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Working Paper

Productivity Analysis in Garments and Textile Industries

PIDS Discussion Paper Series, No. 1997-09

Provided in Cooperation with:

Philippine Institute for Development Studies (PIDS), Philippines

Suggested Citation: Cororaton, Caesar B. (1997) : Productivity Analysis in Garments and Textile Industries, PIDS Discussion Paper Series, No. 1997-09, Philippine Institute for Development Studies (PIDS), Makati City

This Version is available at:

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Philippine Institute for Development Studies

Productivity Analysis in Garments and Textile Industries

Caesar B. Cororaton

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February 1997

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***Productivity Analysis in Garments
and Textile Industries***
(Draft Report)

submitted by:

Policy and Development Foundation, Inc. (PDFI)

submitted to:

Department of Science and Technology (DOST)

August 1996

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Productivity Analysis in Garments and Textile Industries¹

Caesar B. Cororaton²

I. Introduction

The productivity analysis conducted by Cororaton, et al (1996) on the Philippine manufacturing industries at the 3-digit PSIC³ level showed that the number of industries with negative total factor production (TFP) growth increased, especially in 1980s and 1990s. Furthermore, it was observed that the general decline in TFP was due to the deterioration in the technical progress (TP) which can be interpreted to mean, among others, as "...a big gap or a general failure in the approach to acquiring and adapting new technology or foreign technology".

Focusing on the results for the textile and garments industries, Table 1 shows that the TFP growth of the textile industry declined considerably from 4 percent in the period 1956-70 to 0.6 percent in 1981-1992. The decline was primarily due to the negative contribution of technical progress. The garments industry, on the other hand, showed negative TFP growth for both periods, 1971-1980 and 1981-1992. However, the magnitude of negative the TFP growth declined substantially from -9.5 percent to -0.7 percent within the two periods. As in the textile industry, the negative contribution of TFP in the garments industry is also substantial.

The objective of the present study is to take a closer look at the productivity issues in these two industries. The consistent set of data available to be able to compute for the productivity indices is the 5-digit PSIC disaggregation of these two industries which defined is Section II.

This paper is divided into six sections. Section II gives the 5-digit disaggregation of the textile and the garments industries. Section III gives an industry background of the industries. This section is necessary to be able to put the productivity analyses in the succeeding sections in perspective. Section IV presents the methodology used in computing for the productivity indices and the analysis of empirical results. Section V summarizes the results of the company interviews conducted during the course of the study. The company interviews were conducted to validate the

¹This is part of the set of industry studies on productivity funded by the Department of Science and Technology.

²Research Fellow, Philippine Institution for Development Studies. Research assistance was provided by Consolacion Chua.

³Philippine Statistical Industry Classification

result on productivity analysis in the previous section. Lastly, Section VI gives a summary of results and some policy implications.

II. Industry Definition

II.1 Textile Industry

The study includes the manufacture of textiles in the Philippines (Code No. 321 in the 3-digit PSIC level). However, the analysis conducted in the paper extends further down to the 5-digit PSIC level which includes the following 16 subsectors:

	Code	5-Digit PSIC
1.	32111	Integrated textile mills.
2.	32112	Fiber and filament mills.
3.	32113	Spinning mills.
4.	32115	Weaving mills.
5.	32116	Finishing mills.
6.	32117	Hand weaving.
7.	32118	Manufacture of lace, narrow fabrics and small wares in narrow fabric textile mills.
8.	32119	Spinning, weaving, texturizing and finishing textiles, not elsewhere classified (n.e.c.).
9.	32121	Fabric knitting mills.
10.	32122	Hosiery, underwear and outerwear knitting mills.
11.	32131	Manufacture of textile industrial bags.
12.	32132	Manufacture of made-up textile goods for house furnishings.
13.	32141	Manufacture of carpets and rugs.
14.	32151	Manufacture of cordage, rope and twine.
15.	32152	Manufacture of nets, excluding mosquito nets.
16.	32153	Manufacture of articles made of native materials.

II.2 Garments Industry

The garments industry in the study refers to the manufacture of wearing apparel, excluding footwear (Code No. 322 in the 3-digit PSIC level). The paper also extends the analysis further down to the 5-digit level which includes the following 5 subsectors:

	Codes	5-digit PSIC
	32221	Men's and boys' garment manufacturing.
2.	32222	Women's, girls' and babies' garment manufacturing.

3. 32229 Ready-made clothing manufacturing, n.e.c.
4. 32230 Embroidery establishments.
5. 32292 Manufacture of hats, gloves, handkerchiefs, neckwear (except knitted and paper), and apparel belts regardless of material.

III. Industry Background

III.a The Textile Industry^{4,5}

Output Performance. Figure 1 shows the performance of the industry in terms of its annual average real growth of gross value added (GVA) vis-a-vis the GVA of the garments industry and of the entire manufacturing sector. In the second half of the 1960s, the industry performed above par. It surpassed the growth of the garments industry and the whole manufacturing sector. However, it started to decelerate in the first half of the 1970s, and continued to perform poorly in the second half of the 1970s and in the first of the 1980s with a series of negative growth. Although it showed an improvement in the period 1986-90, the recovery was not sustained. It dropped again in the early 1990s. Thus, based on the growth in the last 20 years, the textile industry performed way below par.

