                                └────────────────┘
         ▼                           ┌──────────┐
┌────────────────────────────┐       │ Positive │────▶
│ Explore the reasons linked │──────▶│ Link     │
│ with TL and other sector   │       └──────────┘
│ structural                 │
└────────────────────────────┘
```

Source: Questionnaires
Note: A few firms overlapped answers.

In general, for the whole sample labour changes were in both directions with some firms increasing employment (38 out of 94) and most reducing it (61 out of 94), were a consequence of trade liberalisation[13]. The cross-tabulation in Table 7.6 indicates that computers was the only sector with more job creation than job reduction. But computer companies attributed increasing employment to trade liberalisation, since the suppression of the constraints for importing parts and software stimulated the establishment of new plants. Hence trade liberalisation was also the main cause of labour reallocation, according to the firms, which supported the previous analysis in chapter six.

An example of the firms' strategies to face trade liberalisation was explained by a the carmaker FIAT, during a visit to the headquarters. It had a double strategy of localisation and diversification, which was decisive to face the effects of trade liberalisation: localisation and diversification of activities. The location advantage was already granted, since it has always been based outside São Paulo, where the others carmakers were concentrated. As a consequence of this location, the wages levels of the FIAT employees were 50% less than their colleagues, from São Paulo, in absolute

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[13] 5 firms answered both questions.

values, which was compensated by the low cost-of-living in Minas Gerais, where the plants are located (Caixeta, 1993).

Table 7.6. Regrouped Reasons for Employment Change

Number of Firms

Industry	Employment Expansion			Employment Reduction		
	TL Related	Other	No Answer	TL Related	Other	No Answer
Steel	3		12	6	8	1
Aviation	4	3	5	4	2	6
Computers	9	6	7	7	2	13
Automobile	4	3	16	10	6	7
Mining	1	1	8	4	4	2
Aluminium	3		5	5	1	2
Others	2		2		2	2
Total	26	13	55	36	25	33
Source	Questions 2x22			Questions 2x20		

Note: Six firms added reasons for employment expansion or reduction even if they had agreed that they expanded employment later in the period.

For the diversification, in spite of reducing the number of employees, in 1991-92 due to recession and trade liberalisation, FIAT acquired an agricultural machines producer, located in the South of Brazil in 1991. In 1993, the group set up an engine plant in Minas Gerais and began lorries production in another plant in Minas Gerais (Nucci and Nagamine, 2001). This diversification was attributed to trade liberalisation by the board, justifying their position by the possibility of importing truck engines, software, computerised machine tools and electronics. In spite of the possibility of the main company importing most parts before trade liberalisation, actually importing such intermediate goods was hard due to the similar law, which protected particularly intermediate goods and computer related products. Moreover, every reseller and repair centre needed to have computerised machine tools, which only became available with trade liberalisation. This reinforces trade liberalisation as a vital policy for the automobile. As a result, the group that first reduced the employees from 14,0 thousand to 9,0 thousand in the aftermath of trade liberalisation ended 1999 with 23,0 thousand employees, according to the company's headquarters.

In the visit to the carmakers trade association, they agreed that trade liberalisation was crucial for the investment opportunities, and for capital reallocation, which was supported by the automobile and car-parts firms that constructed plants outside of São Paulo. Nonetheless the influence of tax cuts and other local incentives cannot be neglected. For instance, after 1990 in Minas Gerais, beside FIAT, there was also a Daimler-Chrysler plant and another of a local constructor JPX; in Bahia, Ford; in Goiás, Mitsubishi; in Rio Grande do Sul, GM, AGCO, and International, in Paraná, Audi, WV, Daimler-Chrysler, Renault, and Volvo, and in Rio de Janeiro, Peugeot and

WV (ANFAVEA, 2000; SINDIPEÇAS, 1998). Toyota and Honda installed plants in São Paulo state. With these examples, the conclusion was that labour and capital reallocation were strongly connected to trade liberalisation, by the timing that it happened. Location of plants was a central issue, basically to take advantage of the labour costs differentials. Next subsection will discuss the dynamic effects of trade liberalisation.

7.3.2 Dynamic Effects from Trade Liberalisation

After 1990, the firms reallocated capital and labour mostly due to trade liberalisation, which brings now the discussion to the types of investment, and the decision criteria for buying domestic or foreign equipment, row material and technology. This will clarify the dynamic effects of trade liberalisation. The number of firms that bought machinery and equipment, which indicated the types and the level of capital reallocation will be discussed. The objective of this subsection is to discuss the firms' behaviour with regard to the acquisition and import of machinery, equipment and raw material, since the acquisition of such products and the decision of importing them signalled increasing technical capabilities. From the questionnaires, it became clear that after 1990 every company but one decided to introduce new machinery and equipment, which supported trade liberalisation as a motivation for technical improvement.

Applying the schema discussed earlier, Figure 7.16 shows that out of the 91.4% of firms that admitted having imported machinery, 86.2% (57.4%+28.8%) attributed this decision to trade liberalisation. This proportion seems significant since minimum local content and similar law were still in force as discussed in chapter three. The provenance of equipment and material from abroad reflected the 1990s' global tendency, since for the sake of scale efficiency most of the TNC's plants in Brazil became part of their parent companies' world network suppliers. This came as a consequence of the tariffs reductions and the suppression of imports' bans, which enabled local plants to produce world standard products.

The discussion of the reasons for acquiring and importing equipment, material and inputs will emphasise the links with trade liberalisation. The reasons given by the firms were regrouped in three categories: "Tariff or static reasons", "Learning or Dynamic reasons", and "Other reasons". Increasing exports or imports, and tariff reduction were the reasons given by companies in association with tariff or static reasons, which had 57.4% from the imported machinery, and 66% of inputs imports (see Figures 7.16 and 7.17). The reasons linked to changing location from other

countries to Brazil, enhancing product lines, including better production equipment, improvement of world technology and knowledge improvement by the workforce were linked to learning or dynamic reasons. This group of reasons was the motivation of machinery imports for 28.8% and of inputs imports for 23.4% of them.

Figure 7.16. Equipment and Material Acquisition in the 1990s
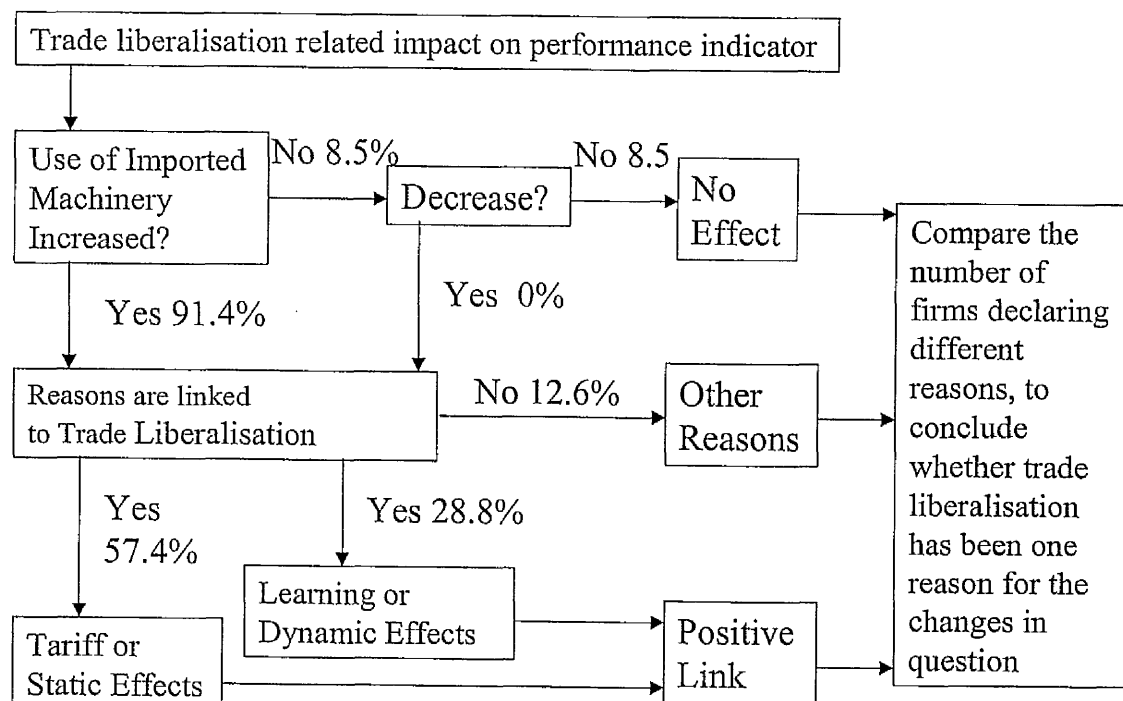
Source: Questionnaires

Combined as above, the reasons for the firms to import inputs gave the percentages pictured in Figure 7.17, which indicated strong support for the dynamic effects of trade liberalisation, as expected by the theory explained in chapter two. Therefore, trade liberalisation was an important reason for the firms to buy new equipment and inputs, although other reasons had influenced their decisions. The number of those that did not answer the questions about importing inputs and machinery added to the number of those that gave other reasons (privatisation, ownership or finance) resulted in 10 firms, which did not cast any doubt on the high level of the dynamics of trade liberalisation since the sample had 94 firms.

Looking at the reasons regrouped as above and distributed by industries, in Table 7.7 the 62 firms, which gave tariff or static reasons for importing input materials, were evenly distributed, with a minimum of 52.2% in automobile (12 firms), a maximum of 100% in others. In absolute terms, computers had the highest number of firms importing inputs for tariff or static reasons. The 22 firms that gave learning or dynamic reasons for importing input materials also were evenly distributed

in industries. Nevertheless, some industries, such as steel, computers, automobile and mining, attached more importance to the learning and technology than others. Since computers and automobile were the most backward industries, because of the prohibition of imports according to the discussion in chapter three, this situation was expected.

Figure 7.17. Imported Inputs by the Sample Firms

Trade liberalisation related impact on performance indicator

Use of Imported Machinery Increased? — No 3.2% → Decrease? — No 3.2 → No Effect

Yes 96.8%

Decrease? — Yes 0%

Reasons are linked to Trade Liberalisation — No 8.5% → Other Reasons

Yes 66%

Yes 23.4% → Learning or Dynamic Effects → Positive Link

Tariff or Static Effects

Compare the number of firms declaring different reasons, to conclude whether trade liberalisation has been one reason for the changes in question

Source: Questionnaires

Thus, concentrating the reasons for importing machinery and input materials into two categories, which were both connected to the dynamic effects of trade liberalisation supported the hypothesis of trade as a market discipline.

Table 7.7. Regrouped Reasons for Import Machinery

Industry	Tariff or NTB		Learning or Technology		Other Reasons		No Answer		Total
	Count	%	Count	%	Count	%	Count	%	Count
Steel	9	60.0	5	33.3	1	6.7			15
Aviation	9	75.0	1	8.3	2	16.7			12
Computers	14	63.6	5	22.7	2	9.1	1	4.5	22
Automobile	12	52.2	7	30.4	3	13.0	1	4.3	23
Mining	7	70.0	3	30.0					10
Aluminium	7	87.5	1	12.5					8
Others	4	100.0							4
Total	62	66.0	22	23.4	8	8.5	2	2.1	94

Source: Questions 2x31

Moreover, since these reasons were a consequence of decisions taken by the firms, to improve their technology and their performance, they also confirmed

that increasing contacts with world class technology and the world market quality requirements have been positive for productivity due to the firms' learning processes, which was a dynamic effect from trade liberalisation. Comparing the intensities of static effects from the previous subsection with dynamic effects of trade liberalisation, it seemed that around 70% of the firms admitted that labour and capital reallocation (static) was attributed to trade liberalisation. But 91% and 96% attributed acquiring and importing machinery and inputs (dynamic) to trade liberalisation. The conclusion could be that dynamic effects overcome static ones, which is consistent with the conclusions in chapter six and in the literature, where margins and profits had positive elasticity with imports. The discussion in the next section will turn to the effects of the elimination of non-trade barriers on productivity and product quality.

7.3.3 NTBs' Elimination and the Effects on Competition

Since there were two important means of introducing trade liberalisation, i.e., by reducing tariffs and by eliminating or alleviating the non-tariff barriers (NTBs), the objective of this subsection is to confirm the changes in competition after trade liberalisation by reducing NTBs. The question to be answered is about the firms' perception of the intensity of the competition, as stated below:

- Has competition increased after trade liberalisation?

In this subsection, to provide an answer to the question above, two complementary views of the effects of trade liberalisation to competition will be described. First the possibility of increasing competition was directly linked to the reduction and elimination of non-trade barriers, which were the strongest barrier to competition by imports. Secondly, the description of the firms import processes and the change in the speed of import operations will also give an idea of the increasing competition. The influence of the NTBs elimination on the firms, and how this could enhance productivity and performance will be discussed according to the interviews and reports, which the firms were able to produce to illustrate the changes in their behaviour.

The description of the ban of NTBs will follow a qualitative approach, due to the difficulties to have a quantitative approach that relates performance and productivity to NTBs (Greenaway and Milner, 1993). In Brazil, the main NTBs were bureaucracy, import prohibitions, quotas, import licenses, advanced import payments, official minimum prices, general standards and regulations, local content requirements and antidumping taxes (Bonelli, et al., 1997). Most of them were relaxed with trade

liberalisation, others downgraded; but antidumping enforcement and standards and regulations actually increased (Kume, 1996a). According to the discussions in chapter three, prior to 1990 NTBs measured by their spread indicated that 70% of the tariff lines were subjected to some NTB. The restrictiveness measure estimated that NTBs implied rise of 28% in average prices (Kume, 1989).

Since every sample firm was submitted to the general NTBs, such as import licensing and local content exigencies, a question on the effects of trade liberalisation on competition was asked to the firms. The answers summarised in Table 7.8 below confirm that the majority of firms admitted that trade liberalisation had strong or very strong effects on competition for them. However, steel, aviation and mining had 20, 25 and 30% of "no effects", which was explained by the firms as connected to the features of such sectors.

Table 7.8. Trade Liberalisation influences on competition

Number of Firms

Industry	No effects		Weak		Strong Effects		Very Strong		Total
	Count	%	Count	%	Count	%	Count	%	Count
Steel	3	20.0	5	33.3	4	26.7	3	20.0	15
Aviation	3	25.0	2	16.7	1	8.3	6	50.0	12
Computers	1	4.5			3	13.6	18	81.8	22
Automobile	1	4.3	1	4.3	14	60.9	7	30.4	23
Mining	3	30.0	2	20.0	1	10.0	4	40.0	10
Aluminium			2	25.0	4	50.0	2	25.0	8
Others			2	50.0	1	25.0	1	25.0	4
Total	11	11.7	14	14.9	28	29.8	41	43.6	94

Source : Questions 2x41

First, steel and mining have a weight-price ratio that generally does not allow for imports, which weakened the threat of competition from imports. Second, Brazilian steel has good quality and low price, which makes the industry also less vulnerable to import competition. For instance, price comparisons by the Brazilian Steel Institute (IBS) highlighted the Brazilian comparative advantage by ranking the border prices of a metric ton of ordinary steel at US$ 130. Russian steel was at US$ 150, Korean at US$ 155, Japanese at US$ 175 and American at US$ 180 (Ramiro and Ramos, 2002b). However, some special steel, such as coated steel, were more likely to endure competition because of the high technology involved in its production. So its weight-price ratio compensates the transport costs. This reflected in the 46.5 % of steel firms that agreed of strong or very strong effects from trade liberalisation on competition. Aircraft industry had 25% of "no effects", which concerned three plane

and parts exporters, and 50% of "very strong effects", which referred to other suppliers that faced strong competition from abroad after trade liberalisation.

The time necessary for a company to have an import licence issued by the appropriate government agencies was another feature that confirmed increasing competition from imports basically due to the NTBs' elimination. Figure 7.18 shows these times by industry, in the 1980s. In the 1990s, some industries such as plane constructers, computers and mining had their license waiting time cut to almost zero. According to the interviews and the trade associations reports, licences for importing steel and automobile still have a certain delay to be issued, which indicated some level of protection (ANFAVEA, 2000; IBS, 1999).

Figure 7.18. Waiting Time for Import Licence in the 1980s

(Number of Firms)
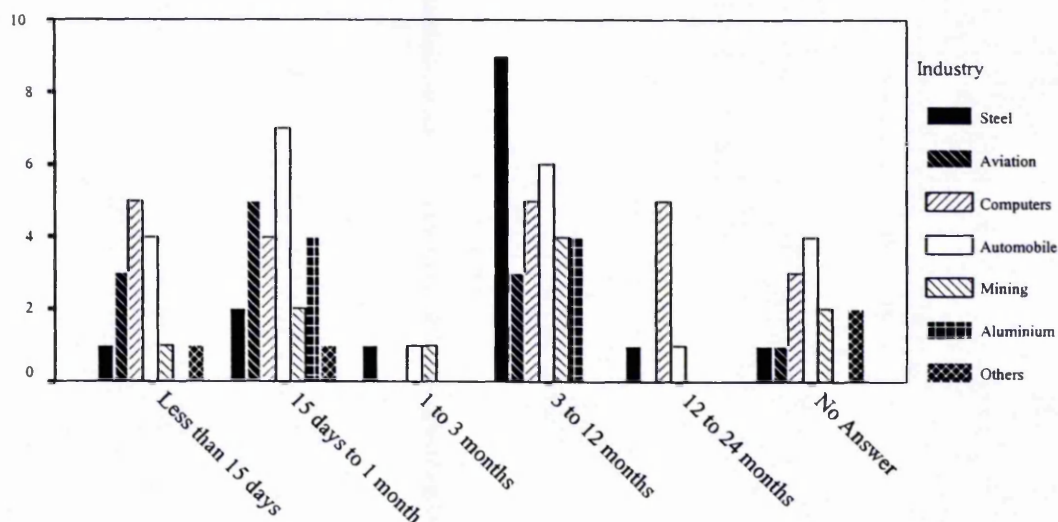
Source: Questions 2x35.

