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**Appliance Industry:  
Impact of Trade Policy Reforms  
on Performance, Competitiveness and Structure**

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**PHILIPPINE INSTITUTE FOR DEVELOPMENT STUDIES**

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# Abbreviations

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AHAM	-	Association of Home Appliance Manufacturers
AFTA-CEPT	-	Asean Free Trade Area-Common Effective Preferential Tariff
BOI	-	Board of Investments
CBU	-	Completely built-up unit
CEPMA	-	Consumer Electronics Product Manufacturers' Association
CIAMP	-	Cooking and Heating Appliances Manufacturers' Association
CKD	-	Completely knocked-down
CR	-	Concentration Ratio
DRC	-	Domestic Resource Cost
ELCP	-	Electronics Local Content Program
EPR	-	Effective Protection Rate
GATT	-	General Agreement on Tariffs and Trade
MEPCO	-	Matsushita Electric Philippines
NCR	-	National Capital Region
NEDA	-	National Economic and Development Authority
NSCB	-	National Statistical Coordination Board
NSO	-	National Statistics Office
OEM	-	Original Equipment Manufacturers
PCM	-	Price-Cost Margin
PEPCEP	-	Progressive Export Program for Consumer Electronics
Philacor	-	Philippine Appliance Corp.
PSIC	-	Philippine Standard Industrial Classification
QR	-	Quantitative Restriction
R&D	-	Research and Development
SEC	-	Securities and Exchange Commission
SER	-	Shadow Exchange Rate
SKD	-	Semi-knocked-down
TLP	-	Trade Liberalization Program
TRM	-	Committee for Tariff and Related Matters
VAT	-	Value-Added Tax



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## Introduction

CURRENT thinking favors an outward-oriented strategy for development, and it has generated stronger preferences for trade liberalization among governments in developing countries. The literature, however, offers little by way of strong empirical support for the conventional wisdom. This has prompted interest in new areas such as the “new theory” of international trade, which incorporates industrial organization issues in the analysis of trade policy. The inclusion of industrial organization concerns has consequently shifted the focus of the analysis to industries and firms.

This study analyzes the effects of the recent experience with trade policy reform on the structure, performance, and competitiveness of the appliance industry. The discussion of trade policy reform involves mainly tariff reform and partial import liberalization. The study also examines the links between changes in the industry structure with changes in the performance and competitiveness of the industry. The performance and competitiveness of the industry are expected to improve under trade reform because of the increased competitive pressure from imports.

The level of competition often refers to the structure of an industry. A low level of competition is often associated with both poor performance and inefficiency (Scherer 1980). Firms are thought to perform best when competition is vigorous, otherwise they will have no compelling reason to improve efficiency. Performance may be loosely defined as what an industry or firm is able to achieve or accomplish in its operations. The study measures performance in terms of export earnings, efficiency, and productivity. Competitiveness refers to the ability of firms and industries to

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compete in the domestic market with importers and in external markets with other exporters (Tecson 1992).

The appliance industry is divided into four subsectors: audio-video appliances, cooking and heating appliances, refrigerators and air conditioners, and miscellaneous appliances. The parts industry for radios and TV sets is also included to represent the entire parts and components industry for appliances.<sup>1</sup> The conclusions of the study are based primarily on the analysis of data from the National Statistics Office (NSO) Census of Manufacturing Establishments for 1983 and 1988.

The hypothesis to be tested in the study may be stated in the following manner: The increased import competition due to trade liberalization had a positive effect on performance (in terms of efficiency) and competitiveness in the industry. The entry (or simply the threat of entry) of imported products may have induced domestic firms to adopt more competitive behavior.

1. Throughout the text, the radio and TV parts industry will also be referred to as the *electronic parts industry*. The audio-video appliances subsector will also be referred to as the *consumer electronics industry*.

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## The Appliance Industry

### GENERAL PROFILE

**T**HIS study focuses on major appliances, which may be broadly classified into four subsectors similar to industry association groupings:

- *Audio-video appliances* which consist of products such as TV sets, stereos, radios, cassette recorders, VCRs, and the like;
- *Cooking and heating appliances* which include ovens, stoves, and ranges, both gas and electric;
- *Refrigerators and air conditioners* which also include freezers (and, in NSO data, cooking ranges); and
- *Miscellaneous appliances* which include products such as electric fans, vacuum cleaners, washing machines, and dryers.

There are four trade associations — organized around product lines — which help promote information exchange and make representations with the government (Tan 1987). These are the Consumer Electronics Products Manufacturers' Association (CEPMA); the Association of Home Appliance Manufacturers (AHAM), composed of refrigerator and air conditioner manufacturers; the Cooking and Heating Appliances Manufacturers' Association of the Philippines (CHAMP); and the Philippine Electric Manufacturers' Association. Some of them, like the AHAM, engage in lobbying and also monitor smuggling.

The local appliance industry is comprised of around 30 firms, most of which carry foreign brands as licensees or as joint ventures with foreign manufacturers. The majority primarily assemble products

from completely-knocked-down (CKD) and semi-knocked-down (SKD) parts from the US, Japan, Taiwan, and Hong Kong. Hill (1981) describes the domestic market as small, because of a predominantly poor population, and highly fragmented because of the proliferation of models. Industry sources also say that local firms are about 10 years behind global market leaders in technology.

Technical arrangements with foreign firms (e.g., Japanese and Korean) are often seen as a necessity in the industry; new entrants are considered at a disadvantage without some form of a technical tie-up with foreign counterparts. In such arrangements, the foreign partner or mother company is often the main source of technical information, and research and development (R&D) projects involve mostly the adaptation of product designs and the addition of features to suit local conditions and tastes.

Parts and components production is considered unprofitable due to the small volume of orders, and the supplier industries are consequently underdeveloped. An industry source says local suppliers are unable to compete in electronic parts but appear to be competitive in plastic and metal parts, such as enclosures for audio products. Among the problems cited were the poor quality, high cost, and erratic delivery of locally-made parts. Although some large firms produce a portion of their own needs (such as plastic and metal parts and printed circuit boards), most firms prefer to import parts due to lower costs, better quality, or because the needed parts are not available locally. As a result, the industry is highly import-dependent.

Despite these problems, there are still opportunities for the parts industry, particularly in export markets. The Board of Investments (BOI), for example, is working to promote plastic and metal parts made with dies and molds because of an apparent comparative advantage. World demand for metal products is expected to rise because of weakened casting and forging industries in the US and Japan. The highly-skilled local metalworking industry has a good chance of becoming a major exporter.

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### *Market Orientation*

The appliance industry may be described as inwardly-oriented since products are aimed mostly at the domestic market. Although most local subsidiaries and joint ventures with foreign firms are exporting, it is often done as part of a complementing scheme with other ASEAN-based subsidiaries. Filipino-owned firms tend to focus on the domestic market, although some have announced plans to export. This inward orientation may be a result of substantial protection since the 1960s, which reduced the attractiveness of the export market by making the domestic market more profitable.

### *Geographical Location*

Data from the 1983 and 1988 Census of Establishments show that the majority of appliance manufacturers are based in NCR, with 80 percent of the establishments in both census years located in the region. For the electronic parts industry, the figure is around 90 percent. Several possible reasons may be cited: Better infrastructure; proximity to airports and shipping port facilities; and the concentration of the country's skilled labor in the National Capital Region (NCR). Manila is a natural choice for most firms since access to material inputs is an important factor in choosing a location.

## SIGNIFICANCE TO THE ECONOMY

### *Contribution to the Economy*

Census data also show that the share of the appliance industry in total value added for the manufacturing sector declined from 0.26 percent in 1972 to 0.16 percent in 1988. It has also been modest — less than 1 percent throughout that period — possibly because the industry is engaged more in *assembling* than in manufacturing operations. In addition, the large number and diversity of parts and components will tend to make substantial vertical integration not

feasible, and manufacturers will tend to prefer importing or buying locally over in-house production. Data for the radio-TV parts industry are incomplete but they show much larger shares for the industry and noticeable growth (from 0.07 percent in 1978 to 0.38 percent in 1988). The larger shares may be attributed to the inclusion of the semiconductor industry which is also a major exporter.

### *Linkages with other Sectors*

The appliance industry has a number of ancillary or supplier industries. The 1983 Input-Output tables from the NSO show substantial backward linkages with three other industries: primary iron and steel, electronics, and fabricated metal products. The 1988 tables have a more disaggregated but similarly defined list of ancillary sectors. The industry is also forwardly linked with the appliance retailing industry.

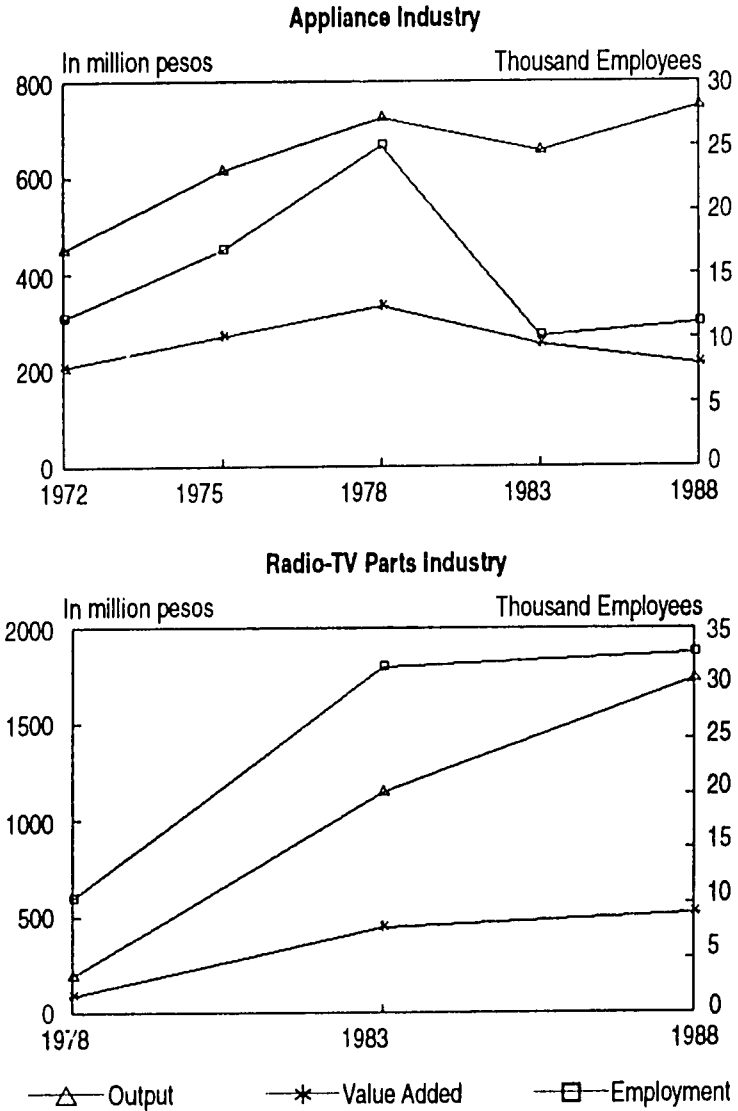
Both supplier and retailer industries have a substantial impact on competitiveness. Supplier industries, for example, are crucial since most manufacturers require a reliable network of parts suppliers. Retailers are important since manufacturers often rely on appliance dealers to sell their products. Arrangements with dealers may also serve as a barrier to entry: New entrants may find themselves facing established firms with close long-standing relations with appliance dealers.

## INDUSTRY PERFORMANCE AND PRESENT SITUATION

### *Growth*

To obtain a general indication of the industry's performance in recent years, we examine several indicators of growth: output, census value added, employment, and the number of establishments. Data were collected across five census years, from 1972 to 1988, for both the appliance industry and the radio-TV parts industry (Figure 1). For

**Figure 1**  
**Growth of the Industry: 1972-1988**



Employment is in thousands. Output and value added are in million pesos.  
 Data for 1972 and 1975 on the radio-TV parts industry are not available.

Source: *Census of Manufacturing Establishments*, National Statistics Office.

comparability, figures for output and census value added have been expressed in constant 1972 prices.

For the appliance industry, there was an increase in output and employment between 1972 and 1978 (Figure 1). Census value added climbed steadily from 1972 to 1978 and fell afterwards. The number of establishments fell from 71 in 1972 to 51 in 1983, and rose again to 64 in 1988. Thus, the appliance industry appears to be growing in terms of output and employment, although value added and the number of plants seem to be going down.

Data for the radio and TV parts industry are available only from 1978 to 1988, but the figures show steady increases in output, value added, and employment. The number of establishments steadily increased from 24 in 1978 to 32 in 1983, and to 51 in 1988. The figures tend to confirm the industry observation that there has been noticeable growth in the parts industry.

A modest growth and a smaller number of plants in the appliance industry is thus observed; similarly, the available data for the radio and TV parts industry indicate steady growth.

### *Industry Structure*

Listings of the country's top 1,000 companies from 1981 to 1991 show that the five largest appliance firms in terms of gross revenues are: Precision Electronics (now called Matsushita Electric Philippines or MEPCO); Philippine Appliance Corp. (Philacor); Concepcion Industries; General Electric Philippines, and; Union Industries. The largest four firms combined account for 70 to 80 percent of total gross revenues for the listed appliance firms. This seems to support Patalinghug's (1983) observation that the industry is highly concentrated. In addition, the large firms are often the market leaders in specific product lines. In audio-video appliances, for example, the leading firms are Solid Corp. (which makes Sony products), MEPCO (which makes National Panasonic products), and Sharp Philippines. Philacor is a leader in refrigerators and freezers.

The industry thus seems to have a handful of large dominant firms. Protection may help explain concentration within the industry —



although it may also be due to the observed smallness of the domestic market. Other things being equal, a small market is more likely to be concentrated than a large one which can accommodate more competing firms.

Soriano (1991) cites five structural entry barriers in the industry: economies of scale; access to distribution channels; product differentiation; capital requirements; and technology acquisition. These barriers pose problems to prospective entrants. However, in the washing machine industry, he observes two waves of entrants in the washing machine market: the assembler-manufacturers which came in 1987-1988, and the importers which came in 1989-1991. These entrants were able to circumvent the need for scale economies, which are important in nearly every part of the business, from manufacturing to research and development. The first wave of entrants (the assembler-manufacturers) did this by going into assembly operations and into joint ventures with foreign original equipment manufacturers (OEMs). The second wave (the importers) simply imported completely built-up units (CBUs).

It also appears that entry seems difficult for *rank beginners* in the domestic market but not for *established* appliance firms seeking new markets. For example, access to distribution channels and product differentiation would not be serious problems for established firms, which may enjoy not only strong ties with distributors, but also consumer loyalty.

## GOVERNMENT POLICIES

This section reviews trade policies pertaining to the industry, beginning with efforts to promote it through protection and the subsequent development programs. This is followed by a discussion of the tariff reductions and the removal of import restrictions under the Trade Liberalization Program (TLP). The policy changes described below become the basis for the next section which analyzes their effects.

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*Import Substitution and Protection*

The appliance industry received substantial tariff protection in the 1960s when trade policy in general tended to promote import substitution. Tariffs were as high as 100 percent on some items. Additional protection came from import restrictions imposed originally due to balance-of-payments problems. A severe balance of payments crisis in 1970 prompted controls on both foreign exchange and imports. Central Bank Circular No. 289 banned imports of all non-essential consumer items, including appliances, without government approval. The restrictions were retained after the BOP problem subsided and were later used to support an export program for the industry.

In the 1970s, the government, under pressure from parts and components makers, sought to encourage the local manufacture of parts and components by imposing a lower sales tax on firms that met prescribed local content specifications. That policy later became the Electronics Local Content Program (ELCP) in 1975, which gave participants tax incentives based on local content and access to imports of parts and components. The regulation of imports was passed on to the BOI. The ELCP was intended to increase the use of local inputs and parts and improve export capabilities. Rapid obsolescence in electronics, however, made investment in production equipment unattractive, and exports consequently remained low (Tan 1987). The program was expanded later to include other appliances and was replaced in 1983 by the Progressive Export Program for Consumer Electronics (PEPCEP). PEPCEP gave participants sole permission to import parts and completely built-up units (CBUs). In return, it required them to export in order to earn dollars for their import needs. Soriano (1991) argues that the development program may have served as an entry barrier, since prospective participants were given value added and foreign exchange earnings targets as the basis for incentives. Based mainly on the import restrictions and foreign exchange controls, the program was effectively stopped with the subsequent reforms in trade policy.

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### *Trade Policy Reforms*

The ensuing trade policy reforms involved tariff reductions and import liberalization and were implemented in separate stages. The first stage began with the 1981 Tariff Reform Program (TRP) which brought down the high tariffs on appliances and was viewed as a modest step toward full-scale reform. Tan (1987) observes that before 1981, tariff rates were 100 percent for air conditioners, refrigerators, freezers, and TV sets; 70 percent for non-electric stoves and electric fans; 50 percent for electric stoves; and 10 percent for washing machines. By 1984, the rates were a uniform 50 percent, except for some low-tariff items whose rates went unchanged.

For material inputs, parts and components, the rates were more dispersed. There were six rates in 1980: 100, 70, 50, 30, 20, and 10 percent. By 1984, there were only four rates: those at 60 were reduced to 30 percent; those at 50, 30, and 20 percent were not changed; and those at 10 percent were increased to 20. The rates were based on the amount of local production; inputs with substantial local production were given higher tariffs. Thus, tariffs on cabinets and chassis for refrigerators and TV sets were as high as 100 percent in 1980, while tariffs on capacitors were as low as 10 percent.

The changes in the protective structure also involved the removal of discriminatory taxes on imports and the adoption of the value added tax (VAT) system in 1988. The 1983 tax code imposes an advance sales tax along with an additional 25 percent markup on imported appliances, thereby raising the effective price of imports. These taxes were replaced by the value added tax in 1988.

Executive Order No. 470, issued in 1991, mandates a more gradual reduction of tariffs than the earlier EO 413 which was withdrawn due to pressure from local firms. It annually reduces tariffs by 5 percent from 1991 to 1995. Average tariffs are expected to fall to 27 percent for finished goods and 19 percent for parts and components by 1995 (Tables 1 and 2), completing the tariff changes under the trade reform program.

Table 1 shows a general reduction in average nominal tariffs on output. Average tariffs on finished goods for the industry went down

**Table 1**  
**Average Tariffs on Finished Goods: 1975-1995**  
**(In percent)**

	1978	1981	1983	1988	1991	1993	1995
<b>Appliance Industry</b>	71	58	47	44	45	36	27
Subsectors							
Audio-video appliances	89	80	55	48	48	38	29
Cooking, heating appliances	39	55	50	50	50	40	30
Refs and aircons	100	63	53	43	43	33	27
Miscellaneous appliances	68	40	35	36	39	31	24
<b>Parts Industry</b>							
Radio and TV parts	59	47	35	32	29	19	18

**Table 2**  
**Average Tariffs on Material Inputs: 1975-1995**  
**(In percent)**

	1978	1981	1983	1988	1991	1993	1995
<b>Appliance Industry</b>	50	42	33	32	30	20	19
Subsectors							
Audio-video appliances	59	47	35	32	29	19	18
Cooking, heating appliances	50	52	47	47	47	33	27
Refs and aircons	38	28	21	28	36	19	19
Miscellaneous appliances	37	43	39	40	28	24	21
<b>Parts Industry</b>							
Radio and TV parts	35	52	26	25	21	16	16

Source of basic data: *Tariff and Customs Code of the Philippines*, Tariff Commission.

from 71 percent in 1978 to 45 percent in 1991. The averages for the subsectors likewise went down substantially between 1978 and 1991. The only exception is cooking-heating appliances, where the average increased from 39 to 50 percent; this may have been due to the reduction in the number of tariff rates under EO 470. Nominal tariffs also went down between 1983 and 1988; the average tariff on output went down from 47 to 44 percent in the appliance industry and from 35 to 32 percent in the electronic parts industry.

Similar changes are seen in tariffs on inputs (Table 2). The average tariff on inputs for the appliance industry went down from 50 percent in 1978 to 30 percent in 1991. Average tariffs on inputs for most of the subsectors also went down between 1978 and 1991, with audio-video appliances showing the largest reduction from 59 to 29 percent.

**Table 3**  
**Central Bank Circulars Removing Restrictions on Appliances**

Circular No.	Date	Items Liberalized	No. of Items
1279	March 19, 1991	Record players, video cassette players and tape recorders	5
		Parts and components for record players, VCRs, and tape recorders	9
1337	April 27, 1992	TV sets	4
		Radios	9
		Parts and components for radios and TV sets	76
1347	July 27, 1992	Material inputs, parts and components for consumer electronics products	9
1356	Sept 25, 1992	Sewing machines	1
		Air conditioners	1
		Electric fans	2
		Washing machines	3
		Refrigerators and freezers	6
<b>Total</b>			<b>125</b>

Source: Central Bank of the Philippines.

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Import liberalization comprised the second part of the trade reform program. Restrictions on consumer durables, both final goods and inputs, were removed in 1991-1992 with several Central Bank Circulars (Table 3).

The attempts to remove quantitative restrictions over the years appear to be erratic. For example, some appliances were liberalized under Circular No. 850 in 1982 but were again restricted in the same year. The government later placed additional restrictions on refrigerators, air conditioners, freezers, and TV sets. A small number of non-electric cooking and heating appliances were also liberalized in 1986 under Circular No. 1105.

The majority of the restrictions, however, were removed in 1991 and 1992. Consumer electronics were the first to be liberalized through Circular No. 1279 in 1991, with five items for finished goods and nine items for parts and components. TV sets and radios followed a year later, along with the majority of the parts and components for consumer electronics that were restricted under PEPCEP. The rest of the PEPCEP parts and components were liberalized a few months later. The remaining items (13 for finished goods and six for parts) were the last to be liberalized in September 1992 with Circular No. 1356. A total of 31 items were liberalized for finished goods and 94 items for parts and components. According to the BOI, all restrictions on consumer durable imports have all been removed at present. The development program for consumer durables was effectively stopped with the liberalization of imports and the earlier removal of the controls on foreign exchange transactions. A BOI source says that there are no programs currently in place for the industry. The only BOI incentives currently available to appliance firms are those provided to exporters.

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## Studies on the Appliance Industry

SEVERAL studies have been written on the local appliance industry concerning various issues such as trade reform and competitiveness, market structure, and inter-firm linkages.

### THE EFFECTS OF TRADE REFORM

Perhaps the closest to the present study in terms of framework is Tan (1987), which looks at the effects of the 1981 Tariff Reform Program by measuring protection and competitiveness using EPRs and DRCs from a survey of 12 appliance firms. The industry's initial experience with trade reform through tariff reductions shows mixed results. There were modest gains in allocative efficiency, but firms had varying responses to the lowering of protection and there was no clear pattern of adjustment. EPRs went down and their range narrowed, and although DRCs went down, firms seemed to remain inefficient. It is possible that the mixed results were partly caused by the smallness of the sample. They may also be due to the prevailing import restrictions on appliances at the time. The study ends by urging further tariff reform in addition to import liberalization and measures to encourage more research and development.

### MARKET STRUCTURE

Patalinghug (1983) looks at industry structure and finds substantial concentration. Recent studies from the Asian Institute of

Management (for example, Soriano 1991 and Chan 1991) also point out the existence of barriers to entry in the industry. The studies serve more as guides to strategic planning for business enterprises but provide very useful insights into industry conditions.

#### OTHER STUDIES ON THE INDUSTRY

Hill (1981) analyzes subcontracting arrangements and local content policies (policies promoting the use of locally-produced parts and raw materials) for appliances and motorcycles. The importance of the parts industry is obvious; given the large number of parts and components needed to produce appliances, makers will normally decide against in-house production and instead require a reliable network of suppliers. In fact, as Hill observes, the development program for appliances was originally an attempt to develop the local parts and components industry. He concludes that while government policy helped increase local content in the 1970s, linkages between firms remain weak. Some fundamental change in both supplier and manufacturing industries must take place before local production can develop.

In general, the studies cited above on the appliance industry seem to point out two things: (1) The degree of competition in the domestic market is low; and (2) The industry appears to have remained inefficient or uncompetitive for some time. Except for Tan (1987), however, these studies do not focus on the links between trade policy, performance, and competitiveness.



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# The Effects of Trade Reform on Structure, Performance and Competitiveness

## SOME CONCEPTUAL DISTINCTIONS

**STRUCTURE** generally refers to the degree of competition in an industry. A low level of competition is often associated with poor performance and inefficiency (Scherer 1980). In the absence of effective competition, firms have no compelling reason to improve efficiency. Conversely, they perform best when competition is vigorous.

*Performance* is often measured in terms of productive efficiency which is composed of two types: Static efficiency and dynamic efficiency (Havrylyshyn 1990). Static efficiency denotes the level of efficiency at a given point in time. It is also composed of two types: Allocative and technical efficiency. Dynamic efficiency is related to efficiency over time. Changes in dynamic efficiency, which are more difficult to measure, are associated with technological progress, since improvements from innovation span more than a single period of time.

The concept of allocative and technical efficiency may be applied both to the economy and the firm. For example, efficiency improvements in the economy under trade reform may be described in the following manner.<sup>2</sup> Protection (in the form of tariffs and taxes,

2. The author is grateful to Dr. John H. Power for some of the ideas presented here.

for example) distorts the relative prices of goods and the allocation of resources. The prevailing market prices will thus deviate from free trade or shadow prices.

Consider a production possibility frontier (PPF) denoting combinations of two goods X and Y when resources are both fully employed and efficiently allocated (Figure 2). We use the two-good case since the results are also applicable to cases with any number of goods. Points on the PPF imply both technical and allocative efficiency. The PPF is determined by the state of "best practice" technology and the point marked C represents a deviation from best-practice technology.

Protection is intended to develop industries by modifying relative price lines and drawing resources towards the comparative advantage industries and helping them expand production. In Figure 2, this is shown by the difference in the shadow and market price lines. The relative price line PP' represents market prices with protection while BB' represents shadow or free trade prices. Point D denotes the optimal combination of goods with protection in place. However, it may also be argued that the wedge created by protection between shadow and market prices itself leads to deviations from best practice.

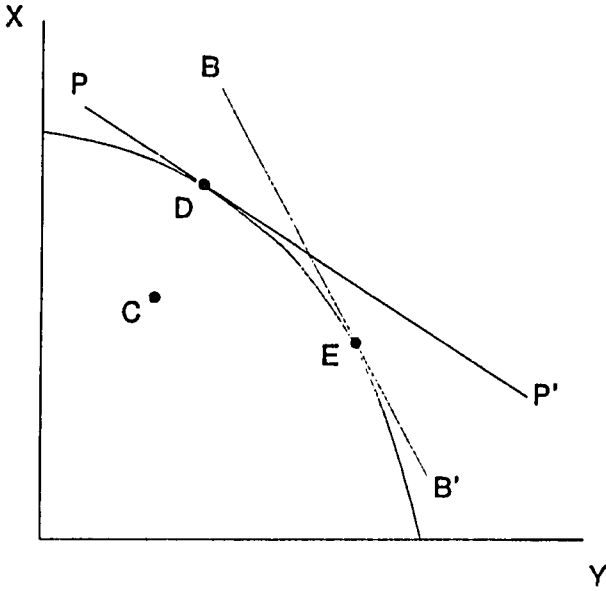
Trade reform may help remove some of the distortions and possibly shift the prevailing price line towards BB', making point E the optimal production choice. A movement by the economy from point C to E represents two types of gains in static efficiency: (1) an improvement in technical efficiency and managerial or x- efficiency; and (2) an improvement in allocative efficiency. Gains in dynamic efficiency, referred to as technical progress, are represented by a shift in the PPF away from the origin. It must be noted, however, that these gains may not occur if policies other than trade are the source of distortions.