In Figure 7.19 the import licence times after 1990 emphasised that the time for obtaining an import licence dropped drastically for every industry, since only two firms claimed more than 15 days to obtain a licence, one has not answered the question, and the lasting 91 indicated less than 15 days. The two steel companies located inside port areas were able to import rapidly before 1990, which was also emphasised by importing components of exported products, to which fast track import licenses applied. This situation also confirmed the discussion in chapter four on the trade liberalisation regulations, and the findings in the questionnaires that issuing import licences was biased towards incumbents before 1990.

Analysing the firms description of NTBs by industry will give an idea of the extent, types and spread of the NTBs, indicating the impact of their suppression in 1990. Steel had all kinds of NTBs, but import prohibitions. Mining was almost NTBs

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free, which was perhaps due to the great comparative advantage of the Brazilian mines that did not require extra protection.

Figure 7.19. Waiting Time for Import Licences in the 1990s

(Number of Firms)
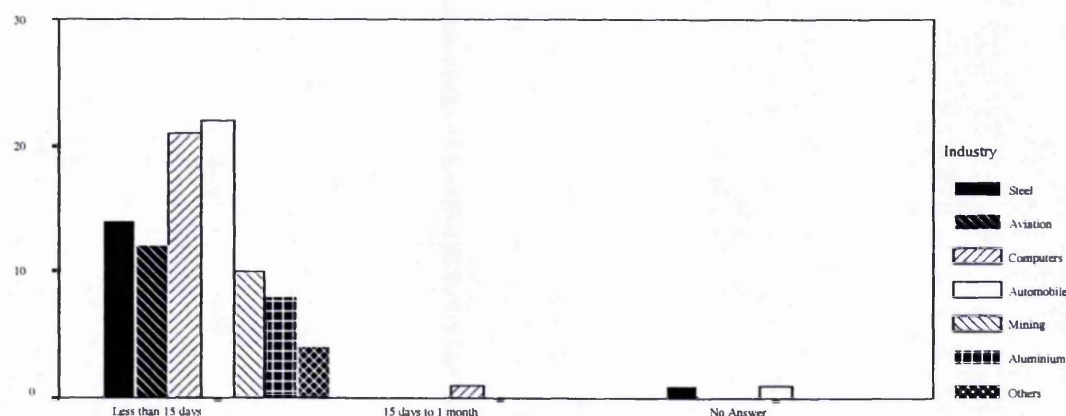
Moreover, since before 1990 some steel and mining firms were state owned, government procurement, and similar law were always in force. Hence, by the suppression of such NTBs these firms experienced strong effects on productivity and efficiency. According to the interviews, mining firms did not show such expected response to the NTBs' elimination. The reason was the difficulty of promoting static changes in this industry, since capital reallocation was hard to achieve due to the mines' localisation and to the type of machinery, which was expensive, heavy to be moved around and hardly discarded in a reallocation process.

However, the ban of NTBs in mining, steel and aluminium reinforced the role of small companies, which with NTBs were unable to import because of transaction costs. The explanation by the firms in steel and aluminium for the bias against small companies and newcomers relied mostly on their lack of bargaining power inside the agencies which were delegated the power to issue import licences. But with the ban of licences and other NTBs small firms could import intermediate goods, which also confirmed the analysis in chapter six (Franco and Fritsch, 1994).

The aviation industry, however, was an exception to NTBs restrictions due to the fact that small firms were not barred from importing inputs that they needed to supply parts to the plane constructors. These small firms participated to national projects, such as developing a war aircraft (the project AMX in the 1970-80s, the Amazon Surveillance in 1990s, and the production of helicopters) (MAer, 1992). The participation in such projects was included in the compensation scheme adopted by the government, i.e., the Ministry for Air Defence (MAer) to benefit domestic firms with

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technology transfers (MAer, 1991). As an evaluation of the efforts of partnership involving the government and small firms, the benefits of trade liberalisation to the small firms' were impressive, according to the interviews in the Centro Tecnólogico Aeronáutico (CTA) and in the Ministry for Air Defence.

Concerning the automobile industry, the ban of NTBs, which were basically local content and imports prohibition, led to strong impacts from trade liberalisation, since the partners became able to import raw material and machinery. This benefited contractorship and outsourcing, which became a central management tool. For instance, all car plants visited outsourced many production activities, such as the assemblage of interiors and mechanical sets to be fitted to the cars at the production line, as discussed earlier for employment and capital reallocation.

The car-parts producers reported strong effects from trade liberalisation, since tariffs referring to parts were reduced to virtually zero to benefit their customers, the carmakers (information gathered from the interviews). Furthermore, local car-parts producers were facing strong competition from abroad, since the newly established carmakers brought with them their world suppliers. This also implied takeover of domestic part-producers by TNCs, on the grounds of technology enhancement and adequacy of supply (ANFAVEA, 2000). However, in spite of the tariff discrimination for the companies aiming to establish plants in Brazil, there was still ground for concluding for strong trade liberalisation effects to overall automobile industry.

The computer and software industry, which after trade liberalisation was submitted to many changes, was one of the most benefited, basically by the suppression of imports prohibitions. With this, local computer assemblers became able to import better technology parts, enhancing product quality. TNCs established local plants, benefiting consumers with low prices and modern technology. Being computers and software intermediate goods, the expected benefits by the linkages with other industries were enormous. Hence, exports were expected to grow after trade liberalisation, according to the interviewees. But increasing local demand kept factories highly occupied during the 1990s and delayed exports expansion.

The discussion in this subsection showed a clear reduction of the times for the firms to have import license issued, which in most industries became less than 15 days. This was an empirical evidence of NTBs alleviation, which suggested a positive answer to the question of increasing competition by the suppression of NTBs. By diminishing transaction costs and suppressing import prohibition trade liberalisation ended up enabling scale economies, which were strong in automobile and computer and

software industries. Furthermore, the efficiency effects of NTBs bans also enhanced specialisation and linkages between industries. Supplying intermediate goods and inputs was also remarkably affected by the changes in imports structures. Particularly, car-parts and computers and software firms were submitted to strong linkage pressures from their final consumers (carmakers and other firms) that resulted in cheaper and better quality products. It also resulted in changes in firms' localisation with plant closures and new plants built in different regions. Since the firms' reactions to trade liberalisation were broadly described above, the next section will emphasise the actual firms' initiatives to take advantage of technology and learning also coming from trade liberalisation.

Section 7.4 Technology Change and Learning Benefits

The objective of this section is to discuss the initiatives that the firms undertook to face increasing competition and to cope with trade liberalisation. The most important topic is to establish the channels for the effects of trade liberalisation and study the reactions by the companies. The research question is recalled bellow:

- What kind of initiatives had the firms adopted to face competition from imports?

The technical changes and product quality improvement will be linked to the previous discussion on static and dynamic effects from trade liberalisation by the initiatives undertaken by the firms as a consequence of imports competition. The evidence of technology and product quality improvement was gathered from the questionnaires, by the description of the firms actions and by the number of companies that introduced new products, or eliminated old products. The inclusion of imported inputs and raw materials in the products was surveyed, assuming that imported inputs improved the domestic products' quality and enhanced productivity in the production lines. Trade liberalisation increased the access to worldwide technology and enabled domestic firms to import intermediate goods and supplies. According to the visits to the companies, the answer to this question would indicate the state of technical changes in Brazilian manufacturing after of trade liberalisation. This was also expected to match with the literature discussed in chapters three and four. However, the firms had different ways to face competition by imports, which will be discussed in the next subsection.

7.4.1 Facing the Competition Pressure

When policymakers introduced trade liberalisation, they expected productivity and competition to increase. Encouraging the firms to adopt modern

technology, as a consequence of market shocks was also a central issue. Since trade liberalisation had many stages, and some where more important than others, according to the firms, describing the firms' initiatives in connection with it will indicate how the government initiatives affected them. The proactive actions by the firms, such as seeking partnerships, merging with others and engaging technology development will be summarised in this subsection. Reorganisation and modernisation will be discussed later, and mark-up reduction which was one of the firms' reactions to trade liberalisation has already been discussed.

The categorisation of the firms initiatives was presented to the firms, to collect their choices and priorities, which are in Table 7.9 below. Mark-ups' reduction was the most frequent initiative with 48.9% of the cases, reorganisation and modernisation was the second choice with 30.9%, and Merging or having a partner came in third place with 10% of the cases. So the first three choices added up to 79.8% of the sample firms. Furthermore, summing up the options "concentration" (merging and take-over) and "partnership" resulted in 18.2% of the cases, with some industries having preference for partnership and reorganisation (aviation: 25 and 25%, computers: 9.1 and 27.3%, automobile: 4.3 and 39.1%, and mining 10% and 30%). It seems appropriate to think that, after reducing margins and consequently relative prices, the next step for coping with competition was reorganisation and modernisation, followed by taking partnership and merging with others. Some examples of partnership and merging will described below.

Table 7.9. Changes in Companies Due to Increase in Competition

Number of Firms

Industry	Mark-up Reduction		Reorganisation		Partnership		Concentration		Development Technology		No Answer		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N
Steel	7	46.7	3	20.0	2	13.3	2	13.3	1	6.7			15
Aviation	5	41.7	3	25.0	3	25.0					1	8.3	12
Computers	11	50.0	6	27.3	2	9.1	2	9.1	1	4.5			22
Automobile	12	52.2	9	39.1	1	4.3			1	4.3			23
Mining	4	40.0	3	30.0	1	10.0	2	20.0					10
Aluminium	6	75.0	2	25.0									8
Others	1	25.0	3	75.0									4
Total	46	48.9	29	30.9	9	9.6	6	6.4	3	3.2	1.0	1.1	94

Source: Questions 2x42

The first example is focused on a group from the agriculture machines industry that had to sell part of the business. It produced monthly 1500 engines and 300 tractors before 1990; but stopped serial production afterwards. This situation matched the Brazilian market. In 1990 30,000 tractors similar to the product in question were

sold, and the group had 50% market share. But, in 1997 the market was only of 10,000 units, and the group had no share. In 2001, the market increased to 25,000; but it was too late for this firm to re-enter, since it had a new strategy of producing and assembling engines and trucks under licence for an American TNC. This case highlighted the reallocation processes after trade liberalisation, and the consequences of efficiency seeking, to cope with international competition. According to the interviews, the rise in competition pushed the owners to sell the group's parent company. Beyond the recession that played a central role in 1991-92, imported technology enabled small tractors from other competitors to achieve the same results as their previous products.

A second example concerned a 100 years old steel firm belonging to a large domestic private group. According to the interviews, it had to close plants and sell the core business (steel and machinery) to two TNCs as a consequence of the trade liberalisation. The rail material branch has been sold to a local group, which later joined another TNC. That group relied on the production of special steel (stainless and coated steel basically), which came under increasing competition from imports. According to the interviews, the Brazilian steel comparative advantage disappeared when special steel was considered due to price-weight ratio and technology. For instance, whereas ordinary steel metric ton price ranged from US$ 200 to 300, special's price ranged from US$ 500 to 15,000, making imports very competitive. Moreover, this kind of steel was also less used in manufacturing, which made production scale hard to achieve in LDCs.

The diversification, which enabled the group to operate all its plants, was implemented under ISI. This policy encouraged the firms to produce everything domestically, as discussed in chapter three. However, trade liberalisation introduced competition from imports, which induced specialisation rather than diversification. Hence this group was not in a competitive position due to the previous wide diversification, which ruled out the measures of reducing mark-ups and reorganisation in order to face imports competition. According to the company's board, selling off and changing ownership was the chosen solution to face import competition.

Summing up the analysis so far, the interviewed firms agreed that competition became stronger after trade liberalisation, and their efforts to cope with this situation involved reducing margins, reorganising their firms and partnerships. The first two were discussed in other sections. Mergers, foreign partnerships and selling off part of the businesses were detailed above, with some examples from the field. Some companies' initiatives highlighted the quantities of new products introduced before and after trade liberalisation, which will be described next.

7.4.2 Introduction of New Products

The introduction of new products before trade liberalisation provided an indication of the influence of trade liberalisation on competition. The companies' reaction in terms of product quantities follow a classical definition of competition. Looking at the number of companies that increased or reduced products after 1990, Table 7.10 shows that 90 companies included new products, and Table 7.11 indicates that more than half of them (56.8%) abandoned products.

The number of companies that introduced new products and the number of those that excluded products after 1990 emphasised the firms' strategies to face competition. Commodity suppliers, like mining, aluminium and steel firms, which had less product innovation before trade liberalisation, took advantage of the increasing imports to improve product quality. For instance 100% of the aluminium firms launched new products, with no reduction of the number of old products. Almost every automobile and computers and software firms also launched new products (100% and 90% respectively). They eliminated many products (75% and 45%), which confirms the hypotheses of learning technology and improving product quality after 1990.

Table 7.10. Introduction of New Products after Trade Liberalisation

Number of firms

Industry	Number of Products Introduced											No answer		Total
	1 or 2		3 to 5		6 to 9		10 to 20		More than 20		No answer		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N
Steel	1	6.7	2	13.3			5	33.3	6	40.0	1	6.7	15
Aviation			1	8.3	5	41.7			5	41.7	1	8.3	12
Computers			8	36.4	2	9.1	3	13.6	7	31.8	2	9.1	22
Automobile			5	21.7			5	21.7	13	56.5			23
Mining	3	30.0	2	20.0	2	20.0	2	20.0	1	10.0			10
Aluminium			4	50.0			3	37.5	1	12.5			8
Others	1	25.0			1	25.0	1	25.0	1	25.0			4
Total	5	5.3	22	23.4	10	10.6	19	20.2	34	36.2	4	4.3	94

Source: Questions 2x25

This also reinforced their backwardness before 1990. Most of the aviation industry firms also introduced new products (91%), and few reduced their product lines (16.6%), which confirmed that this sector already enjoyed world-class technology in 1990, since the firms did not need to eliminate many old products. By the number of introduced and eliminated products there was strong support for diversification and increasing consumer choice, which was also a sign of increasing competition, according to the Industrial Organisation theory discussed in chapter two (Krugman, 1989; Tirole, 1988). Hence, by eliminating old products the firms were reorganising their production rather than going out of business or downgrading their

activities. Furthermore, looking deeper into the figures, 34 firms actually introduced "more than 20 products" after trade liberalisation; but only 4 firms eliminated "more than 20 products".

Table 7.11. Abandon of Products after Trade Liberalisation

Number of Firms

Industry	Number of Products Abandoned											No answer		Total
	1 or 2		3 to 5		6 to 9		10 to 20		More than 20		No answer		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N
Steel	2	13.3	3	20.0	3	20.0			2	13.3	5	33.3	15
Aviation			1	8.3	1	8.3					10	83.3	12
Computers			6	27.3	1	4.5	1	4.5	2	9.1	12	54.5	22
Automobile	5	21.7	5	21.7	4	17.4	1	4.3			8	34.8	23
Mining							2	20.0			8	80.0	10
Aluminium											8	100.0	8
Others					2	50.0					2	50.0	4
Total	7	7.4	15	16.0	11	11.7	4	4.3	4	4.3	53	56.4	94

Source: Questions 2x27

This discussion confirmed the strategy of diversifying the product mix, which is a strong indication of competition increase. This argument is reinforced by the fact that the most common number of eliminated products were "3 to 5" and "6 to 9", with the proportions of 16% and 11.7%. But the most common number of new products introduced was "more than 20", with the proportion of 36.2%. Hence the firms were emphasising consumer choice and satisfaction after trade liberalisation.

The conclusion for increasing competition after trade liberalisation, by the quantity of products, became evident as the firms not only confirmed that competition increased, but revealed many actions that they undertook to face increasing competition. For instance, the analysis of product quantity showed that the introduction of new products outnumbered by far the exclusion of old fashion products. Thus the number of products in the market increased and so did competition. When faced with competition the firms were expected to improve product quality by enhancing technology. Hence, in the next subsection the discussion goes into the changes in technology and the nature of actions undertaken by the companies with the introduction of imported inputs in the products.

7.4.3 Imported Inputs and Materials

The discussion now turns to imported components, which reinforced the argument for linking the increasing competition to trade liberalisation. By incorporating parts and components to the products in order to improve productivity and product quality, the firms provided another evidence of dynamic benefits from trade liberalisation. The firms' answers informing the number of products with imported

components before and after 1990 will be the basis to indicate the level of product quality and competitiveness linked to imported inputs and raw material.