A similar analysis may be used for the individual firm. Figure 3 describes static and dynamic efficiency gains based on the production and cost relations of the firm. (The diagram is taken from Kirkpatrick and Maharaj 1992.) The isoquant PP represents an industry's efficient "best practice" production frontier, determined by the current state of technology. Productivity improvements may be due to changes in static

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**Figure 2**  
**Trade Reform and Efficiency in the Economy**

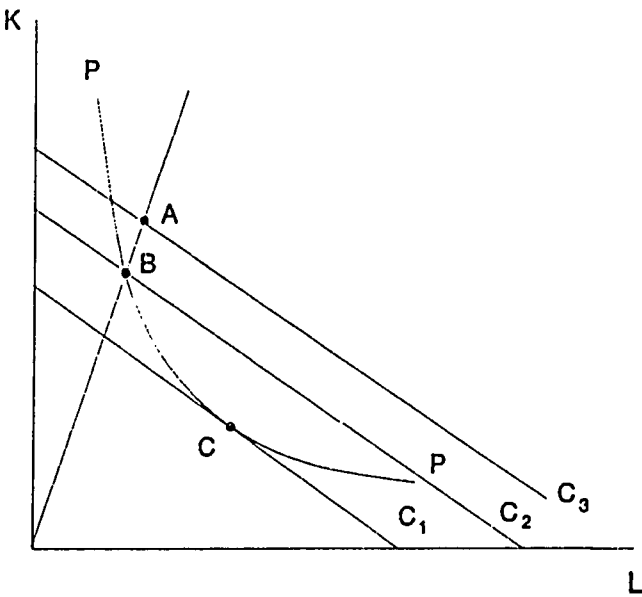
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**Figure 3**  
**Allocative and Technical Efficiency of the Firm**

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efficiency or to changes in dynamic technical progress. Gains in static efficiency are represented by a movement from a point above the frontier, such as point A, to a point on the frontier, such as point C.

A firm at point A is inefficient since it is producing at a higher cost than an efficient firm at point C. The firm's inefficiency has two components:

- 1) The cost of technical inefficiency ( $C_3 - C_2$ ) due to low factor productivity compared to a firm at B which uses the same capital-labor ratio; and
- 2) The cost of allocative efficiency ( $C_2 - C_1$ ) due to an incorrect choice of technique at existing factor prices.

To summarize, allocative efficiency in the industry generally pertains to the optimal combination of inputs used at given relative factor prices. For the individual firm (or plant), allocative efficiency refers to the optimal choice of technique at existing relative factor prices. Technical efficiency, on the other hand, refers to the optimal *use* of inputs, or producing the maximum amount of output possible with available inputs and existing technology. This study makes comparisons before and after trade reform — although available data permits analysis only up to the transition period for the reforms. Thus it focuses on changes in *static efficiency* as embodied by allocative and technical efficiency.

*Competitiveness* may be described as the ability of firms and industries to compete in the domestic market with importers and in external markets with other exporters (Tecson 1992).

#### TRADE POLICY REFORM, MARKET STRUCTURE, PERFORMANCE, AND COMPETITIVENESS

The poor performance of countries that espoused import-substituting policies has led to the thinking that these policies impose inefficiency costs on the economy because of substantial protection and regulation. Bhagwati and Srinivasan (1975), for example, attribute

resource misallocation and capacity underutilization in Indian manufacturing to import substitution. Substantial protection often led to growth in high-cost industries and to specialization that did not reflect comparative advantage (Rodrik, undated). Trade liberalization is expected to correct the distortions created by import substitution, and the advantages of an outward-oriented economy are widely discussed (e.g., Krueger 1980). For example, there is a reduction in the static inefficiency caused by resource misallocation and waste. Increased openness is also thought to enhance learning, technological change, and economic growth.

However, as Rodrik (1988) observes, doubts still prevail because of the apparently weak empirical evidence. The standard theory, used in earlier literature, assumes perfect competition in domestic markets. Studies assuming competitive markets often have neither strong nor conclusive results and fail to establish clear links between trade reform and improvements in performance (Harrison 1990). This has prompted interest in other areas, such as issues related to competition. The literature on the “new theory” of international trade (e.g., Helpman and Krugman 1985) combines industrial organization concepts with trade theory. In effect, it represents an attempt to provide better explanations of the pattern of trade and more conclusive results than those of earlier work which assume markets to be perfectly competitive systems (De Melo and Urata 1986). The approach is partly supported by the increasing evidence, particularly in developing countries, of imperfectly competitive markets marked by high seller concentration (Lee 1992).<sup>3</sup> However, the new theory offers many scenarios on trade reform but no clear directions for either theory or policy. Instead it simply stresses the *indeterminacy* of the outcome under imperfect competition, since the results depend on the behavior of firms (Kirkpatrick and Maharaj 1992). Recent work focuses on the effects of trade reform both across and within industries (e.g., Thomas and Nash 1991; Harrison 1990).

3. In the Philippines, evidence on extensive market concentration has been put forward by Lindsey (1977), De Dios (1986), and Abenoja and Lapid (1991). SGV (1992) presents an extensive analysis of existing barriers to entry.

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This study is premised on two ideas from the new theory. First, trade policy reform affects the competitive environment in a given market. Trade policy has a significant impact on the level of competition in the domestic market, particularly in developing countries where markets tend to be small (Harrison 1990). Second, market structure affects the behavior of individual firms, which in turn affects their response, in terms of performance, to policy changes. The level of domestic competition is therefore expected to at least partly affect the outcome of trade policy reform.

Under trade protection, there are two important sources of welfare loss within the industry (Tybout, De Melo, and Corbo 1991). First, in markets with free entry, the rents created by protection may attract small inefficient producers, thereby increasing average production costs within the industry. Second, in markets with barriers to entry, protected domestic firms will be able to exercise market power and extract monopoly rents. Market power may be defined as the ability to charge a price above marginal cost (Martin 1988). Without vigorous competition, firms will have little reason to move towards the "best effort" production frontier. Consequently, they may be unable to reach the maximum potential output from a given input combination (that is, attain technical or x-efficiency) or operate at minimum efficient scale (attain scale efficiency).

Trade reform affects the level of competition chiefly by increasing the competitive pressure from imports. With free entry and exit, liberalization leads to a rationalization of the domestic industry. Rodrik (1988) argues that increased competition forces out inefficient producers, thereby increasing both allocative and technical efficiency within the industry.

When barriers to entry are present, or when oligopolistic behavior is observed, exposure to international competition will tend to erode the shares of domestic firms and reduce market power. Domestic firms previously enjoying protection are induced to use resources more efficiently, use new technology, and cut down on costs (Nishimizu and Robinson 1984). This is often referred to as the **import discipline hypothesis**: competition (or simply the threat of competition) from imports induces domestic firms to adopt more

competitive behavior (De Melo and Urata 1986). The scenario holds even if trade liberalization reduces the number of domestic producers, since the outcome relies on increased competitive pressure coming from imports.

The study attempts to test the import discipline hypothesis on the effects of trade policy reform and examines the links between the level of competition and the adjustment process. Changes in the level of competition and the degree of market power in the industry are measured and analyzed together with those observed for allocative efficiency, technical efficiency, and competitiveness.

#### INFLUENCE OF OTHER FACTORS ON EFFICIENCY

Although the study focuses on the effects of trade policy, the influence of other factors on performance and competitiveness are equally important. For example, there may be non-price factors involved which are not directly related to trade liberalization. These factors would include plant- or firm-specific attributes related to efficiency. Pack (1988), for example, suggests that measures of allocative and technical efficiency can be related to characteristics such as entrepreneurial experience and technical knowledge. Page (1984) observes that firm size is thought to be systematically related to efficiency. For example, a large firm facing minimal competition may be more inefficient than a smaller one, other things being equal. Other non-price factors include: access to production technology; changes in capacity utilization; the ability to meet quality standards; and other production-related considerations. Furthermore, the present study also does not consider the *dynamic effects* of the policy changes, focusing instead on the static changes involved. Bhagwati and Srinivasan (1975) have noted that it is impossible to capture all the effects of policy changes using purely static measures.

Macroeconomic stability and the business cycle may also affect performance in a given year. For example, Tybout, De Melo and Corbo (1991) analyze trade liberalization in Chile using estimates of technical efficiency on cross-industry data. They conclude that large

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reductions in protection led to improvements in average efficiency, but macroeconomic shocks may have masked the effects.

#### HYPOTHESIS

It may be useful at this point to restate the hypothesis of the study concerning the relationship between trade reform, competition, and performance: Increased competition from imports due to trade liberalization has a positive effect on performance and competitiveness in the industry. Domestic firms are induced to behave more competitively because of the entry (or the threat of entry) of imports.



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## Data Sources and Methodology

### DATA SOURCES

This chapter describes the estimates of various measures of protection, concentration, efficiency, and competitiveness used in the study. Estimates are computed at the industry, subsector, and establishment levels. Subsector- and industry-level estimates are computed from totals of plant-level data.

The analysis relies primarily on data from the 1983 and 1988 Census of Manufacturing Establishments from the NSO. Additional data for 1986 and 1991 are obtained from a survey of firms and financial statements from the Securities and Exchange Commission (SEC).

In order to simplify the analysis, related 5-digit Philippine Standard Industrial Classification (PSIC) industries from the Census were grouped into **subsectors** in the same manner as the industry associations. The five-digit PSIC industries under the appliance industry are grouped as follows:

#### Audio-Video Appliances

PSIC 38321 Radio and TV sets, sound and recording equipment

#### Cooking-Heating Appliances

PSIC 38331 Electrical cooking equipment

38333 Cooking appliances (except ranges) and kitchen appliances

Refrigerators and Air Conditioners

- PSIC 38291 Air conditioners  
38298 Refrigerators

Miscellaneous Appliances

- PSIC 38293 Sewing machines  
38332 Electric fans, vacuum cleaners, floor waxers and  
polishers  
38339 Electrical appliances and housewares, n.e.c.

Radio and TV Parts

- PSIC 38325 Parts and supplies for radio and TV sets

To supplement the census data, copies of a questionnaire were sent to 52 firms, both appliance firms and parts and components makers. These include most of the market leaders and major brand names — although several known brands were also not included. Most of the firms surveyed were either unable or unwilling to reply due to lack of time, unavailability of company records, and fear of information leaks to competitors. Some also complained of the lengthiness of the questionnaire itself. The large firms generally kept more complete records than the small ones although the small ones were more open with information on their operations. Only 18 firms, most of them appliance makers, responded to the survey. Eleven are major brands; the rest are smaller and midsize firms in terms of market position. The available data made domestic resource cost (DRC) and effective protection rate (EPR) estimates possible for only three firms which furnished most of the requested numerical data, such as the value of various types of assets, the age of equipment, and managers' compensation. All three are large appliance makers and carry known brands. One is a market leader, and two have been in the top 1,000 list of corporations. One has significant exports, while the other two are primarily domestic-oriented. One is a multi-product firm, while the other two are limited to one or two products. Due to the limited survey data, the study's conclusions are based primarily on observations on the census data.

Protection is measured using estimates of EPR, which measure the protective effect of tariffs and taxes, and direct price comparisons, which account for the additional effect of quantitative restrictions. The level of competition is examined using various measures often used in the industrial organization literature. The level of foreign competition is measured by import penetration ratios, or the share of imports in the domestic market. The level of domestic competition and market power are measured by concentration ratios, the number and size distribution of plants, and price-cost margins. Performance is measured in terms of the following: exports; allocative efficiency (using the DRC); technical efficiency (using a frontier efficiency model by Nishimizu and Page [1982]); and factor productivity (using labor and capital). Competitiveness is measured using estimates of the DRC in *market prices*, which measures the viability of a business enterprise from the owner's point of view.

## TRADE POLICY REFORM

### *Effective Protection Rates*

Trade liberalization is expected to create a more open and outward-oriented trade regime by reducing the protection given to industries. Changes in the level of protection are measured using **effective protection rates** (EPRs) which indicate the amount of protection on the value added of a firm or industry.

EPRs are estimated for 1983 and 1988 using census data. EPRs for 1986 and 1991 are based on data from the survey and financial statements. The estimation method follows Bautista, Power, and Associates (1979), with some modifications.

The EPR is defined as the percentage excess of domestic value added over world (or free trade) value added (Tariff Commission, undated). The difference between domestic and free trade value added indicates the extent to which protection policy raises domestic prices above world prices. Thus we may write:

$$\begin{aligned}
 EPR &= \frac{DVA - FVA}{FVA} * 100 \\
 &= \left( \frac{DVA}{FVA} - 1 \right) * 100
 \end{aligned}$$

where  $DVA$  = Domestic value added  
 $FVA$  = Free trade value added

Alternatively:

$$EPR = \left( \frac{\frac{VO}{1 + S_j} - \frac{RM}{1 + S_i}}{\frac{VO}{1 + T_j} - \frac{RM}{1 + T_i}} - 1 \right) * 100$$

where  $VO$  = Value of output  
 $RM$  = Cost of material inputs used  
 $s_j$  = Sales tax on output  
 $s_i$  = Sales tax on inputs  
 $T_j$  = Implicit tariff on output  
 $T_i$  = Implicit tariff on inputs

The value of output is computed as the sum of the amount of goods sold and the change in finished goods and work-in-process inventories. Only half of work-in-process inventory is counted as part of output; the rest is assumed to be part of semiprocessed material inputs. Deflating the value of output and cost of material inputs with implicit tariffs converts them into *free trade (or border) prices*. Deflating them by the sales tax converts them into *domestic producer prices*.