The companies' answers informed also about the learning processes, since the decisions of importing components and raw material were assumed to be guided by the objective of improving efficiency and technology. Figure 7.20 below shows that the number of firms, which all the products had imported components increased from 15% to 41% of the cases.

In the mid categories around half of the output included imported components and the number of firms did not change much. But the companies with only a few products having imported components reduced from 35% to 17%, which showed a tendency of importing more components. Moreover, the firms that introduced imported inputs in all products were more than 40% and they were also responding to consumer demands, which was a sign of increasing competition. It seems, therefore, acceptable to conclude that the firms decided to increase imports of raw material and other inputs as a consequence of increasing competition from imports. Thus, this can be attributed to the dynamic benefits from trade liberalisation referred to in chapter two.

Figure 7.20. Imported Inputs in the Product Composition

(Number of Firms, in %)
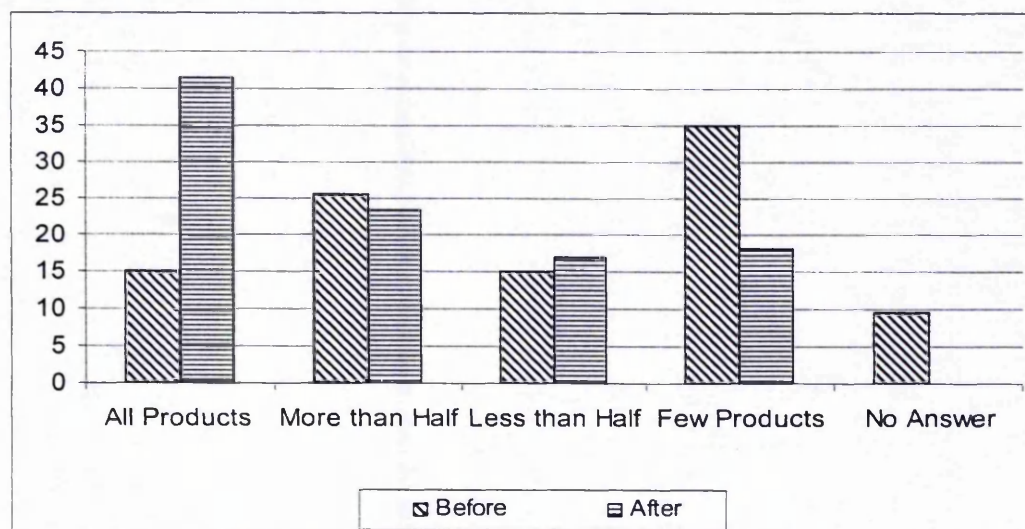
Source: Questions.33 and 34

The increase of imported inputs in "all products" has happened in automobile, aviation, steel and computers. Automobile and computers and software introduced imported inputs in all products, which matched with the previous conclusion that these were the sectors more likely to increase learning and technology by trade liberalisation because of their backwardness before 1990. This also was supported by consultancy reports comparing the world-class efficiency to the Brazilian industry

efficiency, which found that the differences in these sectors were still wide in the 1990s (Mckinsey & Company, 2000).

Comparing the values in Table 7.12 and Table 7.13, which show the number of companies sorted by the categories of the presence of imported components before and after trade liberalisation, will complement this discussion. For instance, just 14 companies (14.9%) included imported material and components in "all products" before 1990. They were in the sectors: computers, aviation, steel and automobile. After 1990, these sectors' figures increased to 39 firms (41.5%) as Table 7.13 shows. Firstly, this increase indicated that their products were not at the edge technology and quality before 1990, which also supports the finding of dynamic effects of trade liberalisation. The increasing share of imported components in domestic products also lent some support to the explanation for mark-ups having negative elasticity with nominal tariffs found in the models estimations in chapter six.

Table 7.12. Imported Inputs in the 1980s

Number of Firms

Industry	All Products		More than Half		Less than Half		Few Products		No Answer		Total
	N	%	N	%	N	%	N	%	N	%	N
Steel	2	13.3	2	13.3	1	6.7	10	66.7			15
Aviation	4	33.3	5	41.7	1	8.3	1	8.3	1	8.3	12
Computers	7	31.8	7	31.8	2	9.1	3	13.6	3	13.6	22
Automobile	1	4.3	6	26.1	6	26.1	7	30.4	3	13.0	23
Mining					1	10.0	8	80.0	1	10.0	10
Aluminium			2	25.0	3	37.5	3	37.5			8
Others			2	50.0			1	25.0	1	25.0	4
Total	14	14.9	24	25.5	14	14.9	33	35.1	9	9.6	94

Source: Questions 2x34

The argument was that by increasing the share of imported inputs due to reduced protection the firms were able to maintain or increase their margins. Hence, increasing imported inputs to domestic goods was a central effect of trade liberalisation.

Table 7.13. Imported Inputs in the 1990s

Number of Companies

Industry	All Products		More than Half		Less than Half		Few Products		Total
	N	%	N	%	N	%	N	%	N
Steel	3	20.0	4	26.7	4	26.7	4	26.7	15
Aviation	5	41.7	3	25.0	4	33.3			12
Computers	19	86.4			1	4.5	2	9.1	22
Automobile	12	52.2	4	17.4	3	13.0	4	17.4	23
Mining			4	40.0	1	10.0	5	50.0	10
Aluminium			5	62.5	1	12.5	2	25.0	8
Others			2	50.0	2	50.0			4
Total	39	41.5	22	23.4	16	17	17	18.1	94

Source: Questions 2x33

Summing up, technical change and product quality by the introduction of imported inputs and materials seemed to confirm the dynamic benefits from trade

liberalisation. After 1990, the firms improved technology and product quality as a result of accessing world class inputs. To study the links between these changes and trade liberalisation, the next subsection will discuss the nature and the extension of the firms' initiatives to improve quality and technology.

7.4.4 Improving Technology and Product Quality

The objective of this subsection is to describe the main technology improvement that happened to the companies in the survey and how these changes were linked to trade liberalisation. Since technology changes involved technology production, education project, research activities and institutes, the first stage of this discussion will conceptualise the topics before describing the firms' efforts. This subsection is based chiefly on the interviews and the firms' reports.

When interviewed about technical change, the firms showed a broad concept of technology, including R&D initiatives, connections with universities, education organisations, laboratories and consultancy institutes. The firms also included foreign partnerships as a technical improvement, since the ability of supplying technology was a main criterion to choose foreign partners due to the urgency of implementing new and sound technology. Hence, the types of technology initiatives summarised in Table 7.14 below were based on the interviews and the information provided by the firms. This approach resulted in a comprehensive measure of the firms' technological level rather than a quantitative index.

Table 7.14. Technology Development Strategies

Number of Firms

Industries	R&D Unit	Laboratory	Foreign Partner	FINEP Projects	HE & Consultancy	Nested Firms	Others
Steel	11	11	7	2	4	2	
Aviation	2	5	3	4	9	3	4
Computer	6	14	11	6	4	4	2
Automobile	12	14	12	2	9	1	1
Mining	7	6	5	3	2		5
Aluminium	2	5	5	3	2		4
Others	1	3	2	1	2		1
Total	41	58	45	21	32	10	17

Source: Interviews

Having foreign partners became a major strategy to enhance technology, which emphasises the situation of strong need for technical improvement before trade liberalisation. This was confirmed as the second strategy, with 45 firms declaring that they had a foreign provider of technology as Table 7.14 shows. Only in

fifth place as a technology came having projects with the Financiadora de Estudos e Projetos (FINEP). This emphasised the extent of the government reforms that reduced funds to technology development.

The option for having a foreign partnership, which sometimes resulted in takeover or switching ownership, was also due to the need of reaching the appropriate production scale to face competition from abroad. For instance, automobile became a champion of foreign partnership mainly due to the incentives of the automobile regime, described in chapter three, which encouraged many TNCs to install local plants.

The attraction of this scheme was such that as many as thirteen TNCs applied to construct plants in Brazil, which meant that by 2005 thirteen car makes will be produced locally, matching with the diversity of the EU production (Beting, 2000). Domestic car-parts industry was overwhelmed by international partnerships, although in some cases the reason was not backwardness before 1990 as it was the case of carmakers and computers. For instance, Brazilian firms producing parts such as car and trucks brakes, cooling systems, car interiors and suspension systems had world-class technology (SINDIPEÇAS, 1998). However, even in these technologically advanced areas large TNCs groups were able to take-over the successful Brazilian producers due to the lack of scale. Before 1990, domestic firms used to produce only for the domestic market, which made them weak in terms of competition.

Moreover, the newcomer carmakers also influenced takeover of car-parts and steel firms by TNCs, for they preferred to keep the same suppliers as abroad. Many reasons could explain this, e.g., technology, quality requirements and learning process, in this specialised niche (steel alloys for the cars of each specific make), according to the firms. For the carmakers, the advantage of having their accustomed suppliers simplified the procedures and accelerated the learning schemes in their new Brazilian plants.

The third technological option in number of cases was having an R&D unit. Since the firms have not detailed the features of having a R&D unit, the cases are reported in Table 7.14, as they were referred to by the firms. In almost all the cases R&D unit meant that the firm was involved in the adaptation of one or more essential technologies to be directly applied to product improvement. Having a laboratory, however, was the firms' first option with 58 cases. But it meant rather an ordinary laboratory, which was common in manufacturing for the day-to-day operations. Having FINEP projects, however, was a better sign of technical improvement. These projects became essential for product quality and productivity improvement, due to the focus

change by FINEP. As explained in chapter three, in the 1980s FINEP funds were directed towards generating indigenous technology. In the 1990s, they were diverted towards the diffusion and adaptation of already developed technologies, in a move that in fact began in 1987, together with a sharp reduction in the R&D funds due to budget constraints (IE/UNICAMP et al., 1993). This shift was also due to the abandonment of trade policy based on ISI and infant industry protection. Hence, from the 21 firms having FINEP projects most were in computer (6), and in aviation (4), which had mainly adaptation projects, such as the development of add-ons to software and hardware.

Furthermore, to improve technology some industries were keen to have agreements and contracts with higher education and consultancy organisations. Automobile and aviation industries used this kind of agreements to enhance technical change, which was due to the need of renewing backward products in the automobile case. But it meant a way of working technology transfers in the case of aviation. The backwardness argument, as previously discussed, was also valid for the computer industry, steel and mining, which was reflected in the high number of firms having opted for connections with higher education and consultancy institutes. In these cases the technical disadvantage was explained by the high proportion of state owned companies before 1990.

As an example, the aviation industry was a case of close connection with an institute of excellence in education, the Centro Técnico Aeroespacial, or the Centre for Aerospace Technology (CTA). This industry had also championed the number of nested firms in universities, which shows the importance attached to technology to enhance product quality, which was proven successful in terms of exports by the EMBRAER (CTA, 2001). For the other industries, however, the most substantial links to improve and adapt technology were with consultancies, which explained the bias towards management and administrative development, since in Brazil most consultants were specialised in management rather than technology (de Paula, 1999b).

Going beyond projects and institutional frameworks, another feature of product quality improvement, which also indicated the level of technical change, originated from computer numerically controlled (CNC) machinery. After the suppression of the imports bans on computer related products, CNC became a current imported equipment, and a channel for improving product quality and productivity. For instance, every firm in mining, steel, aluminium and car-parts explained that they imported CNC machinery to fulfil their needs for mechanisation with increasing

efficiency and productivity. Car-makers and aircraft constructors adopted a more complete and comprehensive system, which added design tools like Computer Aided Design (CAD), to CNC equipment, giving Design Numerical Controls (DNC) machines. These were complex tools linked with computers loaded with CAD software designs (Amann, 2000). For instance the plane constructor EMBRAER organises a firtual model of the aircrafts to function as a production design toll and as a marketing schema. The clients are able to visit and experience the virtual plane before placing an order. This initiative accelerated the process of developing and producing the output, by simplifying human intervention in the production process. As the small and medium firms only could import such equipment after trade liberalisation, this was a substantial dynamic benefit from trade liberalisation, which spilt over the domestic manufacturing sector in terms of technology, product quality and productivity improvement.

Added to the features discussed above, another reason for the manufacturing low level of technology before trade liberalisation was the low Brazilian education standards in the 1960-80s. This made technology development hard to achieve, even with long periods of infant industry protection, though the TNCs' technological strategies also played a central role in this. Moreover the urgency of cost-cutting reforms after trade liberalisation also made it hard to improve educational levels of the workforce.

Summing up the descriptions given with respect to technology improvement, the driving forces for the firms to adopt the expected behaviour as a consequence of trade liberalisation were: need of up-to-date technology and competition pressures. Pressured by these forces the firms undertook five measures to enhance technology and product quality: introducing new products, increasing the part of imported inputs in the production, enhancing the scheme of technology development, modernising the production techniques and reorganising the companies and plants. Since the first three initiatives were discussed in this section, modernisation and reorganisation will be discussed in the next section.

Section 7.5   Modernisation and Reorganisation

This section's objective is to describe the actions indicated by the firms to implement modernisation and reorganisation, in order to illustrate their behaviour when faced with trade liberalisation. Hence, this section continues to discuss the question of the firms' initiatives to face competition by imports. These initiatives were

focused on improving product quality and productivity, which was consistent with the theory of industrial organisation, discussed in chapter two. This also matched with the trade theory, since it stated that as a consequence of competition pressures, the firms were expected to increase the efforts towards productivity and product quality improvement.

In the Brazilian context reorganisation and modernisation initiatives were undertaken as a means of increasing firms' competitiveness, by reducing costs and trying to match international quality standards (Mirshawka, 1990; Sanches, 2001). The support for the descriptions in this subsection was found in the interviews with the firms boards and visits to the plants, which provided examples of their views and attitudes and informed whether their motivations were connected to trade liberalisation.

Since importing machinery and inputs was a strategy for productivity and product quality improvement, as discussed in the previous section, the initiatives described now were undertaken to accelerate new production techniques and management practices. They focused on the employees development and management schemes rather than on strict technical progress. Modernisation and reorganisation comprehended material resources management (MRM), total quality management (TQM), total quality control (TQC), quality circles (QC), flexible cells, and just-in-time (JIT), outsourcing and training strategies, as summarised in Table 7.15.

Table 7.15. Productivity Strategies after Trade Liberalisation

Number of Firms

Industries	Modernisation and Reorganisation			JIT	Outsourcing	Education and Training
	MRM, Kanban	Flexible Cells	TQM, CQ			
Steel	15	9	12	7	8	7
Aviation	12	5	11	4	5	4
Computer	21	14	14	15	15	9
Car Industry	23	17	21	15	13	8
Mining	10	3	5	4	6	5
Aluminium	8	4	4	3	8	3
Others	4	1	3	2	2	2
Total	93	53	70	50	57	38

Source: Interviews

After trade liberalisation, the strategies of modernisation and reorganisation as detailed in Table 7.15 aimed to reduce costs, increase productivity and strengthen the productive capabilities. The figures for the period before trade liberalisation are not available, though the interviews confirmed that some activities existed at that time.

An indication of the importance of trade liberalisation for the introduction of product quality and productivity efforts to the firms can be found in Figure 7.21, which summarises the number of ISO 9000 certifications in manufacturing.

Figure 7.21. Number of ISO 9000 Certifications in Manufacturing
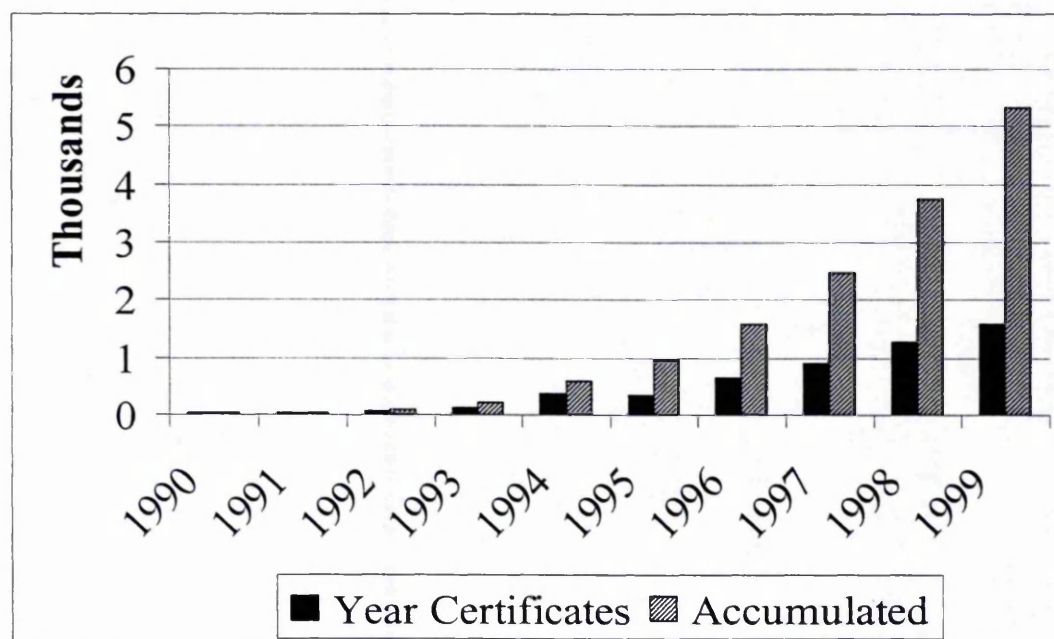
Source: (ABNT, 2002)

However, the firms added that they were reinforced after 1990, by the possibility of importing the adequate inputs and machinery and as a means of coping with increasing competition. But the ISO 9000 certifications started in 1990, and the number increased sharply afterwards, which proved that the firms engaged in the programme, as explained in chapter three in order to improve product quality and productivity, which came also as a consequence of trade liberalisation.

In 1999, there were more than five thousand ISO 9000 certificates issued to manufacturing firms, which shows the rapid increase which will be discussed with the effects of the Brazilian programme for quality and productivity for the sample firms. The general definitions and scopes of such initiatives were described in chapter three, since they were linked to government programmes. The qualitative approach will focus in details supplied by visited firms, highlighting the importance of the modernisation techniques for the firms to face competition and to raise product quality and productivity. The interviews highlighted some successful examples of such actions, which will be summarised. The discussion in the next subsection will turn to the general strategy of quality management.

7.5.1 Quality Management Improvement

First let us discuss the general actions by the firms to improve management skills and modernise production management, which became known, in Brazil, as modernisation techniques or reorganisation, according to most of the interviewees. The objective of such management efforts was basically to reduce costs, and increase efficiency by introducing new techniques into the production system. Besides being in line with the international practices these techniques aimed to compensate for plants' small scale, which did not allow for the latest machinery (Campos, 1996). These management practices were based on the Japanese model of companies management and quality controls, which the firms learned from consultants and educational organisations. The basis for such knowledge development on quality control came from the Japanese Union of Scientists and Engineers (JUSE) (Campos, 2002).

The first tool of cost-efficiency and reducing idle capacity in the production line was a set of computer software or manual techniques applied to manage inventories of raw material and unfinished products named Material Resource Management (MRM). This was developed using customised or general computer programmes, in the large or medium firms. But in the small and medium firms MRM was applied manually with the help of cards and calculators in order to minimise the inventories and organise the production activities. An add-on to this technique, imported from the Japanese management, used a token system to indicate backwards in the line of suppliers when a piece or batch of raw material or input was actually used. This activated the replacement procedures in time, which was know as Kanban and was spread around manufacturing material administration (Mirshawka, 1990). In general, reorganisation initiatives aimed to reduce costs by eliminating non essential work, straightening the lines of command and simplifying the tasks. This was achieved by the suppression of hierarchy layers, reducing the gap between the shop-floor and the top management. Although many of these techniques already existed in Brazilian manufacturing they became more popular, when the appeal to cost-cutting practices was enforced by international competition.

Quality management relied also on the introduction of flexible production cells, which consisted in teamwork, where the team members were capable of realising a variety of jobs in a cell. This system was flexible due to that possibility of rotating jobs. Many firms used this organisation scheme to allow employees to solve the day-to-day problems helping each other on a basis of common interest and productivity

improvement (Chaves, 2000a;b). An example of flexible production cells was in the aviation assembly production, which used the technique with great results, according to the visited firms. The Brazilian plane constructor EMBRAER had strong comparative advantage, due to the simplicity of the assembly cells and the multi-functionality of the staff in the shop-floor (EMBRAER, 1999). The General Electric plane engines plant in Rio also emphasised the success of such approach. Carmakers and car-parts producers introduced flexible production cells with impressive results (Andrade and Serra, 2000; Sanchez, 1992). For instance, the AGCO (US car company) plant in Porto Alegre and the four visited carmakers plants (FIAT, VW, GM and Agrale) were organised in flexible cells as much as their traditional production lines allowed for.

Car-parts providers, such as engines and interiors assemblers used the technique of flexible cells. Mining, steel and aluminium plants implemented flexible cells with less emphasis, since the mechanised production depended on large equipment, blast and integrated furnaces or integrated electric equipment, which limited employees' flexibility (de Paula, 1999a). However, flexibility was introduced in the steel plants of Compania Sidurúrgica Tubarão (CST), Belgo, and USIMINAS by increasing the teams autonomy for the day-to-day decisions in the plants visited. The two large mining groups CRVD (Vitória plant) and MRN (Pará plant) reported that flexibility was encouraged and was consistent with the visit to the CVRD Vitória plant, where labour was organised in flexible teams. Continuing the discussion of total quality management the next subsection will describe the quality strategies adopted by the sample firms.

7.5.2 Firms' Programmes Based on the PBQP

The Brazilian Programme for Quality and Productivity (PBQP), as explained in chapter three, aimed to reorganise the production lines, to cut production costs and to improve competitiveness. The PBQP initiatives boomed after 1990, as Figure 7.21 showed for the ISO 9000 awards, which highlighted the importance of trade liberalisation as a compelling factor for the programme's success. This subsection's objective is to describe the basic quality and productivity techniques included in the PBQP, according to the sample firms.

The most popular techniques described during the visits were total quality management (TQM), which according to some interviewees was a step forward comparing to total quality control (TQC), which was implemented in many plants from the late 1980s. Quality circles (QC) was known by emphasising teamwork and being

consistent with the flexible cells, to enable managers full plant control simultaneously with large degree of team independency (Chaves, 2000a;b). These techniques were based on the Japanese management practices with a Brazilian flavour.

TQM and TQC have been mentioned by every sample firm, although some admitted being in the early stages of the implementation process. These techniques consisted in controlling every phase of the production process, eliminating every unnecessary step, making the place of work clean and adequate, with the proper dimensions, including rationalising the use of furniture, tools and materials. All this effort was aimed to avoid excess of throughput time, intermediate stocks and unnecessary handling of parts and tools, which was based on the Deming method of increasing productivity and quality (Walton and Deming, 1988). The results according to the firms' management have been impressive in terms of economising time, spare material and intermediate products, which finally reduced costs with increasing quality.

For example, after the PBQP implementation in the CVRD mining plant, in Vitória, the management summarised the savings in terms of cost reductions. First, waste disposals turned into revenues, since they managed to recycle most of the waste and sell the proceeding to other companies. Second, space, energy and water savings were 25%. The steel firm Belgo, of Luxemburgian capital established in Minas Gerais, stated that by adopting the PBQP techniques the company saved shop space by 15-18%, more than 25% in raw material, and 12% in waste management in 1998. The techniques constituted of target-savings, which included charts displayed in each unit and monthly target reviews in each plant. USIMINAS, another steel company from Japanese and Brazilian capital, reported that the savings with the PBQP technique were at 18% of operational costs. The car company FIAT reported more than 20% savings in space, waste and water consumption, after the introduction of the third phase of the PBQP, in 1994. Similar savings in terms of general costs were reported by most firms, highlighting waste, energy, and water savings. The main connection with trade liberalisation was that all these savings enabled the firms to export more. Moreover by reducing costs these techniques enabled them to face foreign competition (ABAL, 2000; IBS, 1991; Mártires, 2000).

In the computer and software industry, apart the interviews conducted in the field, the Ministry of Science and Technology (MCT) has surveyed 445 firms in 2000, giving some indications of the influence of trade liberalisation on this industry in terms of quality improvement. It confirmed the pre-1994 low quality levels, since only 11 firms had quality programmes in 1994. The MCT concluded that the results did not

support the previous policy of infant industry protection that this industry enjoyed. Although, by 1999 only 39 firms had met the full ISO 9000 certificate, 177 firms had some ISO 9000 certificate, with was impressive as compared to none before 1990.

Summing up, although the PBQP was an independent programme, it was linked to trade liberalisation at the origin. It was established as a consequence of the companies' need of improving product quality and productivity. Moreover, the timing for setting up this programme was connected with the change in trade policies, since facing strong competition from imports justified the stress on productivity and product quality. Next, the technique of just-in-time, as a means of speeding operations inside the plants will be described.

7.5.3   Just-in-Time

Just in Time (JIT) was the most developed quality and cost efficiency strategy implemented by the sample companies, which confirmed the industrial organisation literature and the industrial surveys on quality and productivity (BNDES/CNI/SENAI, 1996; George, et al., 1993). In the Brazilian manufacturing this was the "best known and the most widely applied strategy" for modernising industrial processes altogether with materials resources management (Amann, 2000:134).

Just-in-time was defined by the interviewees as an effort towards synchronising each step of the process of production, which can be achieved internally (within the company only) or externally, by including the part of the production processes carried out by suppliers and subcontractors. As the objective was to have each stage's input supplied at the moment of use, JIT reduced under-utilised capacity by rationalising the use of labour, storage space, handling time and stocks of unfinished products, smoothing the whole production line (Campos, 1996; Ohfuji et al., 1997). Moreover, operational cost reduction effects added to the diminishing transaction costs, increasing production efficiency. Marketing efficiency was also enhanced, since launching new products was speeded up with reduced costs, since stocks of old products were kept at a minimum level, according to the interviewees. Whereas previously the old products stocks would increase the costs of renewing product lines.

The description of the implementation of JIT will follow, highlighting the importance of trade liberalisation for this. Steel, aluminium and mining industries were row material and intermediate inputs suppliers to the others, such as carmakers, car-parts producers, plane constructors and computers constructors. The interviews confirmed that JIT has been of great use by steel, aluminium and mining firms as a

consequence of increasing competition after trade liberalisation. The firms enhanced the efforts to cut costs and reduce idle capacity, in order to achieve the appropriate competitiveness. The results were a transmission of the benefits by linkages caused the trade liberalisation to other firms and industries.

This was seen as a crucial achievement, since JIT needs the suppliers accordance to be effective. The deliveries acceleration could have increased transaction costs, which had to be negotiated in order to establish long term contracts, since mining, steel and aluminium were constrained by world prices. Just-in-time was an important technique to reduce costs, and increase competitiveness, which was sometime combined with outsourcing that will be presented in the next subsection.

7.5.4 Outsourcing

During the 1980-90s the strategy of outsourcing (terceirização) received special attention in the literature, as a consequence of its growing use in the private sector and government offices (Amann: 2000:142). The basics of outsourcing were that suppliers or subcontractors worked in the firm's or government offices' premises, doing direct production tasks or support jobs. This subsection's objective is to describe the outsourcing practices in the sample firms and to highlight the connection with trade liberalisation. The tasks that were eligible for outsourcing were, in general, peripheral and specialised, although each firm was able to design a particular outsourcing programme. Since almost every cleaning and catering tasks were outsourced, these will not be referred to in the following discussion, which will focus on direct production tasks.

In general, the firms were able to take advantage of low wages that third firms were able to pay to employees that they could not pay themselves. This indicated that wage difference was an important element for implementing outsourcing. The argument for a firm to outsource its workforce in such circumstances can be found in the Brazilian particular legislation of professional wage-floors, which were fixed by agreements between trade unions and employers. Since these agreements in general overcome the national minimum wage for a particular profession, the firms were constrained to hire third firms. These firms were able to pay lower wages than the agreed wage for their core-business employees because of the labour legislation.

Beside this cost efficiency advantage that is typical of the Brazilian labour structure, there were other advantages of outsourcing, such as the rational use of capital and labour specialisation. Capital rationality was the reason for many firms to

introduce outsourcing, since it provided more effective use of capital goods. In fact when third firms that owned the equipments were admitted inside the plants for specific jobs, they were able to maximise the use of such equipment by moving it from one site to another. Reduction of maintenance costs and other indirect costs associate to capital immobilisation were the main reasons for outsourcing. The most common of this scheme was in the mining industry, when large digging, washing and transporting machines were contracted out, since they could be moved around by the owner to do different jobs in different mines, with maximum efficiency. Steel and aluminium sectors also showed similar levels of outsourcing with the same beneficial results.

Other sectors that introduced outsourcing with great success were aviation and carmakers. In these two sectors more than in the others, firms managed to couple JIT with outsourcing, which made the presence of subcontractors inside the plant very effective, with dynamic efficiency by their speciality and knowledge. The carmakers began to introduce new production schemes after 1990, based on outsourcing. In 1990-99 the number of automobile suppliers linked to each plant reduced from more than 200 to 30-40, with specialised suppliers for aggregate parts instead of small isolated parts (Ramiro and Ramos, 2002a). The most common examples of such moves were found in the new plants visited: VW in Rezende and Taubaté, Ford in Salvador, GM in Gravataí, and the enhanced FIAT in Betim. These plants adopted outsourcing as a main production scheme during the 1990s. After trade liberalisation, large companies became able to contract out a greater share of their activities, due to the possibility of small contractors to buy or hire the appropriate imported machinery and other inputs.

The modernisation of the FIAT group plants was impressive, and corresponded to more than a third of their cost advantage, according to the group's analysis (Gomes, 2000). Outsourcing, for instance, has been introduced in an upstanding fashion, because even supplying the chains of production inside the plants was carried out by a third firm specialised in logistics. With the introduction of such outsourcing system, the workforce inside the plant came from different firms, with the assembly personnel from the main firm, and all the parts being fed to the chain-buffers by this firm's employees. They picked the parts up in some stocking points, which were supplied in a just-in-time manner by the part suppliers. The introduction of such logistic firm to supply the assembly positions is unusual in the automobile, but the interviews confirmed that the management was happy with the results, estimating the cost

reduction to be more than 10%. For them, JIT strategy became more accurate with a logistic firm caring for the timing independently.

The links between outsourcing and international trade were evident in aviation too, since international suppliers from Europe, Latin America and East Asia were linked to the plane constructor EMBRAER to supply parts, as the visits confirmed. At EMBRAER the explanation for this scheme was based on modern logistics, where each supplier was informed about the level of stocks in the plant, enabling them to have the next part embarked with the adequate delay to be delivered in time. The system run by air until 1994, when the suppliers in an operation co-ordinated by the EMBRAER's logistics department started shipping parts by boat. Surface shipments became the norm since, with parts from the UK, Spain, Belgium and Chile delivered in time by sea.

However, to illustrate outsourcing shortcomings two tasks seemed to have an impact: maintaining suppliers grids and coordination. Implementing and updating the suppliers' grids, timetables and re-evaluating the changes in technology that could have an impact on product quality was a demanding job and needed constant attention. Co-ordinating the work of different firms to produce a single product, such as a car, or a plane was also very demanding and needed appropriate negotiation rounds. Hence, the balance between the outsourcing benefits (cost reduction, specialisation and capital productivity) and transaction costs was a challenge for the firms. For example, in the 1980s Brastemp, an electric appliances manufacturer, became a case study of outsourcing, by closing down the packaging sector to contract it out. Because of the particular structure of the packaging industry, this company ended up by increasing total costs, since the timber packaging industry was cartelised and workers were strongly unionised (EXAME, 1991). However, after 1991, the government agency for competition and economic defence gained new powers to fight cartels, which made competition in the timber and furniture industry more effective.

Most of the outsourcing was a consequence of trade liberalisation, as importing materials and machinery became possible for small companies, which were the bulk of subcontractors. This situation encouraged large automobile, aviation, aluminium, steel and mining companies to outsource tasks relying on imported equipment. This move actually generated scale economies for both: large and small companies due to capital rationality and efficiency. Another advantage of modernisation and reorganisation, linked to trade liberalisation, was improving employees' skills, which will be discussed in the next subsection.

7.5.5 Education and Training

Almost every visited company had an impressive training programme for the staff, which improved after trade liberalisation as a consequence of changing technology, importing new machinery and changes in the market place. The companies in the sample had connection with universities, particularly those in mining, aviation, computer and automobile industries. Moreover, most of the computer and aviation companies began their activities inside an university or an education centre. EMBRAER, for instance, was created as part of the CTA.

As for the training of the workforce, the new technology was very demanding, with the exception of CNC machinery. The firms informed that they in fact needed less training hours for the employees to operate a CNC equipment due to the high degree of programmed features that such machinery has. Hence, the need for specialised staff to maintain the system was still very cost efficient as compared to the outmoded machinery that required manual adjustment and a number of specialised staff in each plant. This observation was made by plant managers during the visits and concerned particularly mining, steel, aluminium, car-parts and computers industries. In the automobile industry, the training load was diminishing due to mechanisation and outsourcing, since small contractors were now able to supply sets to be fit in the vehicles, reducing costs and increasing efficiency. These points confirmed the literature on Brazilian manufacturing modernisation that found that the introduction of new numerically controlled machinery contributed to reduce the training costs along with increasing quality and productivity (Amann, 2000).

Summarising the points in this section, it is important to remind that the firms adopted strategies of enhancing technology and reorganisation/modernisation to face competition from imports, which confirmed previous studies on the Brazilian industrial institutions (Amann, 2000:148-149). Modernisation and company reorganisation were initiatives of productivity enhancement, based on management techniques, which the firms were able to implement particularly because of trade liberalisation. The role of trade liberalisation was in both ends: increasing competition and allowing for importing the appropriate machinery and inputs.