### Implicit tariffs

Implicit tariffs measure the difference between domestic prices and border prices of comparable goods (Tariff Commission, undated).

The difference is due to various protective measures such as tariffs, taxes, and import restrictions. To estimate protection from tariffs and taxes, the formula for the implicit tariff on a particular commodity is:

$$T = [(1 + t) \cdot (1 + s)] - 1$$

where T = Implicit tariff rate  
 t = Nominal tariff rate  
 s = Sales tax

An implicit tariff rate is derived separately on both output and inputs for each subsector. The average nominal tariff rate on all products under each subsector is used for *t* and the average sales tax is used for *s*.

### *Net Effective Protection Rates*

Although the effective protection rate takes into account the distortions arising from protection policy, it does not include the distortion in the exchange rate which may also affect competitiveness. Protection (and market failures) often results in the overvaluation of the domestic currency — or, alternatively, the undervaluation of foreign exchange (Medalla 1979). Specifically, the protection system artificially holds down the price of foreign exchange and defends a lower exchange rate than what would prevail under free trade. Protection policy, in effect, penalizes exports through an overvalued currency. The estimated protection received by a firm or an industry would thus be lower if the exchange rate distortion were corrected, since value added in free trade or border terms would be larger.

To account for the exchange rate distortion, the effective protection rate is adjusted to include the difference between the market and shadow exchange rate. The shadow exchange rate is defined as the social price of a unit of foreign exchange. In the study, it is assumed to be 25 percent higher than the prevailing market exchange rate. The resulting **net effective protection rate** (NEPR),

expressed in terms of the EPR and the market and shadow exchange rates, may be written as:

$$NEPR = \frac{OER}{SER} (EPR + 1) - 1$$

where  $OER$  = official exchange rate; and  
 $SER$  = shadow exchange rate.

The NEPR is interpreted and analyzed in the same way as the EPR.

### *Direct Price Comparisons*

Changes in the structure of protection between 1983 and 1988 mainly involve the reduction of tariff rates and the removal of discriminatory taxes on imports. The EPR, however, may not capture the effect of the *quantitative restrictions* (QRs) that were still in effect during that time. Direct price comparisons are often used to account for the additional protection from the restrictions.

In price comparisons, we compute the ratio between domestic price ( $P_d$ ) and world (or border) price ( $P_b$ ). The higher domestic prices are than world prices, the higher the implied protection on the local product — and the less price-competitive it is in the world market. Figures for several products from 1985 to 1991 are taken from Appendix 4b of de Dios (forthcoming).

Tan (1987) notes several limitations to using price comparisons. One is that product differentiation appears to be substantial in the industry, and comparisons are bound to involve heterogeneous (or at least slightly differentiated) products. Another is that domestic prices are unit averages of only a handful of products, whereas border prices are unit averages of import values from numerous countries. In addition, the comparisons may not reflect differences in product quality between locally-made and foreign-made appliances.

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## MARKET STRUCTURE

We employ a number of measures of the level of competition often used in the industrial organization literature. In general, with increased competition from imports, one would expect the industry to move towards greater domestic competition. We first measure the amount of foreign competition based on the share of imports. Greater domestic competition is, in turn, indicated by an increased number and proportion of small-sized plants and reduced market power. Concentration is normally expected to fall, but it may also rise if the industry or subsector undergoes rationalization, where inefficient producers are forced out by increased competition.

### *Exposure to Import Competition*

Import penetration ratios indicate the industry's exposure to import competition by measuring the share of imports in the domestic market. The size of the domestic market is measured by the amount of local production minus exports and plus imports. Thus, we may write:

$$IPR = \frac{Imports}{Domestic\ Sales - Exports + Imports}$$

Ratios for the entire industry are computed using census and trade data. A match-up of commodities in the National Statistical Coordination Board (NSCB) Foreign Trade Statistics Yearbook and the census subsectors was constructed for the study. Total exports and imports were then taken for each subsector. Domestic production is measured by the total sales of all establishments. An increased share of imports in the domestic market implies stronger competitive pressure from imports, and possibly, a weaker influence on the part of the domestic firms. We thus expect import penetration ratios to increase with trade liberalization.

### *Seller Concentration*

The amount of competition in the domestic market is often measured by indicators of seller concentration, which is defined as the number and size distribution of firms in the market (Lee 1992). Market size is often measured in terms of output or value added. The higher the level of concentration in an industry, the greater would be the likely influence of its top firms, and the lower the degree of competition that would prevail.

Concentration ratios measure the influence of the largest  $n$  firms in the industry, typically the largest four. The study follows earlier work (e.g., Lindsey 1977) in using the four-firm value added concentration ratio — the combined share of the largest four establishments in total value added for the industry or subsector. An industry with a ratio greater than 60 percent may be considered highly concentrated (SGV 1992).

The Herfindahl index is another standard measure of concentration. We may write it in equation form as:

$$H = \sum s_i^2$$

where  $H$  = Herfindahl index; and  
 $s_i$  = the share of firm  $i$  in total value added for the industry or subsector.

The advantage of the Herfindahl index is that it includes the shares of all firms, whereas the concentration ratio focuses on the possible influence of the largest  $n$  firms (Martin 1988). In addition, the choice of  $n$  is often arbitrary and based on convention. If the industry is evenly dispersed in terms of size (or not concentrated), the Herfindahl index is equal to the reciprocal of the total number of firms. It is thus highly concentrated if  $H$  substantially exceeds the reciprocal of the number of firms — assuming a fairly large number of firms.

Patalinghug (1983) characterizes the industry as highly concentrated based on concentration ratios from 4-digit PSIC data. Using more disaggregated 5-digit data for 1983 and 1988, we



compute value added concentration ratios and Herfindahl indices for the industry and its subsectors. Trade liberalization is normally expected to cause a reduction in both concentration ratios and Herfindahl indices.

However, the measures used here do not include the share of imports. Thus, they pertain more to concentration among domestic producers rather than all sellers (Lee 1992). Concentration as measured in the study may therefore either rise or fall under trade reform. Increased concentration, for example, may simply be due to the rationalizing effect of trade reform, which forces out of the industry those inefficient producers previously attracted by high protection.

#### *The Size Distribution of Sellers*

Structure is also indicated by the size distribution of firms. An industry with a greater number and proportion of large firms is likely to be more concentrated. All things being equal, large firms are expected to have more influence in the industry than small firms. We classify plants according to size and construct a frequency tabulation. To standardize the classification across subsectors, total employment is used as a measure of the size of the firm. Small-sized firms are defined as those with 5 to 99 employees; medium-sized firms are those with 100 to 199; and large firms are those with 200 or more. The number and proportion of small and medium-sized firms are expected to increase, while those of the large firms are expected to decrease. This indicates a weakening of the influence of the large dominant firms.

#### *Profitability and Market Power*

Another indicator is the extent of market power or the ability of firms to raise prices above marginal cost. A measure often used is the price-cost margin, which is also associated with profitability and provides an indication of the extent of profits where substantial concentration is expected (Scherer 1980). The price-cost margin is

defined as the excess of price over marginal cost, expressed as a proportion of price:

$$PCM = \frac{p - mc}{p}$$

The measure indicates the deviation from competitive pricing (denoted by  $p = mc$ ). Since marginal cost is usually difficult to estimate, a number of proxies are employed in the literature. One of the often-used is employed by Lindsey (1977):

$$PCM = \frac{\text{Census Value Added} - \text{Compensation}}{\text{Value of Output}}$$

The difference between value added and compensation represents payments to factors other than labor and indicates profitability. The entry of imports is expected to reduce the ability of firms to raise prices above marginal cost, and price-cost margins are thus expected to fall. Estimates are computed for the industry and the subsectors using census data.

## PERFORMANCE

### *Exports*

Performance may be measured by the proportion of output exported by the industry, which is computed from NSO input-output tables for 1983 and 1988. Ratios are computed only for the appliance and electronic parts industries since the input-output data are for broadly-grouped sectors. However, the figures provide a general indication of export performance.

We also examine the level of exports. Trade statistics for selected years are collected and grouped based on a matching of trade and census classification made for the study. Data are collected for both the industry and the subsectors.

Exports are seen to increase with trade liberalization. The entry of imports may reduce the profitability the domestic market. Assuming there are no barriers to exporting, exports may become a means of expanding the firms' effective market. The import discipline phenomenon may also prompt local firms to export more.

### *Allocative Efficiency*

The DRC may be used in before-after comparisons as an *ex post* measure of the effects of the policy changes. This study uses the DRC in shadow prices to examine allocative efficiency before and after trade policy reform.

As a cost-benefit measure for a production activity, the shadow-price DRC is useful in developing countries with distorted markets and scarce foreign exchange. Distortions such as government intervention drive a wedge between market prices and the true social costs and benefits of goods and resources (Tariff Commission, undated). The DRC corrects for distortions by expressing in shadow prices the value of output and the cost of factors of production (which include foreign exchange). The shadow price is defined as the cost to society of providing the private sector an additional unit of a particular good (Tower 1992).

A high DRC estimate means that a production activity is using too much resources in earning or saving foreign exchange; the activity is *inefficient*, and society would do well to cut down on it. The socially efficient level of the DRC is usually set in relation to the shadow exchange rate (SER); the ratio between the DRC and the SER measures allocative efficiency and comparative advantage. A DRC-SER ratio between 0 and 1.2 implies a high level of allocative efficiency and comparative advantage. Socially efficient DRC/SER values are traditionally between 0 and 1 but we make an allowance of 0.2 for measurement errors. A DRC/SER of 1.2-1.5 indicates mild inefficiency, while a value greater than 1.5 indicates outright inefficiency. A DRC estimate below zero indicates negative net foreign exchange earning or saving - the activity's foreign cost exceeds

the border value of its output. It is roughly similar in meaning to an infinitely high DRC.

Estimates of the DRC in shadow prices are for the industry, the subsectors, and individual plants. It may be written as follows:

$$DRC = \frac{\textit{Cost of Domestic Resources}}{\textit{Net Foreign Exchange Earned or Saved}}$$

The cost of domestic resources is in pesos, while the net foreign exchange earned or saved is in dollars. Alternatively, we may write:

$$DRC = \frac{\textit{Domestic Cost in Shadow Prices}}{\textit{Border Value of Output - Foreign Cost in Border Prices}}$$

All costs are in shadow prices. Domestic costs (the numerator) are in pesos. The value of output and all foreign costs (whose difference make up the denominator) are in dollars and in free trade or border values.

We estimate the DRC by computing for the value of output and the cost of inputs. The cost of inputs has five major components: (1) interest and depreciation costs of fixed assets; (2) interest cost on working capital; (3) cost of raw materials and supplies; (4) labor cost; and (5) other domestic costs. A sixth item, other foreign costs, is not included because there are no available data from the Census. Each of these five cost items is broken up into its domestic and foreign components using allocation ratios. The domestic portions of each of the five factors are expressed in producer (i.e., exclusive of taxes) and shadow prices and then added up. The foreign portions of each factor are expressed in free trade or border prices using implicit tariffs and added up. The totals are then plugged into the DRC formula. Fixed assets refer to buildings, machinery and equipment, transport equipment, and other assets such as furniture and office equipment. Working capital is made up of inventories of material inputs, work-in-process, and finished goods. Other domestic costs consist of services done by others, rent, royalty payments, and subsidies.

### Interest and depreciation costs on fixed assets

Interest and depreciation costs on fixed assets are derived from estimates of the replacement cost (or the present cost of replacing an asset). The following allocation ratios are used to separate interest and depreciation costs into their domestic and foreign components:

	<b>Domestic</b> (%)	<b>Foreign</b> (%)
<i>Interest Cost</i>		
Buildings	85	15
Machines	85	15
Transportation equipment	85	15
Other fixed assets	100	0
<i>Depreciation Cost</i>		
Buildings	100	0
Machines	0	100
Transportation equipment	20	80
Other fixed assets	15	85

These ratios are based on the assumption that much of financial capital (on which interest is paid) is sourced locally, and much of physical capital (on which depreciation is charged, except on buildings) is imported.

### Interest cost on working capital

Working capital refers to inventories of material inputs, work-in-process, and finished goods. The computed interest cost on working capital is based on the computed interest on average inventory levels.

### Labor cost

Labor costs consist of basic salaries and wages and overtime pay. Contributions to government or private insurance institutions and other benefits are not included.

Total labor cost is simply the sum of the number of unskilled workers, skilled workers, and working owners, each multiplied with the appropriate shadow wage rate for each group. The resulting sum is treated as part of domestic costs.

### Cost of material inputs and supplies

Material inputs include both the major and minor material inputs used in production. Supplies include packaging materials, office supplies, fuel, gasoline, electricity, water, and other utilities. The reported value for each item is broken up into its domestic and foreign components using the following allocation ratios:

	<b>Domestic</b> (%)	<b>Foreign</b> (%)
Major and minor material inputs		
Air conditioners	30	70
Sewing machines	63	37
Refrigerators	62	38
Radio and TV sets, sound and recording equipment	36	64
Electrical cooking equipment	47	53
Electric fans, vacuum cleaners, floor waxers and polishers	52	48
Cooking appliances (except ranges) and kitchen appliances	10	90
Electrical appliances and housewares, n.e.c.	17	83
Parts for radio and TV sets	45	55
Packaging materials	10	90
Office supplies	15	85
Water	100	0
Electricity	100	0
Other non-tradeable utilities	100	0
Lubricants	0	100

Diesel	0	100
Fuel and gasoline	0	100
Liquefied petroleum gas	0	100
Bunker fuel	0	100
Coal	0	100
Other purely importable utilities	0	100

The allocation ratios for major and minor material inputs are obtained from survey data. Firms reported the percentage of total material inputs which was imported and an average was computed for each industry group.