Section 7.6   Conclusion

The discussion in this chapter was based on the qualitative analysis of interviews and structured questionnaires with 94 firms. The most important findings

were that most firms admitted some influence of trade liberalisation on their businesses, and they provided descriptions of the actions undertaken to face competition from imports. Trade liberalisation influenced 86.8% of the firms with 56.4% of them classifying this influence as strong. Market structures influenced the way that firms were affected by trade liberalisation, since 89% of the industries with predominance of large firms indicated some effects from trade liberalisation, and 87% of the industries with predominance of medium companies also indicated the same. But the smallest share of those that admitted strong and weak effects of trade liberalisation was the industries with predominance of small firms, with 85.7%, and less than 10% of those admitted strong effects. This reflected the fact that small firms were not protected before 1990, and were therefore less influenced by trade liberalisation.

The variables measuring performance have been analysed. Productivity performance as consequence of trade liberalisation and a reason for exports increase was confirmed by 35% of the firms. A further 25% attributed productivity increase to cost reduction initiatives after trade liberalisation. Thus, 55% of the firms therefore admitted that productivity increase was connected to trade liberalisation. Exports growth after trade liberalisation was also linked to trade liberalisation, specifically due to the possibility of importing machinery and inputs to improve product quality, which confirmed the analysis in the previous chapter.

The detailed examination of the effects of trade liberalisation indicated that almost every company (96%) agreed that investment had increased after 1990, with 77% of them attributing this to trade liberalisation causes. Labour reallocation was in both directions, and 70% of the firms explained labour reallocation as a consequence of trade liberalisation. Although employment reduction was the most common outcome, automobile, steel, mining and aluminium firms indicated employment expansion and attributed it to trade liberalisation. For instance, the majority of computers and software firms indicated labour expansion rather than reduction as a consequence of trade liberalisation. This was due to the domestic market attraction that increased after trade liberalisation. The firms in these industries were able to take advantage of the new import regime to increase their market shares domestically and to install plants in Brazil to benefit from the natural resources and other advantages.

In the case of dynamic effects, machinery and inputs acquisition and imports increased in almost 100% of the firms, which confirmed the hypotheses of cost reduction as a result of trade liberalisation. The reasons for acquiring equipment and

material were attached to trade liberalisation in 86.2% of the cases. For importing machinery and inputs, in 66%.

With most of the firms confirming that trade liberalisation had static benefits (resource reallocation) and dynamic benefits (modernising production, learning and technology), the conclusion for imports as a market discipline had strong support. As a result of the pressures from imports, new products were introduced, in a larger proportion than those that have been abandoned. Moreover, more products increased shares of imported inputs, which confirmed the importance of learning and technology as a consequence of trade liberalisation.

The actions that firms undertook to cope with increasing competition due to trade liberalisation indicated that 48.9% of the firms reduced their mark-ups and 30.6% reorganised their business, introducing new products, modernising plants and investing in product quality. Mergers and takeover affected more than 10% of the firms, which took on foreign partners. These initiatives, according to the firms, followed the following sequence: first, mark-up reduction; second, plant modernisation, which included introducing new products and abandoning old-fashion ones; third, operations aiming to cut costs; fourth: selling part of the business to a domestic or foreign partner, to improve technology and enhance markets.

Combining the conclusions based on the analysis of the answers to the structured questionnaires and the information gathered from the interviews, the companies, and trade associations reports, a consistent pattern of views about trade liberalisation emerged. The firms expressed some concern about the liberalisation of their own markets, because of their fear of competition. They had a discourse of favouring competition as a means of improving quality and reducing costs. But it was more directed to their suppliers than to their own markets. Hence they manifested interest in having their suppliers markets deregulated and highly competitive. This apparent paradox was reflected in the way that the government implemented trade liberalisation: sometimes enforcing low tariffs and abolishing NTBs in a particular industry, and sometimes conceding to the firms' pressures by reinforcing trade barriers, such as the introduction of the automobile regime in 1994 and the reintroduction of minimum local content requirements in 1991. Nevertheless the contact with the firms shed some light on the mechanisms of transmission of costs and quality in a supply chain and on the difficult negotiations between suppliers and consumers of intermediate goods and inputs. Moreover it showed the role of trade liberalisation in such situation.

CHAPTER 8. CONCLUSION AND SUMMING-UP

Section 8.1   General Approach

The discussion of the effects of trade liberalisation on productivity growth, and manufacturing performance has been a dominant theme in the literature on trade and development for many years. Furthermore, trade liberalisation became a key condition in the conditionalities attached to the IMF and World Bank loans to LDCs in the 1980-90s, in the framework of Structural Adjustment Programmes (SAL). However, the number of empirical studies to confirm the hypothesis of increasing productivity, economic welfare and relative growth, as a consequence of trade liberalisation has been limited.

The majority of empirical studies that have been undertaken have focused on individual countries, based on published data on manufacturing firms, gathered from government statistics agencies, or stock exchange regulators. See for example for India, Krishna and Mitra (1998), for Turkey, Levinsohn (1993) and for Mexico, Tybout (1996) and Weiss (1999). Authors have linked the expected effects of trade liberalisation to a range of determinants including market structure variables, such as entry and exit, firms' turnover, foreign ownership and size or scale (Roberts, 1996; Tybout and Liu, 1996). The changes in the pattern of such variables were thought to have affected the level of competitiveness in individual countries according to empirical studies focusing on Mexico by Grether (1996), Morocco, Cote d'Yvoire and Venezuela by Harrison (1996), Chile, and Colombia by Tybout and Westbrook (1993).

In this context, and aiming to contribute to the number of empirical studies based on individual countries, this research has concentrated on Brazilian manufacturing from 1986 to 1999, taking advantage of the policy change in 1990, when trade liberalisation was introduced. The most original contribution came from the finding of market structures effects on productivity, exports performance and mark-ups, confirming the expectations about trade liberalisation, in the majority of cases.

The Brazilian manufacturing environment was particularly interesting for testing such hypotheses, for Brazil had been submitted to a previous long period of infant industry protection and import substitution industrialisation, which provided an appropriate counterfactual in terms of before and after analysis. Moreover, the introduction of trade liberalisation was also preceded by other complementary reforms, like privatisation, finance reform and other state reforms, which were believed to be

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necessary for such policy change to be effective. Hence the research was undertaken in favourable conditions, although a recession cycle began almost at the same time as the trade reforms were at their peak. This also coincided with a political crisis, which delayed some expected results in terms of exports performance and mark-ups.

To summarise the approach adopted in this study, the methodology was based on two complementary frameworks: quantitative analysis, based on a Structure-Conduct-Performance model (S-C-P) and qualitative analysis based on questionnaires and visits to firms in the field. The first approach relied on modelling firms' behaviour in such a way as to handle the effects of trade liberalisation and market structure, and to analyse the impacts of the changes in the latter to the former. The second approach relied on structured questionnaires, interviews and published and unpublished information, obtained from the visited firms, trade associations and government offices, in order to evaluate the firms' reactions to trade liberalisation.

The remainder of this chapter presents a summary of the findings in section 8.2 and section 8.3, and outlines some areas for further research in section 8.4.

Section 8.2   Summary of the Quantitative Analysis

Summing up the quantitative research, which sough to confirm that trade liberalisation affected productivity and performance, a significant amount of evidence has been reported. This has confirmed the influence of trade liberalisation on productivity, export performance and mark-ups. Trade liberalisation measured by nominal tariffs, effective protection rate, imports and the elimination of non-tariff barriers, had in most of the model estimations the expected effects on productivity (measured labour productivity and total factor productivity), on outward orientation (measured by exports performance) and on market discipline (measured by price-cost margins). To control for macroeconomic effects, the real effective exchange rates and terms of trade were also included in the models. Moreover, variables indicating market structure were introduced to the models. The influence of market structures was measured by four variables: the net number of firms, FDI flows for foreign ownership, capacity utilisation index, and proportion of large to small firms for size.

The results of the quantitative analysis supported the hypothesis of increasing productivity as a consequence of trade liberalisation, subject to market structure, since total factor productivity and labour productivity had the expected elasticities with the trade liberalisation variables, i.e., increasing when protection has

reduced or imports increased. Exports also had the appropriate elasticity with the trade liberalisation variables, i.e. increasing when protection was reduced and imports increased. Margins had only one expected elasticity with trade liberalisation, reducing when effective protection increased. But the elasticity with imports became non significant, and margins increased when nominal tariffs were reduced, which was not expected by the hypothesis of market discipline.

Market discipline, measured by mark-ups, has therefore been partially confirmed, since mark-ups had positive elasticity with effective protection, which indicated that increasing effective protection implied a mark-ups increase across the industries. However, by the other trade liberalisation variables the hypothesis of market discipline was not confirmed. This indicates that trade liberalisation had not enough power to force firms to reduce their mark-ups. Moreover, the possibility of importing inputs and machinery allowed margins to increase without increasing prices, which contributed to the firms maintaining mark-ups as a consequence of the dynamic benefits from trade liberalisation.

The quantitative analysis showed that for a 1% reduction in effective protection, total factor productivity increased 0.7%, labour productivity increased by 0.03%, exports had no significant increase and margins reduced by 0.13%. For a 1% reduction in nominal tariffs, total factor productivity increased 0.09%, labour productivity had no significant increase, exports increased by 0.1% and margins increased by 0.03. For a 1% increase in imports, total factor productivity increased 0.26%, labour productivity increased by 0.01%, exports increased by 0.02% and margins had no significant change. Hence reducing protection or increasing imports led to increasing total factor productivity, labour productivity, exports and by one estimation only led to reducing margins.

The above results were similar to those already published on the Brazilian manufacturing productivity and mark-ups evolution. Bonelli (1992) found a 10% increase in total factor productivity after trade liberalisation. Moreira and Correia (1998) assumed 2.5% yearly increase in total factor productivity in 1990-95, which was used to estimate mark-ups changes in the manufacturing sectors. For instance, consumer durable goods, intermediate goods and automobile had margins reductions of 20% to 31.7% during the 1990-95. Only consumer non-durables increased margins by around 5% (Moreira and Correa, 1998).

Another important conclusion was about the dynamic effects of trade liberalisation, which were connected to the possibility of strong productivity increase,

benefiting from the channel of importing intermediate and technology goods. In that situation dynamic effects of trade liberalisation may outweigh the static effects, resulting in the possibility of increasing productivity with increasing profits, or increasing mark-ups. This was confirmed by the econometric analysis in chapter six and by the firms' explanations in chapter seven. The estimations by Hay (2001) give similar results for a period of 1986 to 1994, since labour productivity and total factor productivity had high increase after trade liberalisation, which was attributed to resource reallocation with increasing profits. Nevertheless, imports were confirmed to have generally constrained domestic prices, which also indicated that the dynamic effects, enabled the companies to face increasing competition, by the imports channel. They had the costs of imported material and inputs reduced, allowing for the margins to be maintained at the same levels as before, or even increase without increasing prices.

The second research question considered the influences of market structure on performance and productivity growth. The market structure variables included the number of firms, size, foreign ownership and capacity utilisation. The results confirmed most of the previous research, published about other LDCs, where total factor productivity was higher in industries with less firms and with more large firms, but labour productivity had the opposite outcome. This result was explained by scale economies, since larger firms could have higher total factor productivity. But they had higher labour costs, and therefore had lower labour productivity. Lower labour productivity was also explained as a consequence of increasing competition from increasing number of firms, which reduced total sales values.

However, an industry with a high number of firms exported less and increased margins, which was also explained by scale and competition. To attract more firms, individual firms' scale was reduced, making margins higher than in the industries with less firms. These results are consistent with the literature for Chile and Colombia (Tybout and Liu, 1996). Quantifying the effects of number of firms, for 1% increase in the number of firms, there was 0.1% decrease in total factor productivity, 0.22% decrease in exports, and 0.01% decrease in margins; and 0.04% increase in labour productivity.

The effects of size on productivity signalled that industries with relatively more large firms had higher total factor productivity and exported more. But had lower labour productivity and lower margins. The influence of scale was again the explanation for lower labour productivity and lower margins, since small firms were not capital intensive, which led them to have more workers and relatively higher wage bill.

The findings were consistent with again previous literature on Chile and Mexico (Tybout and Westbrook, 1993; Tybour 1995). For a 1% increase in the relative proportion of large firms, in an industry, there was an increase of 0.19% in total factor productivity, and 0.08% in exports, and a decrease of 0.04% in labour productivity, and 0.03% in margins.

Concerning foreign ownership, both total factor productivity and labour productivity increased with increasing foreign ownership, which meant that transnational companies were more productive than domestic ones. This is in accordance with other studies on TNCs in Brazil, such as Newfarmer (1983) and Moreira (1999). Mark-ups had also positive elasticity with foreign ownership, indicating transnational companies were likely to have higher margins, which was also consistent with previous literature, although the elasticity with exports came out non significant. The explanation was that the domestic market premium attracted the TNCs, which became less inclined to export, which was enhanced by the expansion cycle from 1994-99 (Hunter, 1991, Weiss, 1992). Quantifying the results, for a 1% increase in the stock of FDI in an industry, labour productivity increased by 0.02% and margins by 0.02%.

The other market structure indicator was capacity utilisation, which came out non significant in two estimations. However, total factor productivity had positive elasticity with capacity utilisation, indicating that for a 1% increase in the use of capacity, there was 0.24% increase in total factor productivity. Since labour productivity had negative elasticity with capacity utilisation, indicating that a 1% increase in capacity utilisation led to 0.03 decrease in labour productivity, the results were interpreted according to capacity utilisation that needs to have more labour to fulfil the capacity. In these circumstances having more employees would reduce labour productivity, while increasing total factor productivity, by the increasing use of the machinery, equipment, etc, which characterised increasing capacity utilisation.

Summing up the quantitative analysis, the hypothesis of productivity increase as a consequence of trade liberalisation was strongly supported and exports increase was also confirmed. But mark-ups were not reduced to international levels, since the firms were able to maintain their mark-up levels, which showed a reduction only in connection of increasing effective protection. As for the market structures, the number of firms, size and foreign ownership had the expected effects on productivity, exports and mark-ups. Capacity utilisation was only significantly connected with productivity. Thus, the hypothesis of trade liberalisation contributing to increase in

productivity was found to be consistent with the data analysed for Brazilian manufacturing. The next section summarises the results of the qualitative analysis, which was intended to shed light on the firms efforts to face increasing competition from imports.

Section 8.3   Summary of the Qualitative Research

The qualitative approach to this research was designed to find the reactions of firms to the introduction of the new trade policies, which liberalised imports by reducing tariffs and eliminating non tariff barriers. The findings in the field were intended to supplement the information coming from the econometric analysis, by examining the initiatives undertaken by the firms to cope with the more competitive environment after trade liberalisation. Hence, a case study was designed, which involved visiting ninety four firms in six industries, selected according to the their share in exports, output and more important, whether they were linked in a supply chain.

The outcome was that the firms in the sample intensified their efforts in two directions: changing their resource allocation and modernising their production schemes. The companies' answers guided the research through the capital and labour reallocation processes and explained the firms' choices for imported machinery, inputs and raw material, which became cheaper and of better quality after trade liberalisation. This outcome provided a particular insight of the market discipline effects of trade liberalisation. For example, many inputs only became available to the firms due to trade liberalisation, since they were subject to import prohibitions. This happened with the branches of computer and software, cars, trucks and car-parts. To quantify the results in terms of number of cases, in the visits to firms and plants 68% firms indicated trade liberalisation as a reason for investment changes and 70% for labour changes (reduction or increase of employment). When asked for the reasons for importing inputs and raw material, 66% indicated tariff reductions, and 23.5% indicated the improved quality of imported intermediate goods. Only 8.5% of the firms gave other reasons for imports.

In the analysis of the answers to the questions on the causes of their decisions to release and hire employees, engage new investment and seek technical improvements, a large proportion indicated trade liberalisation. Furthermore, beside the increase in labour productivity by releasing more employees than those who were hired, most of the firms agreed that the improvements in labour productivity were strongly connected to trade liberalisation by technical progress. This was supported by

increasing intermediate goods imports on the one hand, and by the modernisation initiatives undertook by the firms to face competition on the other hand.

A summary of the possible channels that trade liberalisation had passed through, in order to achieve the effects confirmed by the quantitative analysis, and described by the firms during the fieldwork visits is in Figure 8.1 below. It describes a range of possibilities of linking trade liberalisation to price reductions, which measure the welfare gains, with intermediate advantages to the companies, in terms of productivity increase and cost reduction.

Figure 8.1. Channels of the Trade Liberalisation Effects
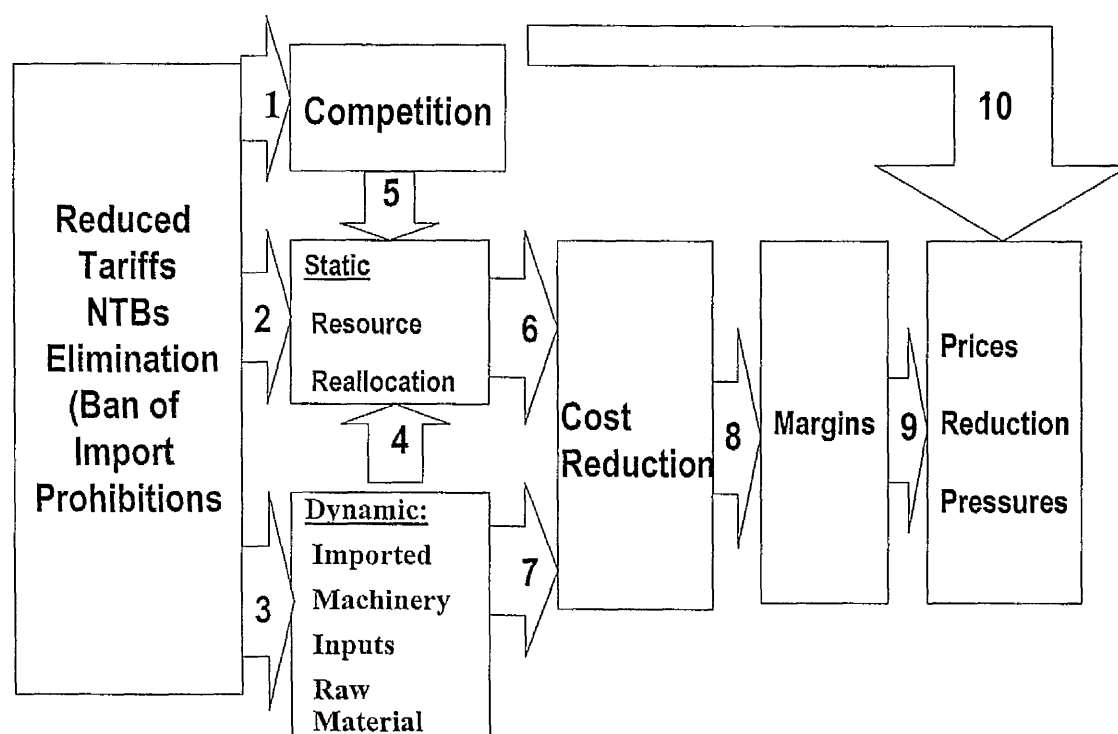
Source: Author's construction based on the discussions in chapters six and seven

For instance, by the numbered arrows there are four possibilities for trade liberalisation pressures to force market discipline, which were discussed in chapter six and seven, and can be summarised as follows:

a) Competition Channel: (1-10);

b) Static Resource Reallocation Channel: (2-5-6-8-9) and (1-5-6-8-9)

c) Dynamic Resource Reallocation Channel: (3-4-6-8-9)

d) Dynamic Learning and Technology Channel: (3-7-8-9)

The channel (1-10) directly depresses prices in the domestic market. However, the other channels (2-5-6-8-9), (3-4-6-8-9) and (3-7-8-9) implied, first cost reduction, which could later imply price reduction. But with the definition of margins as

the difference between prices and costs, margins reduction were not necessarily required by these channels, since cost reduction allowed for increasing margins with price reduction. Hence, judging by the number of possible channels, trade liberalization had better chance of reducing costs than margins. In fact, the only way of having margins reductions was when price-competition pressures overcame cost reduction effects.

With the qualitative approach, the analysis went further by inquiring about the introduction of new products and the abandonment of old ones. The large number of firms that decided to include new products in their product mix, which overwhelmed those that maintained their old product lines, also confirmed that the need for innovation was emphasised by the competition pressures, which increased after trade liberalisation. Moreover, when the firms were asked for the reasons for introducing new products, they indicated that trade liberalisation was the most important reason, since consumers were encouraged to buy new and modern products due to the availability of similar imported goods.

The next point was concerning the inclusion of inputs and raw material of foreign origin into domestic products, as an indicator of technical improvement. The number of firms that included imported raw material and other inputs in their products increased after trade liberalisation, with the firms indicating "reduced tariffs", "technical improvement" and "better quality of imported inputs" as motivations for including such materials and inputs in their products. Thus the technical progress that began in 1990 was confirmed by the sample firms as being strongly linked to trade liberalisation, which was the main motivation for their decisions. Further discussions with the firms implied that margins, which were the observable measure of price or profits behaviour, remained positively elastic with nominal tariffs, because of the advantage of importing cheaper inputs and raw material, which became components of goods sold to the domestic markets.

One of the most important conclusions based on the qualitative approach was the description of the firms' initiatives to face imports competition and to boost their capabilities. First, 48.9% of the firms answered that they had reduced their mark-ups, when asked what actions they undertook to face increased competition by trade liberalisation. This substantial proportion is still less than the average, which may explain why margins elasticities for the whole manufacturing were not positive with nominal tariffs, although margins had the expected positive elasticity with effective protection. This behaviour should perhaps be explained by the fact that the firms had a wide range of initiatives to undertake to face trade liberalisation effects, before being

forced to reduce margins. Thus the responses to competition confirmed the quantitative analysis.

Most of the firms' initiatives were concerned with productivity increase, quality and technology improvement and technical and managerial modernisation. Technology and product quality improvement included the initiatives to improve the production processes and to adapt foreign technology to the Brazilian conditions. Under the heading of modernisation and reorganisation, a group of techniques to enhance managerial practices and industrial organisation was introduced in almost every company and plant (Amann, 2000; BNDES/CNI/SENAI, 1996; Vellasco, 1997). To summarise the firms' initiatives, they were grouped in two sets: technology/product quality improvement and modernisation/reorganisation.

The first group, technology/product quality improvement consisted of having their own laboratories and R&D units to promote tests and develop new products. This units have been directed to the adaptation of foreign technology after trade liberalisation. Every industry had them, with 41 sample firms having R&D units and 58 laboratories. The firms had also projects for developing technology and engaged consultancies with specialised institutes and higher education organisations. In the sample, 32 firms engaged consultancies, and 21 firms had projects financed by the Financiadora de Estudos e Projetos or Studies and Project Financing Agency (FINEP). This agency used to be the channel for government funds dedicated to develop indigenous technology; but has been converted into adaptation of imported technology after trade liberalisation. Concerning technology and product quality improvement, however, the most important action by the firms was having a foreign partner, which was adopted by 45 firms in the sample. But only 9 firms indicated merger and takeover with foreign partners as an strategy to cope with competition. Hence, five times more firms were having access to international technology by adopting foreign partners.

The second group of initiatives modernisation/reorganisation covered a range of techniques and methods, which were indicated by the Brazilian executives, companies' boards and technical advisers as modernising techniques to make the firm reach the international standards. The first technique concerned raw material and unfinished products management: the Material Resources Management (MRM), which was enriched by the adoption of Japanese techniques, such as Kanban and Kaisen[14].

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[14] Kanban, according to the Brazilian management adaptation, consisted in having a token with the material or the spare part, which would be returned back to indicate its use and start the process of feeding the production line; Kaisen consisted in repeated effort to improve each skill and technique based on group discussion and design.

Another technique was "flexible cells", which was considered as a modern way of producing different sets of parts, instead of specialisation in an unique part of the process. This technique was characterised by the employees using a group of tools, in a team, instead of the traditional production line (Campos, 1996; Carrie and Perera, 1985). The procedures of total quality management (TQM) and quality control (QC) were introduced in many firms, as part of the government programme, Programa Brasileiro de Qualidade e Produtividade or Brazilian Programme for Quality and Productivity (PBQP), as explained in chapter three. This programme was intended to assist the firms with modernising skills and to implement the wining Japanese standards of productivity and product quality (Campos, 1999; MDIC, 1995; Mirshawka, 1990).

These quality and productivity tools were combined with "just-in-time" techniques implemented from the late 1980s to connect the plants with suppliers. From that time the technique spread into the aluminium, steel, automobile and many other industries, according to the interviewees. The combination with the above mentioned techniques of total quality management produced an advanced degree of modernisation, by the elimination of delays and unnecessary work in the production lines. This package simplified the production process without the need of implementing the most advanced automation techniques, which were prohibitive in the small scale of the local production or in the backwardness of the technical skills of the staff (BNDES/CNI/SENAI, 1996).

Combining "just-in-time" with outsourcing was one of the most interesting arrangements found in some firms, such as the plane constructor EMBRAER, the carmakers FIAT, GM, and VW, some steel plants, such as CSN, CST, USIMINAS, GERDAU, and a mining plant of CVRD. The firms were able to have third firms supplying the positions of assemblage, inside the plants with precision. These contractors were also responsible for maintaining the level of inventories and keeping up-to-date records of the supply chains, in the models of assembled products. Even with product differences, which came from different production cadences (e.g., planes were produced at 16-20 a month, and cars at 30,000 or more) outsourcing was combined with "just-in-time" to achieve the minimum inventories in the plants. This liberated space, inventory costs and provided speed and flexibility to changes in product specifications.

Moreover, the combination of "just-in-time" techniques with outsourcing was able, in certain automobile companies, to include a third company for supplying the chain positions. In this scheme, the suppliers handed over their parts to that intermediary third company to maintain the inventory inside the assemblage area, and to feed the positions during the hours of work, keeping records of the internal

transactions. This system pushed the idea of outsourcing a step further, since in this case, a third company entered the production chains just to co-ordinate the internal logistic, which in many industrial plants was a vital task undertaken by the main company itself.

This advanced outsourcing scheme, since it includes servicing the firms' core business, left the master companies dedicated to design, management and corporate activities, contracting out as much work as possible. These third companies have been able to take advantage of their specialisation by increasing scale, since they were able to optimise the use of employees amongst various plants, reducing costs and supplying more than one car-marker.

According to most of the interviewees, the initiatives described above were very important for the companies decisions and technology improvement, which shaped the new industrial structures in Brazil. This implied that trade liberalisation was a milestone for the industrial development, although further research on the effects and the efficiency of such initiatives is still needed in Brazil. Hence, the next section will identify a number of future research topics.

Section 8.4   The Path for New Research

An important finding of this study was that technology transfer improved after trade liberalisation, as a result of firms' efforts, relying on imported machinery, computers and software. Changing the market structure as a consequence of trade liberalisation to cope with increasing competition from imports and to take advantage from imported equipment and inputs completed the circle of advantages of trade liberalisation to firms.

The argument, as described in chapter seven, was that new imported machinery and other equipment or inputs forced the firms to enhance the employees' skills in two levels: i) by developing their skills to use sophisticated imported equipment; and ii) by switching the R & D efforts towards the adaptation of foreign technology. Hence a further research derived from this important topic will be to find out the impact of imported machinery, equipment and technology in productivity and product quality, in manufacturing and other sectors in Brazil. It was confirmed in the visits to plants and companies' headquarters that impressive savings in learning and training costs had been realised, since the introduction of such machinery resulted in simple, better controlled and more efficient production tasks. This also shortened employees training time, since the new machinery was less demanding on human supervision and manual tasks (Amann, 2000; Besant, 1991).

A thorough confirmation of the further advantages of the new generation technology, which ended up by being effectively cost cutting, may be a subject for further research. For instance, the influences of technical adaptation, and the approach of acquiring foreign knowledge by the Brazilian firms could add to an evaluation of the policy shift from developing indigenous technology to technology purchasing and licensing. This evaluation could be carried out in terms of technical progress, product quality change and economic reward. Moreover, since it seems that the firms' decision for a change was motivated by government policies, which benefited domestic and foreign firms established in the country, but did not automatically triggered outward orientation, there is a need for a deeper analysis of the kind of technical change that has been achieved. It would be interesting to compare the old programme for developing indigenous knowledge with the technology imports strategy. A particular feature of such evaluation and possible political implication might be to extend the evaluation of the effects that such policies had on market structure and social welfare.

Another important research subject, which was of crucial interest in shaping firms' behaviour after trade liberalisation, is the influence of productivity and quality management tools, particularly the original administrative and managerial experience based on the Japanese experience. Researching how that was translated into the Brazilian administrative culture with relative success seems interesting for development studies. The components of such productivity oriented management techniques, combined with already proven techniques, like Just-in-Time and outsourcing, brought a special evolution to the Brazilian industrial structures. However, an empirical evaluation of its impacts on economic performance, market structure and human resources management remains to be undertaken.

The international reallocation process, in terms of plant moving in the search of low cost labour and tax benefits, beside other comparative advantages such as natural resource abundance and special market niches, might constitute another interesting topic for future research, as the companies interviews confirmed transfer of production lines from other countries to Brazil, as a consequence of trade liberalisation. The movements of plants, research development departments and design units occurred in both directions, to and from Brazil, but there was certainly a pattern to these movements, which according to the trade theory paradigms, would follow comparative advantages. However, the companies were keen to emphasise that TNCs' market strategies where the key to decisions on technical progress and plant locations, which suggested an interesting area for future empirical research, with the Brazilian and TNCs companies.

A study of the appropriate framework for the regulatory agencies needed to control monopolies and oligopolies, and encourage competition might be the subject of an

in-depth research in Brazil. One of the important discussions should be whether the results of enforcing competitive behaviour would be better achieved by regulatory agencies for each sector rather than a central agency for competition and antidumping practices for the whole economy, such the one in place. The form of appointment of the agency members, and the degree of independency that such agencies would have with respect to the government, and at what level the members will be accountable for their decisions must be settled, in the Brazilian context, are key questions to be studied by empirical evidence.

With an appropriate agency for some important industries, and provided that regulation allow for multiple producers of service providers, competition would increase and supply would not be a problem. However, the evaluation of the cases of the general regulatory agencies already introduced in Brazil, together with a detailed study for an adaptation of the regulation framework to the industrial and service sectors would complement the study of the effects of trade liberalisation to market discipline. For effectively disciplining the markets, some industries needed regulation. Imperfections in some markets would not be removed by trade liberalisation, due to international oligopolies and empirical analysis of these issues seems crucial for policymaking.

A final remark about the change in government in November 2002 is the election of a member of the Partido dos Trabalhadores or Labour Party as President. According to this party tradition a policy such as trade liberalisation, which was labelled as neo-liberal and imposed by the IMF, has little chance to continue. However, to win the elections the party has made many concessions to the so-called neo-liberal economic thinking. It also engaged a wide range of political agreements with central parties. Hence, there is a chance of continuity of this process of increasing competition in the domestic markets by maintaining the policies implemented by the predecessor. The new government declared as the first priority the elimination of extreme poverty that causes many Brazilians to skip daily meals and feel hungry. By this declaration one can wonder that a policy of reducing the distortions that have benefited few industrialists but not the population such as trade liberalisation could be preserved. Mostly by its feature of increasing access to imported intermediate goods and modernisation of the process of production it seems that the main elements of such policy will resist the need for reforms. First because of the persistency of other priorities and second due to the benefits that trade liberalisation could carry to the society. The second government priority of increasing the population's education level also seems in line with a policy of increasing competition by investing in workers professional qualifications.