#### Other domestic costs

Other domestic costs include industrial and non-industrial services done by others. Subsidies are also part of domestic costs since they represent costs from a social point of view. Other examples include rent and royalty payments. These costs are simply added up and no longer adjusted.

#### Value of output

The value of output is composed of the amount of goods sold, the change in finished goods inventory, and half of the change in work-in-process inventory. Exported output is separated from output sold locally. Goods sold locally are converted into free trade terms by deflating them with the official exchange rate and the implicit tariff. Exports are deflated only by the official exchange rate since tariffs and taxes on exports are assumed to be zero. The sum of these two values becomes the border value of production. Thus:

$$BVO = \frac{VX}{OER} + \frac{VDS}{OER * (1 + T_j)}$$

where  $BVO$  = border value of production;  
 $VX$  = value of goods sold locally;

$VDS$  = value of exports;  
 $OER$  = market exchange rate; and  
 $T_j$  = implicit tariff on output.

The sum of the domestic portions of each cost item becomes the numerator of the DRC formula, while the sum of the foreign portions is subtracted from the border value of production as part of the denominator.

$$DRC = \frac{\text{Total Domestic Costs}}{\text{Border Value of Production} - \text{Total Foreign Costs}}$$

All costs are expressed in shadow prices. Domestic costs, the numerator, is valued in pesos. The border value of output and all foreign costs are in dollars and in border values.

### Frequency distributions

Frequency distributions are used in order to show the link between performance and other variables. Specifically, there is an attempt to relate efficiency with protection and firm size. Protection is measured by EPRs, efficiency by the DRC and firm size by the level of employment.

To see the correlation between efficiency and protection, we construct a frequency distribution for the DRC-SER ratio and the EPR. Establishments are classified according to the level of protection using multiples of the average EPR for the entire manufacturing sector. Those with EPRs substantially exceeding the manufacturing average are considered highly protected. Observations are also classified according to DRC-SER ratios. A possible correlation between high EPRs and high DRC-SER ratios among establishments would imply that high levels of protection may have at least partly caused inefficiency in the industry.

We also relate efficiency with firm size. Small-sized plants are defined as having 5 to 99 employees; medium-sized plants are those with 100 to 199; and large plants are those with more than 200. Small



plants may have experienced difficulties in importing needed parts because of exchange controls which tended to favor large firms. In addition, imported inputs typically embody technology that is unavailable to domestic firms (Nishimizu and Robinson 1984). The hypothesis is that lifting of restrictions on various parts and components enabled smaller plants to gain access to better-quality (or at least less costly) imported inputs and thus improve their efficiency.

### *Technical Efficiency*

We compute measures of technical efficiency, which is defined as the ability to produce the maximum possible output from a specified amount of inputs given existing technology (Nishimizu and Page 1982). Most studies use Farrell's (1957) approach, which involves estimating a frontier or "best practice" production function that represents the maximum achievable output for any given level of inputs. Attainment of the maximum is assumed to arise from adherence to best practice. When maximum output is known, an index of technical efficiency may be constructed using the ratio between actual output and the maximum level of output.

Nelson (1981) observes two weaknesses in the frontier model. First, it assumes that firms in an industry are sufficiently homogenous to be grouped together and represented by a single production frontier. Production technology may vary greatly even within an industry, particularly with multi-product firms. Second, the use of actual data to estimate the frontier may generate an average production function instead of a "best practice" production frontier, which the estimation theoretically represents.

Two common methods for the estimation are the deterministic method and the stochastic method. Deterministic models identify the difference between actual output and maximum potential output as being exclusively due to inefficiency. Stochastic models, such as that by Aigner, Lovell and Schmidt (1979), break up the deviation into two components: technical inefficiency and a random disturbance term. This separates technical inefficiency from other factors which

may cause deviations from the frontier, making stochastic models more accurate than deterministic models. However, the statistical software for a stochastic model is not available. We use instead a deterministic model by Nishinizu and Page (1982) which estimates a transcendental logarithm (or translog) frontier production function using linear programming. The translog form imposes fewer restrictions on the structure of production than the Cobb-Douglas form used in many studies and is regarded as more flexible.

The estimation uses plant-level data to compute technical efficiency indices for plants in the appliance and electronic parts industries. Since most firms in the appliance industry produce more than one product and may therefore employ divergent technology for different products, the observations are treated as a single sample of multi-product firms. Although this may precisely lead to an average function, it seems reasonable since the sample for some subsectors is too small for estimation. For the electronic parts industry, plants seem to be more homogenous.

The linear programming model represents deviations from the frontier as an optimization problem. It minimizes the deviations of actual output from maximum potential output subject to a number of constraints, using a translog production function for the “best practice” frontier. The problem is set up as follows:

Minimize  $Y_i - Y$

where  $Y_i = a_0 + \alpha_L \ln L + \alpha_K \ln K + \alpha_M \ln M$   
 $+ \alpha_{LK} \ln L \cdot \ln K + \alpha_{LM} \ln L \cdot \ln M + \alpha_{KM} \ln K \cdot \ln M$   
 $+ \frac{1}{2} \alpha_{LL} (\ln L)^2 + \frac{1}{2} \alpha_{KK} (\ln K)^2 + \frac{1}{2} \alpha_{MM} (\ln M)^2$

subject to the following constraints:

$$(i) \quad \alpha_L + \alpha_K + \alpha_M = 1$$

$$(ii) \quad \alpha_{LK} + \alpha_{LM} + \alpha_{LL} = 0$$

$$\alpha_{KL} + \alpha_{KM} + \alpha_{KK} = 0$$

$$\alpha_{ML} + \alpha_{MK} + \alpha_{MM} = 0$$

$$\begin{aligned}
 \text{(iii)} \quad & \alpha_{LL} \leq 0 \\
 & \alpha_{KK} \leq 0 \\
 & \alpha_{MM} \leq 0
 \end{aligned}$$

where

- $Y_e$  = Estimated maximum potential output
- $Y$  = Value of actual output, computed in the same manner as in the DRC estimation
- $L$  = Total number of man-hours
- $K$  = Cost of capital (interest cost plus depreciation cost)
- $M$  = Cost of material inputs

The above problem produces coefficients for the frontier production function that defined maximum output. Technical efficiency is then:

$$\text{Technical Efficiency} = \frac{Y}{Y_e}$$

The import discipline hypothesis predicts that technical efficiency will improve since firms will be forced to make better use of their inputs in order to compete successfully with imports.

### *Factor Productivity*

The most common measures of factor productivity compare some indicator of output with the existing stock of an input. Value added is used in place of output since the census data are for plants rather than firms. Capital is measured by the value of the stock of capital at replacement cost, while labor is measured by the number of workers. Inputs are treated as a *stock* since we wish to measure the productivity of the existing stock of inputs. This contrasts with the technical efficiency estimation which looks at the efficiency of input *use* and thus treats inputs as a *flow*. The values for the replacement cost of capital are derived using formulas from the estimation of the domestic resource cost in shadow prices.

Factor productivity is expected to increase with trade liberalization for the same reasons that efficiency is expected to increase: Firms will be induced by competitive pressure to improve the use of inputs. However, it is also possible that observed increases in factor productivity may be simply due to increases in capacity utilization.

The census value added and replacement cost of capital stock are first converted into 1972 prices before computing for the ratios.

$$\text{Capital Productivity} = \frac{\text{Census Value Added}}{\text{Capital Stock at Replacement Cost}}$$

$$\text{Labor Productivity} = \frac{\text{Census Value Added}}{\text{Number of Workers}}$$

#### COMPETITIVENESS

Competitiveness is measured using the domestic resource cost in *market prices* (denoted as DRC\*), which is the ratio of total domestic cost in market prices to the net foreign exchange earned or saved (Tecson 1992). We may write

$$\text{DRC}^* = \frac{\text{Domestic cost per unit or output in market prices}}{\text{World price - Foreign cost per unit of output}}$$

The formula measures the average cost (in market prices) of earning or saving a unit of foreign exchange and provides an indication of the market viability of a firm from its owners' point of view (Tecson 1992). The DRC\* may also denote profitability since — if measured properly — it is roughly equivalent to the price-cost margin. It is interpreted in a similar manner as the domestic resource cost (DRC) in shadow prices. A low DRC\* estimate indicates that the enterprise is viable. Like the shadow-price DRC, the market-price DRC is compared with the official exchange rate to get an indication of *competitive* advantage or the ability to compete in international markets.

The estimation is almost the same as that for the shadow-price DRC, except that the numerator (domestic costs) is expressed in *market* prices while the denominator (difference between output and foreign costs) remains in border prices. Competitiveness is expected to increase because of the removal of distortions in the economy (such as currency overvaluation) and partly because of the import discipline phenomenon. Increased import competition may improve a firm's ability to compete in the market, since it will have to work harder to maintain its position.

It is possible to observe similar movements in DRC in shadow prices and DRC in market prices (or in comparative and competitive advantage), since they are described by the following relationship:

$$\frac{DRC^*}{OER} = \frac{DRC}{SER} \cdot \frac{SER}{OER} \cdot \frac{DRC^*}{DRC}$$

where  $DRC^*$  = Domestic resource cost in market prices  
 $DRC$  = Domestic resource cost in shadow prices  
 $OER$  = Official exchange rate  
 $SER$  = Shadow exchange rate

Thus, competitive advantage ( $DRC^*/OER$ ) is made up of three components: (1) comparative advantage ( $DRC/SER$ ); (2) the distortion in the exchange rate system due to protection policy ( $OER/SER$ ); and (3) other possible distortions in the economy due to the incentive system ( $DRC^*/DRC$ ). Consequently, we may observe firms and industries showing comparative, but not competitive, advantage due to distortions caused by the incentive system in the exchange rate and in the economy itself.

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## Analysis of Results

**T**HIS chapter examines the changes in the industry during trade policy reform. It presents the estimation results and attempts to describe the adjustment process.

Competition is expected to increase with the entry of imports. Although lower concentration is expected, higher concentration may occur if industry rationalization takes place, since the concentration measures pertain more to production concentration. Inefficiency is then expected to decline and performance and competitiveness to improve as domestic competition increases.

We examine changes in market structure, performance, and competitiveness and attempt to relate them with observed changes in protection policy below.

### PROTECTION POLICY

#### *Effective Protection Rates*

Effective protection rates (EPRs) measure the level of protection on value added for a firm or industry. Estimates were made for the industry and its subsectors using census data from the NSO as presented in Table 4.

There is a general decline in effective protection between 1983 and 1988 for the industry. The EPR for the appliance industry went down significantly, by 40.56 percent, while those for the subsectors, including electronic parts, went down by half on the average. Audio-video appliances showed the largest decrease.



Table 4

## Effective Protection Rates and Implicit Tariff Rates: 1983 and 1988

	1983						1988						Change in EPR
	EPR	NEPR	Ave Tj	Ave Ti	Tj	Ti	EPR	NEPR	Ave Tj	Ave Ti	Tj	Ti	
<b>Appliance Industry</b>	70.15	36.12					41.69	13.36					-40.56 %
Subsectors													
Audio-video appliances	128.82	83.05	49.94	35.00	105.63	51.87	38.49	10.79	33.54	31.67	65.00	44.84	-70.12
Cooking-heating appliances	39.25	11.40	44.95	50.00	96.88	82.81	18.91	-4.87	36.24	50.00	65.00	65.00	-51.82
Refs and aircons	182.48	125.98	58.62	35.16	95.39	64.73	81.19	44.96	40.95	30.00	59.50	43.00	-55.51
Miscellaneous appliances	45.39	16.31	42.19	40.00	83.34	66.25	27.18	1.74	34.76	40.00	61.34	54.00	-40.12
<b>Parts Industry</b>													
Radio and TV Parts	69.30	35.44	37.37	27.37	77.19	43.29	33.66	6.93	28.90	26.32	44.84	38.95	-51.43

All figures are in percentage terms.

EPR = Effective Protection Rate

Ave Ti = Average Implicit Tariff on Inputs (exports and importables)

NEPR = Net Effective Protection Rate

Tj = Implicit Tariff on Output (importables)

Ave Tj = Average Implicit Tariff on Output (exports and importables)

Ti = Implicit Tariff on Inputs (importables)

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

As with the EPR, the *average implicit tariffs* in Table 4 measure the combined protection on both importables and exportables. In general, the EPR tends to be higher (lower) than the average  $T_j$  when the average  $T_j$  is greater (less) than the average  $T_i$ . The implicit tariffs on inputs and output ( $T_i$  and  $T_j$ ) denote protection only on *import substitutes* and were used to derive border values for EPR and DRC estimates.

Effective protection on different types of goods is also partly affected by the exchange rate. Tradeable goods may either be penalized (relative to nontradeables) by an overvalued currency or protected by an undervalued currency (Tan 1979). The EPRs are corrected for the distortion in the exchange rate distortion to derive the **net effective protection rates** (NEPRs):

$$NEPR = \frac{OER}{SER} (EPR + 1) - 1$$

where  $OER$  = the official exchange rate; and  
 $SER$  = the shadow exchange rate.

The penalizing effect of currency overvaluation on tradeables relative to nontradeables is shown by the similar movements in EPRs and NEPRs and the smaller values for the NEPRs.