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APPENDICES

Appendix 1. Manufacturing Structures Changes (% of Manufacturing Value Added)

Year	1920	1940	1950	1960	1970	1975	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998
Traditional Industry	**89.67**	**79.65**	**74.05**	**56.19**	**48.09**	**34.07**	**35.15**	**35.64**	**39.06**	**37.8**	**37.91**	**36.17**	**36.73**	**37.43**	**38.65**	**38.39**	**39.41**
Wood	5.31	3.79	5.05	4.48	4.07	3.76	3.54	2.35	2	3.25	2.56	2.83	3.13	3.31	3.22	3.09	2.9
Leather	2.35	1.95	1.52	1.08	0.66	0.49	0.49	0.6	0.53	1.45	1.67	1.57	1.32	1.22	1.23	1.12	0.86
Pharmaceuticals	3.28	3.21	3.66	3.47	3.53	2.55	1.93	1.99	1.97	1.93	2.63	2.97	2.8	2.86	2.95	3.46	3.89
Textile	25.2	20.61	18.69	12.54	9.29	1.85	6.5	5.77	5.23	4.26	3.57	3.34	3.07	3.15	2.95	2.6	2.27
Clothes, Shoes,	7.7	6.2	4.34	3.41	3.38	3.48	3.9	4.34	4.09	2.75	2.41	2.12	2.13	2.22	2.23	1.96	1.89
Food	37.35	36.17	32.02	24.15	20.21	16.36	14.05	15.81	18.81	8.95	9.44	8.64	8.97	9.46	10.13	10.2	10.87
Beverage	4.4	2.24	3.13	2.37	1.88	1.28	1.07	1.06	1.15	0.66	0.5	0.75	1.03	0.91	0.85	0.72	1.04
Tobacco	3.34	1.53	1.38	1.12	0.96	0.79	0.55	0.6	0.61	3.22	3.52	3.11	3.02	2.72	2.99	3.24	3.1
Miscellaneous	0.74	0.8	1.43	1.29	1.59	1.31	1.49	1.8	2.28	2.38	2.17	2.2	2.29	2.12	1.97	1.8	1.72
Dynamics A	**9.06**	**16.13**	**21.09**	**30.19**	**33.32**	**43.78**	**43.96**	**44.28**	**43.1**	**43.3**	**42.75**	**43.69**	**41.64**	**39.86**	**38.84**	**40.33**	**41.3**
Non-metals	2.55	3.52	4.51	4.52	4.17	4.06	4.25	3.02	2.92	4.84	4.19	3.77	4.28	4.25	3.94	4.34	4.79
Metallurgy	3.18	5.41	7.6	10.53	12.47	13.46	13.9	13.99	13.12	10.56	9.92	9.18	10	10.16	9.61	9.54	8.87
Paper/ Cartons	1.19	2.11	1.99	2.97	2.44	2.37	2.72	2.81	2.82	5.17	3.83	2.78	3.01	4.12	3.95	3.68	3.57
Rubber	0.12	0.5	1.61	2.53	1.7	1.62	1.52	1.66	1.67	1.38	1.37	1.3	1.34	1.39	1.32	1.37	1.2
Chemicals	2.02	4.59	5.18	8.96	10.89	15.5	19.52	20.88	20.92	19	21.5	24.62	21.15	17.76	17.58	19.07	20.64
Plastics			0.2	0.68	1.65	6.77	2.05	1.92	1.65	2.35	1.94	2.04	1.86	2.18	2.44	2.33	2.23
Dynamics B	**1.27**	**4.24**	**5.31**	**13.62**	**18.61**	**22.15**	**20.89**	**20.08**	**17.82**	**18.84**	**18.78**	**19.29**	**20.62**	**22.27**	**21.55**	**20.63**	**18.39**
Mechanic	0.07	0.91	1.6	2.85	5.7	8.02	7.69	6.85	5.99	6.93	7.83	8.43	8.34	7.94	7.97	7.65	7.73
Electric/ Communicat.		0.79	1.4	3.98	4.71	5.06	5.26	5.8	5.38	6.16	5.33	4.88	5.47	6.58	6.19	5.42	4.79
Transport Equip.	1.2	2.54	2.31	6.79	8.2	9.07	7.94	7.43	6.45	5.75	5.62	5.98	6.81	7.75	7.39	7.56	5.87
Sum	**100**	**100**	**100.5**	**100**	**100**	**100**	**100**	**100**	**99.98**	**99.94**	**99.44**	**99.15**	**98.99**	**99.56**	**99.04**	**99.35**	**99.1**

Source: IBGE (2001), and Bonelli (1996) quoted in Bonelli and Gonçalves (1998:623)

Appendix 2. Total Factor Productivity Estimations

Estimations		Const	E	NI	I	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	DW	AIC
1	Coefficient	-9.13	-0.77	-0.09	0.26	0.02	0.44	2.02	0.22	0.25	-0.04	0.06	-0.11	0.18	0.24	0.09	0.41	20	1.81	0.62
	t Values	-3.22	-1.97	-2.35	5.49	2.55	3.85	3.94	0.68	1.68	-1.39	4.04	-1.93	1.54	1.6	0.27				
2	Coefficient	-9.23	-0.77	-0.09	0.26	0.02	0.44	2.03	0.22	0.24	-0.04	0.06	-0.11	0.18	0.24	*	0.41	22	1.81	0.62
	t Values	-3.29	-1.98	-2.35	5.49	2.72	4.40	3.91	0.92	1.68	-1.41	4.15	-1.96	1.62	1.53	*				
3	Coefficient	-9.07	-0.75	-0.09	0.26	0.02	0.43	2.02	*	0.24	-0.02	0.06	-0.11	0.19	0.22	*	0.41	22	1.81	0.61
	t Values	-3.24	-1.93	-2.37	5.47	1.99	3.81	3.96	*	1.69	-1.11	4.22	1.95	1.67	1.95	*				
4	Coefficient	-9.36	-0.72	-0.09	0.26	0.02	0.43	2.03	*	0.24	*	0.06	-0.11	0.19	0.23	*	0.41	25	1.8	0.61
	t Values	-3.36	-1.96	-2.41	5.46	1.99	3.78	4.03	*	1.95	*	4.27	-1.96	1.69	1.99	*				

Source: Regressions

Note: 1. * variable dropped from the previous estimation, for low significance

2 Estimations at 5% level of significance.

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Appendix 3. Total Factor Productivity Estimations (with Lags of TL variables)

Estimation		Const	E	E_1	NI	NI_1	I	I_1	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	AIC
1	Coeff	-9.10	-0.86	-0.48	-0.12	-0.09	0.28	-0.01	0.04	0.43	2.17	0.25	0.24	-0.04	0.06	-0.12	0.20	0.21	0.03	0.42	17	0.615
	T Value	-3.25	-2.18	-1.24	-2.91	-2.32	5.82	-0.19	1.41	3.61	4.17	1.08	1.64	-1.58	3.65	-2.04	1.64	0.93	0.54			
2	Coeff	-9.10	-0.86	-0.46	-0.11	-0.09	0.28	*	0.04	0.42	2.17	0.25	0.24	-0.04	0.06	-0.12	0.20	0.21	0.03	0.42	19	0.612
	T Value	-3.26	-2.16	-1.24	-2.93	-2.32	5.86	*	1.40	3.63	4.17	1.08	1.62	-1.58	3.69	-2.04	1.64	0.93	0.61			
3	Coeff	-9.30	-0.80	-0.47	-0.12	-0.08	0.27	*	0.34	0.40	2.20	0.25	0.24	-0.05	0.06	-0.11	0.20	0.21	*	0.42	20	0.606
	T Value	-3.42	-2.16	-1.48	-2.93	-2.30	5.90	*	1.95	3.91	4.27	1.88	1.95	-1.65	3.67	-2.00	1.96	0.92	*			
4	Coeff	-9.32	-0.80	-0.48	-0.12	-0.09	0.27	*	0.26	0.39	2.24	0.25	0.23	-0.04	0.06	-0.12	0.20	*	*	0.42	21	0.602
	T Value	-3.41	-2.15	-2.30	-2.96	-2.32	5.91	*	1.94	3.91	4.41	-1.95	1.96	-1.76	3.83	-2.07	1.97	*	*			
5	Coeff	-8.44	-0.78	-0.46	-0.12	-0.09	0.27	*	0.024	0.38	2.25	0.22	0.24	*	0.06	-0.11	0.20	*	*	0.42	23	0.599
	T Value	-3.31	-2.09	-1.96	-3.02	-2.43	5.92	*	1.99	3.86	4.42	0.95	1.94	*	3.94	-2.04	1.97	*	*			

Source: Regressions

Note: 1. * variable dropped from the previous estimation, for low significance

2 Estimations at 5% level of significance.

Appendix 4. Labour Productivity Estimations

Estimations		Const	E	NI	I	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	DW	AIC
1	Coefficient	-0.34	-0.01	-0.01	0.01	0.036	0.95	0.095	-0.02	0.026	0.002	0.006	0.042	-0.04	-0.03	0.014	0.95	63	1.9	-3.02
	t Values	-0.75	-1.8	-1.02	1.71	2.23	5.9	1.84	-0.48	1.96	0.65	2.62	4.6	-1.84	-0.69	1.53				
2	Coefficient	-0.44	-0.01	-0.01	0.01	0.035	0.95	0.094	-0.02	0.022	0.002	0.006	0.041	-0.04	*	0.013	0.9	68	1.9	-3.03
	t Values	-1.04	-1.28	-0.99	1.92	2.22	5.1	1.83	0.39	1.97	0.554	2.57	4.58	-1.89	*	1.56				
3	Coefficient	-0.44	-0.03	*	0.008	0.036	0.95	0.094	-0.01	0.023	0.002	0.006	0.039	-0.04	*	0.014	0.91	73	1.91	-3.03
	t Values	-1.05	-1.48	*	1.91	2.23	5.1	1.83	-0.38	1.95	0.554	2.47	4.49	-1.97	*	1.67				
4	Coefficient	-0.44	-0.03	*	0.01	0.035	0.95	0.09	0.002	0.023	*	0.006	0.039	-0.04	*	0.015	0.95	80	1.9	-3.03
	t Values	-1.08	-1.88	*	1.91	2.22	5.1	1.9	0.1	1.99	*	2.43	4.5	-1.99	*	1.86				
5	Coefficient	-0.44	-0.03	*	0.01	0.035	0.95	0.094	*	0.023	*	0.005	0.04	-0.04	*	0.015	0.9	89	1.9	-3.01
	t Values	-1.09	-1.99	*	1.91	2.22	16.2	1.93	*	1.99	*	2.43	4.51	-1.99	*	1.9				

Source: Regressions
Note: 1. * variable dropped from the previous estimation, for low significance
  2 Estimations at 5% level of significance.

Appendix 5. Labour Productivity Estimations (with Lags of TL variables)

Estimation		Const	E	E 1	NI	NI 1	I	I 1	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	AIC
1	Coefficient	-0.32	-0.01	0.19	0.00	-0.002	0.01	0.02	0.04	0.95	0.05	-0.02	0.01	0.003	0.006	0.05	-0.04	-0.03	0.01	0.90	54	-3.04
	t Values	-0.72	-0.17	3.07	0.18	-0.368	1.28	3.23	2.42	5.02	0.64	-0.57	0.52	0.76	2.470	5.38	-2.29	0.90	1.43			
2	Coefficient	-0.32	*	0.19	0.001	-0.002	0.01	0.02	0.04	0.95	0.05	-0.02	0.01	0.00	0.006	0.05	-0.04	-0.03	0.01	0.90	57	-3.01
	t Values	-0.71	*	3.07	0.15	-0.366	1.26	3.24	2.64	5.10	0.63	-0.59	0.52	0.78	2.590	5.39	-2.27	-0.89	1.46			
3	Coefficient	-0.32	*	0.19	*	-0.002	0.01	0.02	0.04	0.96	0.53	-0.02	0.01	0.00	0.006	0.05	-0.04	-0.03	0.01	0.90	61	-3.05
	t Values	-0.71	*	3.18	*	-0.380	1.29	3.27	2.65	5.10	0.64	-0.59	0.52	0.78	2.610	5.50	-2.28	-0.90	1.96			
4	Coefficient	-0.33	*	0.18	*	*	0.01	0.02	0.04	0.96	0.05	-0.02	0.01	0.03	0.006	0.05	-0.04	-0.03	0.01	0.90	65	-3.06
	t Values	-0.73	*	3.19	*	*	1.31	3.31	2.68	5.17	0.63	-0.58	0.54	0.77	2.580	5.50	-2.29	-0.87	1.94			
5	Coefficient	-0.29	*	0.18	*	*	0.01	0.03	0.04	0.95	0.06	-0.22	*	0.003	0.006	0.05	-0.04	-0.03	0.01	0.90	70	-3.06
	t Values	-0.67	*	3.23	*	*	1.29	3.42	2.66	5.18	0.69	-0.59	*	0.79	2.640	5.49	-2.25	-0.85	1.99			
6	Coefficient	-0.29	*	0.18	*	*	0.01	0.03	0.04	0.96	0.06	0.00	*	*	0.006	0.05	-0.04	-0.03	0.01	0.95	76	-3.00
	t Values	-0.66	*	3.18	*	*	1.29	3.43	2.66	5.19	0.68	0.03	*	*	2.580	5.48	-2.31	-1.89	1.93			
7	Coefficient	-0.29	*	0.18	*	*	0.01	0.03	0.04	0.95	0.06	*	*	*	0.006	0.05	-0.04	-0.03	0.01	0.90	84	-3.06
	t Values	-0.66	*	3.18	*	*	1.96	3.43	2.67	5.25	0.69	*	*	*	2.580	5.48	-2.31	-1.98	1.99			

Source: Regressions

Note: 1. * variable dropped from the previous estimation, for low significance

2 Estimations at 5% level of significance.

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Appendix 6. Exports Estimations

Estimations		Const	E	NI	I	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	DW	AIC
1	Coefficient	1.74	0.1	-0.11	0.021	-0.14	0.1	-0.81	-0.04	-0.15	-0	0.038	-0.22	0.076	0.056	0.007	0.3	12.6	1.93	-0.66
	t Values	4.95	0.49	-5.47	1.8	-2.59	1.73	-2.87	-1.33	-1.91	-0.08	4.92	-7.55	1.5	0.049	0.26				
2	Coefficient	1.78	0.101	-0.11	0.021	-0.13	0.1	-0.81	-0.05	-0.15	*	0.038	-0.22	0.077	0.005	0.006	0.3	13.5	1.93	-0.67
	t Values	7.96	0.5	-5.47	1.86	-2.59	1.72	-2.97	-1.64	-1.92	*	4.97	-7.5	1.71	0.045	0.21				
3	Coefficient	1.77	0.1	-0.11	0.02	-0.13	0.1	-0.8	-0.05	-0.15	*	0.039	-0.22	0.077	*	0.01	0.3	14	1.93	-0.67
	t Values	8.47	0.5	-5.49	1.8	-2.59	1.73	-2.98	-1.64	-1.92	*	5	-7.56	1.7	*	0.21				
4	Coefficient	1.77	0.1	-0.11	0.02	-0.13	0.1	-0.79	-0.05	-0.15	*	0.039	-0.22	7.62	*	*	0.3	16	1.93	-0.67
	t Values	8.4	0.59	-5.49	1.81	-2.59	1.73	-2.98	-1.63	-1.94	*	5.1	-7.6	1.92	*	*				
5	Coefficient	1.75	*	-0.11	0.02	-0.14	0.11	-0.78	-0.05	-0.15	*	0.037	-0.22	0.076	*	*	0.3	18	1.95	-0.68
	t Values	8.48	*	-5.74	1.81	-2.94	1.86	-2.94	-1.89	-1.99	*	5.15	-7.61	1.99						

Source: Regressions

Note: 1. * variable dropped from the previous estimation, for low significance

2 Estimations at 5% level of significance.

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Appendix 7. Exports Estimations (with lags of TL Variables)

Estimation		Const	E	E_1	NI	NI_1	I	I_1	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	AIC
1	Coefficient	11.94	0.11	-0.13	0.10	-0.05	0.02	-0.03	-0.15	0.11	-0.72	-0.05	-0.15	-0.001	0.04	-0.23	0.09	-0.02	0.005	0.32	12	-0.667
	T Value	8.11	0.55	-0.63	4.43	-2.68	0.99	-1.98	-2.79	1.76	-2.62	-0.37	-1.90	-0.06	5.07	-7.06	1.58	-0.20	0.17			
2	Coefficient	11.94	0.12	-0.13	0.10	-0.05	0.02	-0.03	-0.19	0.11	-0.72	-0.05	-0.15	*	0.04	-0.23	0.09	-0.02	0.00	0.32	12	-0.670
	T Value	8.12	0.55	-0.63	4.43	-2.68	0.99	-1.98	-2.79	1.89	-2.62	-0.67	-1.99	*	5.12	-7.29	1.58	-0.22	0.17			
3	Coefficient	11.94	0.12	-0.13	0.10	-0.05	0.02	-0.03	-0.15	0.11	-0.71	-0.05	-0.15	*	0.04	-0.23	0.09	-0.02	*	0.32	14	-0.676
	T Value	8.13	0.56	-0.66	4.44	-2.69	0.99	-1.97	-2.69	1.95	-2.63	-0.65	-1.92	*	5.20	-7.64	1.86	-0.21	*			
4	Coefficient	11.83	0.11	-0.13	0.10	-0.05	0.02	-0.03	-0.15	0.11	-0.71	-0.05	-0.15	*	0.04	-0.23	0.09	*	*	0.32	14	-0.687
	T Value	5.58	0.54	-0.65	4.46	-2.68	0.99	-1.97	-2.80	1.97	-2.63	-0.63	-1.99	*	5.21	-7.66	1.99	*	*			
5	Coefficient	11.78	0.11	-0.13	0.10	-0.52	0.03	-0.04	-0.15	0.11	-0.71	*	-0.15	*	0.04	-0.23	0.09	*	*	0.32	15	-0.683
	T Value	8.56	0.55	-0.64	4.46	-2.73	1.91	-1.93	-2.88	1.77	-2.62	*	-1.99	*	5.21	-7.66	1.44	*	*			
6	Coefficient	11.76	*	-0.12	0.10	-0.05	0.02	-0.03	-0.16	0.11	-0.69	*	-0.15	*	0.04	-0.23	0.09	*	*	0.32	16	-0.689
	T Value	8.56	*	-0.61	4.69	-2.73	1.96	-1.95	-3.19	1.92	-2.54	*	-1.99	*	5.24	-7.67	1.92	*	*			
7	Coefficient	11.70	*	*	0.10	-0.06	0.02	-0.03	-0.16	0.12	-0.72	*	-0.15	*	0.04	-0.23	0.09	*	*	0.31	17	-0.696
	T Value	8.58	*	*	5.14	-2.92	1.96	-1.92	-3.20	1.99	-2.71	*	-1.95	*	5.43	-7.71	1.99	*	*			

Source: Regressions

Note: 1. * variable dropped from the previous estimation, for low significance

2 Estimations at 5% level of significance.

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Appendix 8. Margins Estimations

Estimations		Constant	E	NI	I	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	DW	AIC
1	Coefficient	4.8	0.128	-0.03	-0	0.031	-0.08	0.015	0.039	0.03	-0	0.012	-0.01	-0.03	0.002	0.015	0.31	14	1.53	-3.5
	t Values	13.5	2.6	-5.92	-0.41	2.49	-5.24	0.22	1.34	1.64	-0.61	6.69	-1.72	-1.85	0.072	2.11				
2	Coefficient	4.79	0.13	-0.03	-0	0.031	-0.08	0.015	0.025	0.03	*	0.013	-0.01	-0.03	0.002	0.014	0.31	14	1.53	-3.5
	t Values	13.5	2.66	-5.95	-0.42	2.51	5.31	0.23	1.45	1.63	*	6.79	-1.72	-1.83	0.066	2.04				
3	Coefficient	4.8	0.13	-0.03	-0	0.031	-0.08	0.015	0.025	0.03	*	0.013	-0.01	-0.03	*	0.014	0.31	15	1.53	-3.5
	t Values	14.3	2.67	-5.98	-0.42	2.51	-5.34	0.23	1.45	1.63	*	6.83	-1.72	-1.84	*	2.05				
4	Coefficient	4.87	0.13	-0.03	-0	0.031	-0.08	*	0.025	0.031	*	0.012	-0.01	-0.03	*	0.014	0.31	16.5	1.53	-3.51
	t Values	4.6	2.72	-5.99	-0.42	2.51	-5.42	*	1.68	1.66	*	7.44	-1.79	-1.89	*	2.1				
5	Coefficient	4.86	0.13	-0.03	*	0.03	-0.08	*	0.025	0.031	*	0.012	-0.01	-0.03	*	0.019	0.31	18	1.59	
	t Values	14	2.78	-5.98	*	2.48	-5.43	*	1.99	1.96	*	7.44	-1.89	-1.89	*	2.11				

Source: Regressions
Note: 1. * variable dropped from the previous estimation, for low significance
　　2 Estimations at 5% level of significance.

Appendix 9. Margins Estimations (with Lags of TL Variables)

Estimation		Const	E	E 1	NI	NI 1	I	I 1	K	L	R	D	T	Z	TS	S	P	G	O	R2	F	AIC
1	Coefficient	4.85	0.13	0.27	-0.02	-0.001	-0.01	0.02	0.03	-0.07	-0.05	0.03	0.02	-0.001	0.01	0.00	-0.04	-0.01	0.02	0.37	14	-3.56
	t Values	14.10	2.64	5.75	-3.74	-0.11	-0.89	3.37	2.65	-5.02	-0.72	1.06	1.25	-0.28	7.13	0.34	-2.43	-0.21	2.22			
2	Coefficient	4.84	0.13	0.27	-0.02	*	-0.01	0.02	0.03	-0.07	-0.05	0.03	0.02	-0.001	0.01	0.00	-0.04	-0.01	0.02	0.37	15	-3.58
	t Values	14.10	2.65	5.89	-3.75	*	-0.90	3.41	2.67	-5.03	-0.73	1.60	1.52	-0.25	7.19	-0.35	-2.44	-0.20	2.22			
3	Coefficient	4.85	0.13	0.27	-0.02	*	-0.01	0.02	0.03	-0.07	-0.05	0.03	0.02	-0.001	0.01	-0.003	-0.04	*	0.02	0.37	16	-3.07
	t Values	15.00	2.65	5.87	-3.75	*	-0.90	3.41	2.67	-5.03	-0.73	1.99	1.95	-0.26	7.20	-0.35	-2.45	*	2.23			
4	Coefficient	4.82	0.02	0.27	-0.02	*	-0.01	0.02	0.03	-0.07	-0.05	0.03	0.02	*	0.01	0.00	-0.04	*	0.01	0.37	17	-3.06
	t Values	15.00	2.68	5.91	-3.76	*	-1.00	3.41	2.68	-5.06	-0.76	1.99	1.92	*	7.29	-0.35	-2.44	*	2.22			
5	Coefficient	4.80	0.13	0.28	-0.02	*	-0.01	0.02	0.03	-0.07	-0.05	0.03	0.02	*	0.01	*	-0.04	*	0.01	0.37	18	-3.05
	t Values	15.00	2.67	6.15	-3.86	*	-0.99	3.50	2.77	-5.11	-0.77	1.94	1.95	*	7.45	*	-2.49	*	2.26			
6	Coefficient	4.58	0.13	0.27	-0.02	*	-0.01	0.02	0.03	0.07	*	0.03	0.02	*	0.01	*	-0.04	*	0.01	0.37	20	-3.06
	t Values	15.80	2.60	6.11	-3.92	*	-1.00	3.47	2.92	-5.32	*	1.97	1.90	*	8.35	*	-2.42	*	2.17			
7	Coefficient	4.55	0.13	0.27	-0.02	*	*	0.02	0.03	-0.07	*	0.03	0.02	*	0.01	*	-0.03	*	0.01	0.36	21	-3.07
	t Values	15.60	2.70	6.05	-3.99	*	*	3.58	2.80	-5.39	*	1.97	1.97	*	8.32	*	-2.32	*	2.17			

Source: Regressions
Note: 1. * variable dropped from the previous estimation, for low significance
2 Estimations at 5% level of significance.

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Appendix 10. Questionnaire

The first questions characterise the respondent and give information about its business:

1. Tick to indicate the region were the respondent is answering the questionnaire:

Code	Answer (Tick)	Region
1		Belo Horizonte
2		Rio
3		São Paulo
4		Porto Alegre
5		Fortaleza
6		Recife
7		Salvador
8		Vitoria
9		
10		Brasilia
99		No Answer

2. What is the main sector your company is operating in?

Code	Tick	Answer
1		Steel
2		Aviation
3		Computers & Software
4		Car/Trucks/Transport Industry
5		Mining
6		Aluminium
99		No Answer

3. How many employees has the company or the group ?

Code	Answer (Tick)	Characteristics
97		Number of Employees
1		Less than 5
2		6 to 29 employees
3		30 to 99
4		100 to 499
5		500 to 999
6		1000 to 4999
7		5000 to 9999
8		10000 and more
99		No Answer

4. For how much time has your company been in this activity?

Code	Tick	Answer
97	/ /	Date of initiating activities (month and year)
01		Less than a year
02		More than 1 to 3 years
03		More than 3 to 5 years
04		More than 5 to 10 years
05		More than 10 to 20 years
06		More than 20 years (collapsed with the 5)
99		No Answer

5. What can characterise the main owner of the companies?

Code	Answer	Categories
01		Domestic private
02		Foreign private
03		State Domestic
04		State Foreign
99		No Answer

6. Who makes the most important decisions in the company? (please, rank the answers if more than one)

Code	Answer	Categories
01		The Domestic Owner
02		The Foreign Shareholder
04		The Board of Directors
05		The Council of Administration
06		The Co-operators (for co-operatives)
07		The Marketing Department
08		The Production Department
99		No Answer

7 How can you describe your market share at this moment?

Code	Answer	Categories
01		Less than 3%
02		More than 3 and Less than 10%
04		More than 10 and less than 30%
05		More than 30 and Less than 50%
06		More than 50 and Less than 80%
07		More than 80 and Less than 95%
08		More than 95 to 100%
99		No Answer

Research on performance and implications from Trade Liberalisation

8. How the adoption of Free Trade (in 1990 and the years after) has affected your business?

Code	Answer	Categories
01		No Effects
02		Weak Effects
03		Strong Effects
99		No Answer

9. Have your company exported in the 90s?

1		Yes
0		No

10. How much have been exports during this time? (90s) In US$ Million

Code	Answer	Categories
97		the amount in US$ for 2000
96		the amount in US$ for 1999
1		less than 0.1
2		from 0.1 to 0.9
3		from 1.0 to 4.9

4		from 5 to 9.9
5		from 10 to 49.9
6		from 50 to 499.9
7		500 and more
99		No Answer

11. Have your company exported in the 80s?

1		Yes
0		No

12. How much have been exports during this time? (80s)

Code	Answer	Categories
97		the amount in US$ for 2000
96		the amount in US$ for 1999
1		less than 0.1
2		from 0.1 to 0.9
3		from 1.0 to 4.9
4		from 5 to 9.9
5		from 10 to 49.9
6		from 50 to 499.9
7		500 and more
99		No Answer

Research of the evidence of reallocation of resources linked with TL.

13. Have your company increase overall investment after TL in 1990?

1		Yes
0		No

14. What was the level of increase in investment in the 90s?

Code	Tick	Categories
1		Less than 3%
2		3 to less than 10%
03		10 to less than 30%
04		30 to less than 60%
05		60 to less than 90%
06		90 to less than 200%
07		200 to less than 500%
08		500 to less than 1000%
09		1000 % and more
99		No Answer

15. What is the most important reason to in increase investment after TL in 1990? (Rank 3 of them using 1, 2 or 3 to classify them)

Code	Tick	Categories
01		Possibility of Exporting (Free Trade)
02		Ownership (the fact that the owner is foreign, private, or state)
03		Government Programmes and incentives
04		Reducing costs (became cheaper because of imports are free)
05		Reduction costs, (became cheaper because local supplies became cheaper)
06		Privatisation of other companies (suppliers, customers)
07		Privatisation of your own company
08		Product quality became better
09		Increasing domestic markets
10		Cheaper Credit
11		Introduction into International Markets
99		No Answer

16. Has your company reduce investment after TL in 1990?

1		Yes
0		No

17. What was the level of increase in investment in the 90s?

Code	Tick	Categories
1		Less than 10%
2		10 to less than 30%
03		30 to less than 50%
04		50 to less than 70%
05		70 to less than 90%
06		90 to less than 100%
07		other
99		No Answer

18. What is the most important reason to in reduce investment after TL in 1990? (Rank the answers if more than one, using 1,2 or 3 to classy them)

Code	Rank	Categories
01		Difficulty of Exporting (Despite Free Trade)
02		Facility of Importing (causes more competition)
03		Because of the owner as a foreign company decides about this
04		Because of lack of investment funds
05		Because of difficulty to access international credit
06		lack of incentives from the government
07		Finance costs are high (high interest rates) in Brazil
08		Privatisation of the company reduced investment
09		Production has moved to other countries
10		Reduction of domestic markets
11		Product lines have been closed down
99		No answer

19. Has your company dismissed employees or reduced the number of employees after TL in 1990?

1		Yes
0		No

20. What is the most important reason to in reduce the number of employees after TL in 1990? (Rank three of them using 1, 2, or 3 to classify them)

Code	Tick	Categories
01		Difficulty of Exporting (Despite Free Trade)
02		Facility of Importing (causes more competition)
03		Because of the owner as a foreign company decides about this
04		Because of the lack of investment funds
05		Because of difficulty to access international markets
06		lack of incentives from the government
07		high finance costs in Brazil (high interest rates)
08		Privatisation of the company reduced employment
09		Production has moved to other countries
10		Reduction of domestic markets
11		Product lines have been closed down
12		Need better skilled employees
99		No Answer

21. Has your company hired employees or increased the number of employees after TL in 1990?

1		Yes
0		No

22. What is the most important reason to in increase the number of employees after TL in 1990? (Rank 3)

Code	Tick	Categories
01		Increase of Exporting (Free Trade)
02		Facility of Importing (increase production)
03		Because of the owner is a foreign company
04		Because of the company is state owned
05		Because the company owner is private national
06		Incentives from the government programmes
07		Higher taxes on employment in other countries
08		Privatisation of the company needed more employees
09		Production has moved from other countries
10		Expansion of domestic markets
11		Product lines have been augmented
12		Need better skilled employees
13		Need of all kind of employees
99		No answer

23. What will be the first region in the world your company will export or increase exports? (please, if more than one, rank)

Code	Tick	Categories
01		Mercosur (Argentina, Uruguay, Paraguay)
02		Alca – North America (US, Canada, and Mexico)
03		South America
04		Europe
05		Southeast Asia
06		Middle East
07		Japan and Korea
08		China
09		India
10		Africa
11		Other
99		No Answer

24. Have your company included new products in the line in the 90s?

1		Yes
0		No

25. How many products/lines have been created during this time? (90s)

Code	Answer	Categories
97	………..	Give the number of products or lines introduced
01		1 to 2
02		3 to 5
03		6 to 9
04		10 to 20
05		More than 20
99		No Answer

26. Have your company excluded products from the line in the 90s?

1		Yes
0		No

27. How many products/lines have been excluded during this time? (90s)

Code	Answer	Categories
97	....	Give the number of products or lines excluded
01		1 to 2
02		3 to 5
03		6 to 9
04		10 to 20
05		More than 20
99		No Answer

28. Have your company acquired (buying or renting or leasing) new machinery in the line in the 90s?

1		Yes
0		No

29. What was the most important reason for your company to hire new machinery? (Rank 3)

Code	Tick	Categories
01		Increase of Exporting (Free Trade)
02		Facility of Importing (increase production)
03		Because of the owner is a foreign the company
04		Because the owner is the state
05		Because the owner is private national
06		Incentives from the government programmes
07		Because Tariffs have been reduced
08		Privatisation of the company facilitated imports
09		Production has been moved from other countries
10		Expansion of domestic markets
11		Product lines have been augmented
12		Need better machinery and equipment
13		Technology has improved around the world
14		New employers came with new ideas and technology
99		No answer

30. By how much have your production been increased with the new machinery?

01		Less than 3%
02		From 3 and Less than 10%
03		From 10 and less than 30%
04		From 30 and Less than 60%
05		From 60 and Less than 90%
06		From 90 and Less than 200%
07		From 200 and Less than 500%
08		From 500% and Less than 1000%
9		1000% and more
99		No Answer

Research for dynamic benefits (scale, import improvement machinery, technical progress and learning)

31. Have your company included imported material in the products in the 90s?

0		Yes
1		No

32. Why did your company decided to import components (machinery, technology, or material) (Rank 3 reasons using numbers 1, 2, and 3)

Code	Tick	Categories
01		Increase of Exporting (Free Trade)
02		Facility of Importing (increase production)
03		Because of the owner is a foreign the company
04		Because the owner is the state
05		Because the owner is private national
06		Incentives from the government programmes
07		Because Tariffs have been reduced
08		Privatisation of the company facilitated imports
09		Production has been moved from other countries
10		Expansion of domestic markets
11		Product lines have been augmented
12		Need better machinery and equipment
13		Technology has improved around the world
14		New employers came with new ideas and technology
15		There is not a similar national that replaces the imported input
16		Financial schemes for import make the final cost attractive
99		No answer

33. How many products/lines have imported components now? (90s)

Code	Answer	Categories
01		All of them – 100%
02		More than half of them
03		Less than half
04		Few Products
99		No Answer

34. How many products/lines of products have imported components before? (80s)

Code	Answer	Categories
01		All of them – 100%
02		More than half of them
03		Less than half
04		Few Products
99		No Answer

35. How much time was needed to have an import licence before Trade Liberalisation in the 80s?

Code	Answer	Categories
97		Months (give the number of months)
01		less than 15 days
02		15 days to less than 1 month
03		1 to 3 less than months
04		3 to less than 12 months
05		12 to less than 24 months
06		more than 24 months

99		No Answer

36. How much time you need to have an import licence now in the 90s?

Code	Answer	Categories
97		Months (give the number of months)
01		less than 15 days
02		15 days to less than 1 month
03		1 to 3 less than months
04		3 to less than 12 months
05		12 to less than 24 months
06		more than 24 months
99		No Answer

37. What is the most important reason for your company or sector to import products (raw material, machinery, licenses, and technology)? (Mark the most important only, comment on the others below) (Rank)

Code	Tick	Categories
01		Increase of Exporting (Free Trade)
02		Facility of Importing (increase production)
03		Because of the owner is a foreign company
04		Because the owner is the state
05		Because the owner is national
06		Incentives from the government programmes
07		Because Tariffs have been reduced
08		Privatisation of the company facilitated imports
09		Production has moved from other countries
10		Increase of domestic markets
11		Product lines have been augmented
12		Need better machinery
13		Technology has improved around the world
14		New employers came with new ideas and technology
99		No answer

38. Has your firm or sector made improvements in productivity in the last 10 years or so?

1		Yes
0		No

39. What are the most important factors that pushed your company or sector towards productivity improvement? (Mark the most important only, comment on the others below) (You can point more than 1 by ranking then using 1, 2, 3 to classify them)

Code	Tick	Categories
01		Possibility of Exporting (Free Trade)
02		Ownership (foreign, state, private)
03		Government Programmes
04		Reducing costs
05		Privatisation
06		Development of Product Quality
07		Employees Motivation,
08		ISO 9000 programmes
09		Customers Needs
99		No Answer

Research for production and market structures influences on TL and productivity Links:

40. Can you describe your view of the market during the least years?

Code	Tick	Answer
01		1 to 3 large competitors and few medium and small
02		1 – 20 large competitors with many medium and small
03		1 – 100 medium and few small competitors
04		Numerous medium and small competitors
99		No Answer

41. How do you classify the influences that TL had on competition in your sectors and for your company?

Code	Answer	Categories
01		No Effects
02		Weak Effects
03		Strong Effects
04		Very Strong Effects
99		No Answer

42. What were the changes introduced in your company due to the increase in competition after TL?

Code	Tick	Categories
01		Reduction of Mark-ups
02		Reduction of Investments
03		Business Reorganisation
04		Company and Product Mix Reorganisation
05		Search for New Partners and Technology
06		Selling part of the company and business
07		Concentration by merging with other or being taken over
08		Development own technology and products
99		No Answer

43 How to you classify your company's capital structure:

Code	Tick	Answer
1		PLC - Shares negotiated in the Stock Market (S. A.)
2		Ltd Company – Closed Capital Company
3		Co-operative
4		Other
5		State Owned Company
99		No Answer