To use more recent data, EPRs were also estimated for 1986 and 1991 using financial statements and survey data for the three firms. The EPRs went down between 1986 and 1991, indicating that protection also fell when restrictions were lifted in 1991. The EPR for Firm A went down from 62.26 to 47.12 percent; for Firm B from 91.05 to 65.87 percent; and for Firm C from 69.0 to 55.36 percent.

It is important to note that during the period 1983-1988, the reforms were still incomplete. Most import restrictions were not removed until 1991. In addition, the EPR estimates account only for the protective effect of tariffs and taxes. The effect of quantitative restrictions (QRs), another important protection measure for the industry, is not captured in the figures above.



### *Direct Price Comparisons*

The combined effect of both tariffs and quantitative restrictions is to raise the price of the domestic product above the corresponding border or world price. Direct price comparisons incorporate the protective effect of import restrictions by measuring the ratio between the domestic and the foreign price.

Table 5 shows price comparisons from a recent study on import restrictions (de Dios, forthcoming). Since most restrictions remained until 1991, the figures are not expected to change significantly before that year. The main purpose of the comparisons is to find out if significant price differences exist and thus determine the importance of the restrictions. The figures generally indicate substantial differences between domestic and foreign prices but do not show any trend over time. High price ratios are also observed even after tariffs went down

**Table 5**  
**Direct Price Comparisons for Selected Appliances: 1985 to 1991**

	Pd / Pb* (in percent)						
	1985	1986	1987	1988	1989	1990	1991
Radio sets	57	88	105	102	96	88	90
Radio phonos	19	15	23	131	234	184	131
Air conditioners	298	247	253	262	264	250	247
TV sets	180	116	124	114	106	122	80
Electric fans	174	226	253	352	371	361	325

\* Pd = Domestic price, computed using wholesale prices obtained from the National Statistics Office (NSO)

Pb = Foreign price, derived from Hong Kong unit import values

The wholesale prices from the NSO consist of the ex-factory price plus taxes, markup, the wholesale trade margin and the distribution cost of the wholesaler.

The price ratios above indicate whether substantial differences exist between the domestic and foreign prices of products. Import restrictions on the above products were reimposed in 1982 and 1983 and were not removed until 1992.

Source: Appendix 4b in de Dios (forthcoming).

— a possible effect of the restrictions. The restrictions thus seem to have a considerable effect on the level of protection.

However, although the restrictions appear to be important in protecting the industry, they do not seem to be fully binding for two reasons. One is that the share of imports (to be discussed below) increased. The other is that substantial domestic-foreign price differences were observed both before and after tariffs were reduced. It can also be argued that the share of imports would be higher if no QRs were present. Thus, the restrictions seem to have raised the price of imports and may have dampened the positive effects of reduced protection, but they also did not completely curtail imports.

### *Overall Changes in Protection*

We observe a general reduction in effective protection using census data for the appliance and electronic parts industries. Similarly, the estimates from the survey point to a possible reduction in effective protection between 1986 and 1991. However, we also find substantial differences between the domestic and foreign prices of some appliances, which may be an effect of the quantitative restrictions. The quantitative restrictions appear to be not fully binding since the share of imports increased even as substantial price differences were observed.

We turn to the corresponding changes in the level of competition, performance, and competitiveness in the succeeding discussion.

## MARKET STRUCTURE

### *Competition from Imports*

We first measure the effect of trade liberalization on the amount of competition from imports. Inport penetration ratios, defined as the share of imports in total domestic demand, are estimated from census and trade data using a match-up of commodities and census subsectors constructed for the study.

Import penetration ratios increased between 1983 and 1988 for the appliance industry (Table 6), the increase seems consistent with the observed decline in effective protection. The same is true for the electronic parts industry and the subsectors, except for audio-video appliances. For this subsector, the share of imports went down, even as effective protection declined. This may be a possible effect of the import restrictions which act as an important protective measure despite being not completely binding.

Trade data (Table 7) also show an increase of about \$36 million in appliance imports between 1983 and 1988. Some manufacturers have cited smuggling and competition from the Duty Free Shops (which sell appliances at lower prices) as major industry problems providing unfair competition. One firm estimates that smuggled air conditioners account for about 30 percent of the domestic market. These problems may work against the protection measures. The availability of lower-

**Table 6**  
**Import Penetration Ratios: 1983 and 1988**

	Import Penetration Ratio		Change
	1983	1988	
<b>Appliance Industry</b>	6.77	16.86	149.04
Subsectors			
Audio-video appliances	7.45	1.41	-81.07
Cooking and heating appliances	8.45	17.03	101.53
Refs and aircons	19.99	43.89	119.56
Miscellaneous appliances	5.21	13.69	162.76
<b>Parts Industry</b>			
Radio and TV parts	8.03	46.62	480.57

All figures are in percent.

The import penetration ratio is defined as the percentage share of imports in the domestic market.

Import Penetration Ratio = Imports / (Domestic Sales - Exports + Imports)

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office, and *Foreign Trade Statistics*, National Statistical Coordination Board.

Table 7

## Imports of Finished Goods: 1972 to 1991

	Value of Imports (CIF in dollars)					
	1972	1978	1981	1983	1988	1991
<b>Appliance Industry</b>	3,839,147	25,375,597	43,371,823	16,090,723	53,088,753	46,336,758
Subsectors						
Audio -video appliance	2,772,360	17,787,239	32,006,153	6,276,961	2,093,205	22,798,194
Cooking, heating appliances	740,572	395,087	641,772	1,564,580	2,377,359	4,301,176
Refs and aircons	326,215	7,193,271	10,723,898	8,249,182	48,618,189	19,237,388
Miscellaneous appliance	121,399	2,927,387	4,347,109	5,108,752	6,088,950	6,861,063
<b>Parts Industry</b>						
Radio and TV parts	7,339,717	16,072,355	23,419,528	32,934,128	532,269,943	133,614,740

Source of basic data: *Foreign Trade Statistics Yearbook*, National Statistical Coordination Board.

**Table 8**  
**Imports of Material Inputs: 1972 to 1991**

	Value of Imports (CIF in dollars)					
	1972	1978	1981	1983	1988	1991
<b>Appliance Industry</b>	13,860,158	81,746,058	120,311,656	189,884,404	390,284,394	180,959,150
Subsectors						
Audio -video appliances	7,339,717	47,858,142	82,393,968	155,585,319	350,867,854	143,815,490
Cooking, heating appliances	170,170	374,850	487,782	591,074	450,653	611,147
Refs and aircons	4,361,424	30,418,505	34,018,005	30,620,621	35,135,181	32,737,038
Miscellaneous appliances	1,988,847	3,094,561	3,411,901	3,087,390	3,790,706	3,795,475
<b>Parts Industry</b>						
Radio and TV parts	1,757,650	31,785,787	58,974,440	122,649,342	297,640,911	10,200,750

Source of basic data: *Foreign Trade Statistics Yearbook*, National Statistical Coordination Board.

priced imports, legal or otherwise, effectively increases import competition, and may also contribute to the changes in performance and competitiveness. Duty Free sales, for example, may have helped to increase the share of imports in spite of the import restrictions.

### *Concentration*

The degree of domestic competition is measured by indicators of concentration, defined as the number and size distribution of firms in the market (Lee 1992). Higher concentration may imply a greater amount of influence for the larger firms and a lower degree of competition. The study uses four-plant concentration ratios (CR4) and Herfindahl indices for the industry and the subsectors. The CR4 is the combined share of the largest four plants in total value added or output for the industry, while the Herfindahl index is the sum of the squares of the shares of all plants.

Trade liberalization is expected to foster greater competition. However, the concentration measures exclude the share of imports and thus reflect concentration only among *producers* rather than sellers. Greater competition in the industry may therefore occur with either higher or lower concentration. A rise in concentration, for example, may simply be due to the *rationalizing* effect of trade reform, which forces out inefficient producers attracted earlier to the industry by high protection.

The Herfindahl index shows reduced concentration for the appliance industry (Table 9), although the four-plant concentration ratio seems to have hardly changed. The Herfindahl index is considered more accurate since it includes all plants in the industry (or subsector), whereas the CR4 shows only one point on the cumulative distribution curve for the industry (Lee 1992).

Both measures declined for miscellaneous appliances and electronic parts. Both increased for cooking-heating appliances and refrigerators-air conditioners, possibly indicating the exit of inefficient producers. For audio-video appliances, the concentration ratio increased while the Herfindahl index went down. Thus, even as the share of the largest four plants increased, the size dispersion of plants



Table 9

## Measures of Seller Concentration and Market Power: 1983 and 1988

	4-Plant Concentration Ratio (%)		Herfindahl Index (%)		Price Cost Margin (%)			
	1983	1988	1983	1988	1983	1988		
<b>Appliance Industry</b>	65.37	65.35	15.76	(1.56)	14.85	(1.64)	20.35	11.63
Subsectors								
Audio-video appliances	87.06	89.64	49.11	(5.88)	39.63	(6.25)	17.79	12.25
Cooking, heating appliances	98.87	99.61	34.32	(12.50)	44.39	(20.0)	22.61	7.85
Refs and aircons	68.66	87.58	14.12	(5.26)	54.33	(5.0)	13.85	6.72
Miscellaneous appliances	88.72	74.77	44.27	(5.0)	21.16	(5.0)	24.92	18.19
<b>Parts Industry</b>								
Radio and TV parts	61.38	40.70	12.87	(3.13)	6.79	(1.96)	18.7	12.14

4-Plant Concentration Ratios and Herfindahl Indices are computed using census value added.

The data set was cleaned for missing and negative values before computations were made.

Figures in parentheses are reciprocals of the number of establishments, denoting the competitive benchmark for Herfindahl indices.

Price Cost Margin = ( Value Added - Compensation ) / Value of Output

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

seems to have narrowed down. Concentration may thus generally have decreased for the appliance subsectors. It also appears to have decreased for the electronic parts industry based on both measures. The industry, however, remained highly concentrated in 1988. This is indicated by (a) the largest four plants comprising more than 60 percent of industry size, or (b) the Herfindahl index being significantly greater than the reciprocal of the number of plants, assuming a sizable number of plants. A larger Herfindahl index indicates greater dispersion in the size distribution of plants in the industry. The concentration ratio for appliances decreased but was still above 60 percent in 1988; the same is observed for miscellaneous appliances. By contrast, the radio and TV parts subsector became only moderately concentrated in 1988.

The increases in concentration in two subsectors (cooking-heating and refs-aircons) coincided with reduced protection and may signify some sort of rationalization due to trade policy reform. For the other subsectors and the parts industry, reduced concentration and higher import penetration ratios imply a move towards greater competition. It thus appears that competition in the industry has generally increased with the entry of imports.

### *Number and Size Distribution of Plants*

Between 1983 and 1988, the total number of plants decreased slightly for the appliance industry and increased by more than half for the parts industry (Table 10). Audio-video and cooking-heating appliances had fewer plants, miscellaneous appliances showed no change and refs-aircons added one more. As for size, small plants are defined as those with 5-99 employees, medium-sized plants with 100-199 employees, and large plants with more than 200.

The number of small plants did not change in the appliance industry, but the number of both medium-sized and large plants fell, causing a larger proportion of the small plants (from 58 to 61 percent). The majority, however, were large in both years. For the electronic parts industry, there was an increase in all size groups, with the small plants almost doubling in number. The proportion of small plants



**Table 10**  
**Size Distribution of Plants Based on Employment: 1983 and 1988**

	Plant Size							
	1983				1988			
	Small	Medium	Large	Total	Small	Medium	Large	Total
<b>Appliance Industry</b>	37	9	18	64	37	8	16	61
Subsectors								
Audio -video appliances	6	2	9	17	7	1	8	16
Cooking, heating appliances	5	1	2	8	2	1	2	5
Refs and aircons	14	3	2	19	14	5	1	20
Miscellaneous appliances	12	3	5	20	14	1	5	20
<b>Parts Industry</b>								
Radio and TV parts	8	3	21	32	15	9	27	51
Small = 5 to 99 employees								
Medium = 100 to 199 employees								
Large = 200 employees and above								

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

increased from 25 to 29.4 percent, while that of large plants decreased from 65.6 to 52.9 percent. Most of the plants were likewise large in both years.

The increased relative proportion of small plants in the industry coincides with reduced concentration, bolstering the possibility that reduced protection resulted in a more competitive industry structure.

### *Profitability and Market Power*

The extent of market power, or the ability to raise prices above marginal cost, is another indicator of the amount of competition. A commonly-used measure for market power is the price-cost margin (PCM), which is also associated with profitability and therefore provides an indication of the amount of profits where high concentration is expected (Scherer 1980). Price-cost margins are expected to decline since increased import competition is expected to reduce the ability of firms to raise prices above marginal cost.

The results seem to agree with expectations. Price-cost margins went down for the appliance industry, its subsectors, and for the electronic parts industry (Table 9). Interestingly, except for the audio-video subsector, reduced price-cost margins seem to be associated with higher import penetration ratios (shown in Table 6). Increased competition from imports may have reduced the profitability or market power of incumbents. In addition, except for the cooking-heating and ref-aircon subsectors, lower price-cost margins also coincide with lower concentration based on Herfindahl indices. This agrees with findings by earlier studies (e.g., Cowling 1976) of a positive relationship between concentration and price-cost margins.

Lower price-cost margins are observed with higher Herfindahl indices and higher import ratios in the ref-aircon and cooking-heating subsectors, which may imply rationalization from increased import competition. For miscellaneous appliances and electronic parts, lower price-cost margins coincided with reduced concentration and increased import penetration — likewise signifying greater competition. Audio-video appliances showed a different combination of results: reduced import competition with decreased concentration

and a lower price-cost margin. The reduced import share may have been due to improved competitiveness of audio-video products — which in turn may have been brought about by heightened competition as implied by the lower price-cost margin.

Reduced market power and profitability within the industry thus seem to be attended by two things: An overall increase in the share of imports and a general reduction in industry concentration.

### *Overall Changes in Market Structure*

To summarize, we observe the following changes in the structure of the industry: an increased share of imports, a general reduction in concentration, and an overall reduction in profitability and market power. These changes coincide with reduced protection and imply increased competition in both the appliance industry and the electronic parts industry. The census data also show a greater number of establishments in the industry. Lower profitability and concentration may have been due to competition from new entrants. The size distribution also indicates that a sizable proportion of the new plants are small. Lower market power and profitability, therefore, seem to be associated with reduced effective protection and increased competition either from new entrants, which appear to be small, or from imports.

Given these observations, the important question will concern the links between reduced protection and increased competition on the one hand, and changes in performance and competitiveness on the other.

## PERFORMANCE

### *Exports*

As earlier noted, the industry is primarily domestic-oriented: Local subsidiaries, joint ventures and Filipino-owned firms primarily sell to the domestic market, and this inward orientation may be traced

partly to substantial protection. Exports are expected to increase with trade liberalization. The increased share of imports may reduce the profitability of the local market, and make exports a means of expanding a firm's effective market.

Exports have been rising steadily in nominal terms (Table 11). The largest share belongs to audio-video appliances, but the other subsectors seem to be catching up. The share of exports in total output, computed from NSO input-output data, likewise increased from 4.45 percent in 1983 to 23.38 percent in 1988. Export ratios cannot be computed for radio and TV parts, but the trade data show an increase of about \$50 million in the value of exports between 1983 and 1988.

Industry sources say that some appliance firms are actually losing money in exports and recover losses only through local sales. Moreover, the decision to export is largely determined by strategic concerns, particularly for subsidiaries of foreign firms. Exporting also entails a number of problems, such as costly delays in processing necessary documents. It is encouraging, however, that the industry generally seems to have become more export-oriented, possibly using the local market to sustain efforts to enter the export market. The liberalization process may have also led to the greater interest in exports by inducing firms to consider prospects outside the domestic market.

### *Allocative Efficiency*

DRC in shadow prices increased for the appliance industry but went down for two of its subsectors, namely audio-video and cooking-heating appliances (Table 12). Higher DRCs were observed for refs-aircons, miscellaneous appliances, and the radio-TV parts industry.

However, ratios of the DRC and the shadow exchange rate (SER) uniformly went down for the industry and its subsectors, indicating reduced allocative inefficiency and improved comparative advantage. The SER represents the social value of foreign exchange and is set at 25 percent above the market exchange rate to reflect the overvaluation

**Table 11**  
**Exports of the Appliance Industry: 1972 to 1991**

	Value of Exports (FOB in dollars)						Percentage Shares					
	1972	1978	1981	1983	1988	1991	1972	1978	1981	1983	1988	1991
<b>Appliance Industry</b>	27,377	6,579,705	8,367,389	16,742,637	24,618,438	65,968,665	100.00	100.00	100.00	100.00	100.00	100.00
Subsectors												
Audio-video appliances	26,332	6,387,656	8,250,855	16,612,387	16,036,825	57,705,971	90.51	97.08	98.37	98.35	57.55	77.62
Cooking, heating appliances	1,245	190,561	116,134	59,917	298,022	1,354,092	4.31	2.90	1.38	0.35	1.07	1.82
Refrs and aircons	—	1,488	400	70,333	8,283,591	6,908,602	0.00	0.02	0.00	0.42	29.72	9.29
Miscellaneous appliances	1,495	317	20,371	149,217	3,249,207	8,371,493	5.18	0	0.24	0.88	11.66	11.26
<b>Parts Industry</b>												
Radio and TV parts	26,665	747,367	23,419,528	3,234,128	53,226,943	133,614,740						

Source of basic data: *Foreign Trade Statistics Yearbook*, National Statistical Coordination Board.

**Table 12**  
**Domestic Resource Cost in Shadow Prices: 1983 and 1988**

	DRC		DRC/SER	
	1983	1988	1983	1988
<b>Appliance Industry</b>	26.99	38.99	1.94	1.48
Subsectors				
Audio-video appliances	46.39	43.32	3.34	1.64
Cooking and heating	43.19	27.78	3.11	1.05
Refs and aircons	40.24	41.11	2.89	1.56
Miscellaneous appliances	15.14	25.45	1.09	0.97
<b>Parts Industry</b>				
Radio and TV parts	59.85	346.82	4.31	13.15

SER is the shadow exchange rate, which was 13.89 in 1983 and 26.37 in 1988.

The DRC/SER ratios are interpreted as follows:

- 0.01-1.20 : Efficient
- 1.21-1.50 : Mildly Inefficient
- > 1.50 : Inefficient
- < 0 : Dissaving on foreign exchange

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

of the currency. For the radio-TV parts industry, the ratio increased significantly, implying diminished comparative advantage.

The appliance industry itself did not become socially efficient, although two of its subsectors (cooking-heating and miscellaneous appliances) did. The other subsectors remained inefficient, with ratios greater than 1.5. Based on these ratios, therefore, allocative inefficiency seems to have generally declined in the appliance industry, even though social efficiency was generally not attained. For the radio and TV parts industry, however, allocative inefficiency appears to have increased.

DRCs were also estimated for the three firms (A to C) using 1986 and 1991 data from the survey and financial statements (Table 13), with roughly similar results to those from census data. DRCs increased for two of the firms, but DRC/SER went down for all three. In

**Table 13**  
**DRC and EPR Estimates: 1986 and 1991**

	EPR		DRC		DRC/SER		DRC/OER	
	1986	1991	1986	1991	1986	1991	1986	1991
Firm A	62.26	47.12	32.99	23.38	1.23	0.71	0.0000	0.0000
B	91.05	65.87	56.03	57.23	2.09	1.74	0.0000	0.0000
C	69.00	55.36	33.26	37.45	1.24	1.14	0.0000	0.0000

The SER was 32.97 in 1991 and 26.86 in 1986.

Source of basic data: Survey of Appliance Firms and Securities and Exchange Commission's Financial Statements.

addition, two firms (A and C) became socially efficient in 1991. Hence, there is an apparent improvement in social profitability for all three firms which coincides with reduced protection.

### *Efficiency and Protection*

Frequency distributions of plants are constructed in order to relate protection with social efficiency. Effective protection rates that were below the average for the manufacturing sector were considered low, while the above-average EPRs were considered high. The average manufacturing EPR was 38.01 percent in 1983 and 35.5 percent in 1988.

The distributions show that the majority of appliance plants in 1983 had high EPRs and that most of these high-EPR plants were also socially inefficient (Table 14). In 1988 most of the EPRs were low but plants were still mostly inefficient. The efficient among the low-EPR plants increased and numbered only slightly less than the inefficient (nine compared to 13). Among the high-EPR plants, the efficient increased in number, the inefficient were fewer, and the gap between their numbers narrowed. For the radio-TV parts industry, the majority of plants were inefficient and had high EPRs in 1983 (Table 15). In 1988, the low-EPR plants constituted the majority.

Table 14

## Distribution of Efficient and Inefficient Appliance Manufacturing Plants by EPR: 1983 and 1988

DRC/SER	Effective Protection Rate									
	1983					1988				
	< 0	0-38.0	38.01-76.0	> 76.0	Total	< 0	0-35.5	35.51-71.0	> 71.0	Total
Efficient	0	0	4	1	5	1	9	7	1	18
Mildly inefficient	0	0	8	0	8	0	3	6	2	11
Inefficient	5	2	12	12	31	0	11	7	5	23
Dissaving	0	0	2	2	4	1	2	0	0	3
<b>Total</b>	<b>5</b>	<b>2</b>	<b>26</b>	<b>15</b>	<b>48</b>	<b>2</b>	<b>25</b>	<b>20</b>	<b>8</b>	<b>55</b>

SER = shadow exchange rate (equal to 13.89 in 1983 and 26.37 in 1988)

DRC/SER ratios at the establishment level are classified as follows:

- Efficient = 0 to 1.20
- Mildly inefficient = 1.21 to 1.50
- Inefficient = Greater than 1.50
- Dissaving on foreign exchange = Less than 0

EPRs are classified into ranges based on multiples of the average EPR for the manufacturing sector.

The average EPR for manufacturing is 38.0 in 1983 and 35.5 in 1988.

An EPR which is higher than the average in a given year is considered to be quite high.

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.





Table 15

## Distribution of Efficient and Inefficient Radio and TV Parts Manufacturing Plants by EPR: 1983 and 1988

DRC/SER	Effective Protection Rate									
	1983					1988				
	< 0	0-38.0	38.01-76.0	> 76.0	Total	< 0	0-35.5	35.51-71.0	> 71.0	Total
Efficient	0	0	0	0	0	0	12	1	0	13
Mildly inefficient	0	0	1	0	1	0	2	1	0	3
Inefficient	4	1	15	3	23	0	17	6	0	23
Dissaving	0	1	1	0	2	0	10	1	0	11
<b>Total</b>	<b>4</b>	<b>2</b>	<b>17</b>	<b>3</b>	<b>26</b>	<b>0</b>	<b>41</b>	<b>9</b>	<b>0</b>	<b>50</b>

SER = shadow exchange rate (equal to 13.89 in 1983 and 26.37 in 1988)

DRC/SER ratios at the establishment level are classified as follows:

- Efficient = 0 to 1.20
- Mildly inefficient = 1.21 to 1.50
- Inefficient = Greater than 1.50
- Dissaving on foreign exchange = Less than 0

EPRs are classified into ranges based on multiples of the average EPR for the manufacturing sector.

The average EPR for manufacturing is 38.0 in 1983 and 35.5 in 1988.

An EPR which is higher than the average in a given year is considered to be quite high.

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

Most of these plants were still inefficient, but the efficient have increased in number. Almost all of the high-EPR plants were inefficient. Thus, it generally seems that slightly better results in terms of efficiency were observed among the plants with relatively low EPRs. This would imply that reduced protection has some links with improved efficiency.

#### EFFICIENCY AND ESTABLISHMENT SIZE

Similar distributions are made to relate size with efficiency. Efficient and inefficient plants are classified by size based on employment. Plants with five to 99 employees were classified as *small*, those with 100 to 199 as *medium-sized*, and those with 200 and more as *large*.

The majority of both small and large appliance plants were socially inefficient in 1983 (Table 16). In 1988, the majority of the small plants were still inefficient, but a greater number became efficient. Most of the large plants were socially efficient. For the radio-TV parts industry, the majority of both large and small plants were socially inefficient in 1983 (Table 17). In 1988, inefficient small plants numbered slightly more than the efficient small plants, while most of the large plants were still inefficient.

The small plants in the appliance industry increased and a greater number of them were also efficient. The number of medium- and large-sized plants did not change significantly. It is thus possible that a good proportion of the new appliance plants in 1988 were both small and relatively efficient. Trade data show an increase of \$200 million in industry imports of material inputs, parts, and components between 1983 and 1988 (Table 8). This supports the hypothesis that a larger proportion of small plants gained access to imported inputs because of lower protection. The increased access to imported inputs may have in turn contributed to the efficiency gains for the industry as a whole.

**Table 16**  
**Size Distribution of Efficient and Inefficient Appliance Manufacturing Plants: 1983 and 1988**

DRC/SER	Plant Size							
	1983				1988			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Efficient	2	1	2	5	9	2	7	18
Mildly inefficient	1	0	2	3	5	1	5	11
Inefficient	19	5	12	36	18	2	3	23
Dissaving	3	1	0	4	2	1	0	3
<b>Total</b>	<b>25</b>	<b>7</b>	<b>16</b>	<b>48</b>	<b>34</b>	<b>6</b>	<b>15</b>	<b>55</b>

SER = shadow exchange rate (equal to 13.89 in 1983 and 26.37 in 1988)

DRC/SER ratios at the establishment level are classified as follows:

- Efficient = 0.01 - 1.20
- Mildly inefficient = 1.21 - 1.50
- Inefficient = > 1.50
- Dissaving on foreign exchange = < 0

Establishments are classified according to size based on employment:

- Small : 5 - 99 employees
- Medium : 100 - 199
- Large : More than 200

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

Table 17

## Size Distribution of Efficient and Inefficient Radio-TV Parts Manufacturing Plants: 1983 and 1988

DRC/SER	Plant Size							
	1983				1988			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Efficient	0	0	0	0	4	3	6	13
Mildly inefficient	0	0	0	0	0	2	1	3
Inefficient	4	3	17	24	6	2	15	23
Dissaving	2	0	0	2	4	2	5	11
<b>Total</b>	<b>6</b>	<b>3</b>	<b>17</b>	<b>26</b>	<b>14</b>	<b>9</b>	<b>27</b>	<b>50</b>

SER = shadow exchange rate (equal to 13.89 in 1983 and 26.37 in 1988)

DRC/SER ratios at the establishment level are classified as follows:

Efficient	=	0.01 - 1.20
Mildly inefficient	=	1.21 - 1.50
Inefficient	=	> 1.50
Dissaving on foreign exchange	=	< 0

Establishments are classified according to size based on employment:

Small	:	5 - 99 employees
Medium	:	100 - 199
Large	:	More than 200

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

### *Technical Efficiency*

Technical efficiency is measured using a linear programming model by Nishimizu and Page (1982). The model minimizes the difference between actual and maximum potential output subject to a number of constraints. Maximum output is represented by a transcendental logarithm (or translog) production function which denotes the "best practice" production frontier. A technical efficiency coefficient is derived from the ratio of actual to maximum potential output and a coefficient between 75 and 100 percent indicates high technical efficiency. Weighted averages of plant-level estimates are computed for the appliance industry and the electronic parts industry.

The average technical efficiency of plants dropped by more than half for the appliance industry, from 61.28 percent in 1983 to 29.88 percent in 1988. For the radio-TV parts industry, there was an increase from 56.93 percent in 1983 to 65.90 percent in 1988. (Figures are not available for the appliance subsectors since the plants were grouped into one sample.) Table 18 shows that the number and proportion of technically efficient plants in the appliance industry fell from six (or about 12.5 percent of the total) to three (5.45 percent). For the radio and TV parts subsector, the number of efficient plants increased from four to six.

**Table 18**

**Number and Proportion of Technically Efficient Plants: 1983 and 1988**

	No. of Plants in the Sample		No. of Technically Efficient Plants		% of Efficient Plants	
	1983	1988	1983	1988	1983	1988
Appliance industry	48	55	6	3	12.50	5.45
Radio-TV parts industry	26	49	4	6	15.38	12.24

The estimation used the census data set which was cleaned for missing values.

A plant with a technical efficiency coefficient between 75 and 100 percent is considered technically efficient.

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

It is possible that while trade reform removed enough distortions to reduce allocative inefficiency, input use among most appliance plants remained inefficient. Similarly, the opposite movements in the DRC and technical efficiency estimates for the electronic parts industry point to the possible influence of other factors not related to trade policy. For example, increased technical efficiency as estimated here may simply be due to improved capacity utilization. Another explanation is that some plants may have improved to a greater degree than others in technical efficiency due to the reforms, thereby raising the average best-practice level of efficiency and widening the average gap between actual and best-practice output.

It is also possible that the more efficient plants (or those with larger efficiency gains) had a smaller share in sectoral output, resulting in a lower *weighted* average of plant-level technical efficiency. Other nontrade-related factors affecting efficiency include production problems cited by firms: The high cost and low quality of locally-made parts and components; the unavailability of specialized parts, and; the lack of testing facilities for products.

The results may also signify some deficiencies in the estimation. Nelson (1981) notes that Farrell's (1957) estimation technique for technical efficiency relies on neoclassical assumptions which for him seem to be too strong or too heroic. For example, the assumption of homogenous production technology within an industry may pose problems when multi-product plants are involved.

### *Factor Productivity*

Performance is also measured by the productivity of both labor and capital. Capital productivity is measured by the ratio between value added and the stock of capital while labor productivity is measured by the ratio between value added and the number of production workers.

For the appliance industry, capital productivity appears to have generally gone up while labor productivity has gone down (Table 19). The capital productivity increases may imply that trade reform induced firms to invest in new production equipment, improving

**Table 19**  
**Measures of Factor Productivity: 1983 and 1988**

	Value Added/Capital (in percent)		Value Added per Worker	
	1983	1988	1983	1988
<b>Appliance Industry</b>	5.69	10.61	16,924	14,056
Subsectors				
Audio-video appliances	3.39	7.68	16,394	18,037
Cooking, heating appliances	4.95	26.05	13,152	7,549
Refs and aircons	4.13	13.64	16,503	10,600
Miscellaneous appliances	13.57	30.88	22,477	13,274
<b>Parts Industry</b>				
Radio and TV parts	2.47	1.84	11,742	13,011

Figures for value added and the stock of capital were converted into constant prices (1972 = 100).

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office

both productivity and allocative efficiency. Lower labor productivity, on the other hand, may account for the observed reduction in technical efficiency. Since capital productivity gains and labor productivity reductions seem to be associated with a general decline in allocative inefficiency for the appliance industry, the efficient use of capital may be more important compared with that of labor in bringing about improvements in efficiency and comparative advantage.

The opposite is observed for radio and TV parts, where capital productivity fell and labor productivity went up, coinciding with increased allocative inefficiency and improved technical efficiency. These results similarly indicate a positive association between capital productivity and allocative efficiency and between labor productivity and technical efficiency. The changes may also partly reflect the labor intensity of the industry.

*Overall Changes in Performance*

The following changes in the performance of the appliance industry were observed. First, the amount and proportion of exported output have increased. Second, allocative inefficiency declined and comparative advantage (measured by the DRC-SER ratio) improved. Frequency distributions with plant-level data also indicate that reduced protection may have some links with improved efficiency. This is shown by slightly better results in terms of efficiency among the plants with relatively low EPRs. In addition, the industry had more small plants, a greater number of which were also relatively efficient. This supports the hypothesis that reduced protection led to efficiency gains in the industry by giving access to imported inputs to a larger proportion of small plants.

The decrease in average technical efficiency in the appliance industry may be explained either by very large improvements in technical efficiency for a handful of plants or by relatively smaller sectoral output shares for efficient plants, both of which would produce a lower weighted average for technical efficiency. The results also point to the effect of other factors not accounted for in the analysis and to imperfections in the estimation procedure. Capital productivity appears to have increased while labor productivity seems to have declined in the appliance industry. The hypothesized effect of the productivity changes on efficiency is thought to be related to the capital intensity of production.

For the radio-TV parts industry, exports have increased, while allocative efficiency and comparative advantage seem to have worsened, as seen from the DRC-SER ratios. Technical efficiency seems to have improved. Although the estimation results call for some skepticism because of some of the assumptions made, they also suggest the influence of other nontrade-related factors on performance, such as changes in capacity utilization and other production-related problems. The parts industry also showed a decline in capital productivity and a rise in labor productivity. The accompanying changes in allocative and technical efficiency may reflect the labor intensity of the industry.



The results of trade liberalization may be incomplete given the delay of its implementation. In addition, there may be a time lag for the effects of the reforms, and the data used may denote a transition period. However, the immediate impact of the reforms appear to be moderate improvements in allocative efficiency and comparative advantage for the appliance industry and in technical efficiency for the electronic parts industry. Both cases would indicate modest positive results from trade reform.

## COMPETITIVENESS

### *Competitive Advantage*

Competitive advantage is measured using the domestic resource cost in market prices (DRC\*), defined as the ratio of total domestic cost in market prices to the net foreign exchange earned or saved (Tecson 1992). The market-price DRC provides an indication of the market viability of a firm from its owners' point of view and is interpreted in the same manner as the shadow-price DRC. The ratio between the DRC\* and the official exchange rate (OER) denotes competitive advantage.

Competitiveness is expected to increase with trade liberalization because of the removal of distortions in the economy (such as currency overvaluation) and partly because of the import discipline phenomenon: Increased import competition may improve a firm's ability to compete in both domestic and external markets.

DRC\*s from census data indicate improved competitiveness for the appliance industry (Table 20). The changes generally seem to parallel those observed for the DRCs in shadow prices. DRCs in market prices improved for three subsectors (audio-video appliances, cooking-heating appliances, and refs-aircons) but worsened for the entire industry.

The DRC\*-OER ratios, however, went down for the appliance industry, indicating improved competitive advantage. However, none of the subsectors became socially efficient (signified by ratios between

**Table 20**  
**Domestic Resource Cost in Market Prices: 1983 and 1988**

	DRC*		DRC* / OER	
	1983	1988	1983	1988
<b>Appliance Industry</b>	37.68	42.83	3.39	2.03
Subsectors				
Audio-video appliances	84.61	47.51	7.61	2.25
Cooking, heating appliance	86.21	31.29	7.76	1.48
Refs and aircons	62.76	44.96	5.65	2.13
Miscellaneous appliances	18.65	28.22	1.68	1.34
<b>Parts Industry</b>				
Radio and TV parts	179.57	378.47	16.16	17.94

DRC\* = Domestic Resource Cost in Market Prices

OER = Official Exchange Rate (equal to 11.1127 in 1983 and 21.0947 in 1988)

The DRC\*/OER ratios are interpreted as follows:

- 0.01 - 1.20 : Efficient
- 1.21 - 1.50 : Mildly inefficient
- > 1.50 : Inefficient
- < 0 : Dissaving on foreign exchange

Source of basic data: *Census of Manufacturing Establishments*, National Statistics Office.

0 and 1.2). Only one subsector (miscellaneous appliances) indicated a significant improvement and showed only mild inefficiency in 1988.

By contrast, competitive advantage seems to have deteriorated even more for the radio-TV parts industry. Both competitiveness and performance appear to have generally declined. A partial explanation may lie in the fact that the technology for making parts and components is more difficult to absorb and master than that for assembling appliances from prefabricated components.

### *Overall Changes in Competitiveness*

Modest improvements in competitiveness were observed for the appliance industry, although none of its subsectors seems to have

attained competitive advantage. For the radio-TV parts industry, competitiveness seems to have deteriorated.

It is possible that large improvements in both competitiveness and efficiency were not observed because of the delays in the reforms and because of other factors not directly related to liberalization. For example, changes in technical efficiency may be linked to changes in capacity utilization. Other nontrade-related factors which may affect efficiency are: (a) limited access to production technology, which often tends to be proprietary or specialized; and (b) the ability to meet quality standards. For the electronic parts subsector, the decline in competitive advantage may be partly due to the relative difficulty of absorbing and mastering the technology for manufacturing parts and components compared with assembling appliances.

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## Conclusion and Policy Recommendations

**T**HIS study analyzes the effects of trade liberalization on the structure, performance, and competitiveness of the appliance industry. It examines the links between changes in industry structure and changes in performance and competitiveness. Performance and competitiveness are expected to improve under trade reform due to competition from imports. The conclusions of the study are based primarily on the analysis of census data for 1983 and 1988.

Estimates of EPRs reflect reduced tariff protection for the industry. Import restrictions seem to be *not fully binding* since the share of imports increased even though substantial differences were found between local and foreign prices. Competition also seems to have generally increased, indicated by increases in import competition, reductions in industry concentration, a larger proportion of small plants and reductions in market power.

The appliance industry's responses to these changes include modest improvements in both performance and competitiveness. For the radio-TV parts industry, performance improved nominally, although competitiveness declined. The full effects may not be evident since the liberalization process was only partially complete. There may also be a time lag between the reforms and their effects, and the period considered here may well be a transition period. The *immediate* impact of the reforms, however, appear to be positive, albeit modest. Generally, therefore, some positive results from trade reform for the industry were observed. In addition, there appear to be links between the level of competition and changes in performance and

competitiveness under trade reform. Some support for the import discipline hypothesis were also noted, since reduced protection, market power, and profitability were observed with improvements in performance and competitiveness.

It is also important not to overlook the influence of factors other than trade liberalization. Non-price factors may be linked to the observed changes, such as plant-specific attributes related to efficiency, changes in capacity utilization, and other production-related concerns. Factors such as the business cycle and macroeconomic stability may also affect the performance of industries in general. Moreover, the present study does not consider the equally important dynamic effects of the policy changes.

The crucial question for the industry concerns the direction of trade policy after EO 470. Recently, the National Economic and Development Authority (NEDA) announced a target maximum of 5 percent for all tariffs by 2001 as part of a reduction program to simplify the present structure and align tariff policy with the AFTA-CEPT and the GATT Uruguay Round. Under the plan proposed by the Committee for Tariff and Related Matters (TRM), the present 60 percent tariff on consumer durables will be cut to 30 percent by next year, then to 20 percent by 1998, and to 10 percent by the year 2000. Worried of being edged out by foreign goods, local manufacturers are understandably opposing the plan. However, as the TRM points out, the industry had had substantial protection for quite some time. Moreover, the high protection and the QR-based development programs did not seem to improve the industry's efficiency and competitive ability. Although partial trade reform seems to have produced only modest positive results, continued protection for the industry must have specific, compelling reasons. Otherwise, the tariff reductions proposed by the TRM should be strongly supported.

It should be noted, however, that trade reform alone will not guarantee improved performance and competitiveness. It will require complementary measures to address other distortions in the economy and to help industries in preparing for increased foreign competition. This involves dealing with problems that raise unit costs for local firms. For example, in the small local market, it is difficult to achieve high

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production volumes that will bring down unit costs and enable firms to compete with foreign rivals. Higher unit costs are also attributed to high interest rates (which particularly affect smaller firms) and the poor condition of transportation infrastructure (which raises the cost of transporting material inputs).

The latter two problems generally affect all industries and may be handled through low-cost financing and prudent infrastructure spending. But the smallness of the market also poses problems for the industry's future growth and ways will have to be found to increase the effective market. One obvious solution is exports. Efforts to promote the industry should set an eye toward external markets. Promoting the local assembly of appliances for export has been suggested, encouraged no doubt by the increased exports of some locally-assembled low-end products. Problems in exporting — such as costly delays in the processing of import shipments and incentive-related documents — will have to be addressed. The government can help with measures to provide technical and marketing assistance, promote product quality standards, and speed up the flow of documents.

A competitive parts industry will also strengthen the appliance industry. Institutional support and encouragement from government will be crucial in encouraging local production and tapping external markets. Local parts production has been impeded by problems such as high costs, low quality, and a low volume of orders — problems related to the state of the appliance industry itself. Sufficient local demand for parts will build up once the appliance industry expands, and business decisions should play a greater role. Yet, there are a number of things that the government can do, such as putting out measures aimed directly at the problems of the small and medium-sized enterprises which comprise the supplier industries. Among these are: (1) lack of financing; (2) shortage of suitably trained manpower; (3) equipment; (4) an information network to link prospective buyers with suppliers; and (5) lack of training in world-class manufacturing techniques (such as just-in-time manufacturing). Investments in manpower training, technical assistance, and information networks will particularly benefit the small firms.

Marketing assistance will also be important in external markets. For example, regular trade missions may be made part of a sustained effort to help exporters find new markets.

As a final note, while the results of the study may strengthen the possibility of improved performance and competitiveness under trade reform, much still has to be known about the actual adjustment process, and future research may yet provide a better answer.



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