Contribution to the Economy. Table 2 shows the contribution of the textile industry to the economy. In 1972, it contributed 7.3 percent to the total GVA of the entire manufacturing sector. Its share increased steadily up until 1978 with a share of 10.7 percent. The contribution of the industry reversed since then. In 1991, its share to the total went down to as low as 3.9 percent.

In 1972, the textile industry employed about 61 thousand workers, or 13.9 percent of the total manufacturing employment. In 1978, the share inched up to 14.6 percent, or about 177 thousand people. However, employment in the textile industry dropped steadily since then, both in terms of employment level and percentage share. In 1991, the total industry employment was down to 84 thousand, or 8.9 percent of the total manufacturing employment.

Market Structure. The industry sells its product mostly to the domestic market. As such, it has not been contributing much to the country's export earnings (see Table 3). However, it sells to the domestic garments industry, which is one of the major export earners of the country. Table 4

⁴Industry productivity performance is affected by a host of factors which may range from issues specific to the structure of the industry to concerns at the macroeconomy. Thus this section is included to put the productivity analyses in the succeeding sections in perspective.

⁵Much of the discussion in this section comes from two sources: (1) the comprehensive industry study of the Development Bank of the Philippines: "Industrial Restructuring Studies: Spinning and Weaving" DBP 1994; (2) Austria (1995). "Textile and Garments Industries: Impact of Trade Policy Reforms on Performance, Competitiveness and Structure" PIDS Research Paper Series No. 94-06.

shows the market distribution for textiles. The share of direct exports declined through time, but the share of indirect exports improved considerably. Indirect exporting takes place when the industry sells to the garments industry which is a major exporter. The industry's forward linkage, as well as the garments' backward linkage are shown in Table 5. The forward linkage with the textile industry increased from 2.95 in 1983 to 6.34 in 1990, while the backward linkage of the garments industry jumped from 1.31 in 1983 to 2.49 in 1990⁶. However, despite the improvement the present link between the two industries is still far below from the desirable level⁷. As we shall see later, the garments industry heavily depends on imported fabrics.

Production Process and Activities. There are three major stages of production in the manufacture of textiles: spinning, weaving, and finishing. The spinning process is the making of thread or yarn out of the fibers which come from cotton, wool, polyester (which blends with cotton and rayon), nylon, rayon (which also blends with cotton), acrylic, and other synthetic blends of yarn materials. The spinning process is done by a spindle machine.

The second stage is the weaving process which involves the production of fabrics out of the thread produced in the previous stage by interlacing long threads in two directions. This process is done with a loom. The main products here are: denims (an important set of product which accounts for 30 percent of the total production and is competitive relative to imported ones), cotton products, and nylon taffeta.

A number of activities are involved in the finishing stage. Activities include bleaching, dyeing, coloring of fabrics, printing (which involves marking of textile fabric with decorative designs). The finishing stage is completed through some kind of a surface treatment of the textile fabric.

Thus, the spinning stage produces inputs to the weaving stage, which in turn, produces inputs to the finishing of fabrics. Fabrics are then sold to the garments sector which produces clothing for final consumption.

Machineries. There are two types of spindles used by the millers: the ring spindles and the open-end rotor spindles. Ring spindles are used in a spinning system in which a twist is inserted by using a revolving traveller. The yarn is wound on to a tube since the rotational speed of the package is greater than that of the traveller. Rotor spinning, on the other hand, is a method of open-end spinning, using a rotor (a high speed centrifuge) to collect and twist individual fibers into yarn. The rotor spinning process is more modern and faster than the ring spinning process and is therefore,

⁶Based on an input-output table analysis.

⁷A desirable link is reached when the garments industry buys mostly its fabric requirements from the local textile millers, which is not the case in the Philippines.

more efficient.

Two types of looms are generally used in the weaving stage: the shuttle and the shuttleless looms. The shuttle looms use a shuttle to carry the weft yarn across the width of the loom. Shuttleless looms, on the other hand, use a projectile, air, water or rapiers, to transfer the weft yarn across the loom. The process sequence for shuttleless looms is generally shorter than the other type, making it far more efficient process.

Table 6 shows the type of machines used and therefore shows the level of technology in the industry at present. One can observe that the spindles installed and used are mostly of the ring type which is of the old technology and therefore less efficient. In terms of the weaving machines, the ones that are commonly used are the shuttle type, which again are of the old technology and therefore less efficient. Furthermore, one can observe from the 1991 data that the efficient machines are fully utilized, while the less efficient ones have lower capacity utilization.

Concentration of Textile Firms. Based on the sample of firms from the membership of the industry association⁸, there are a total of 81 major firms in the industry. Of the total, 46 firms (or 57 percent) are engaged in the spinning processing alone (see Table 7). About 24 percent or 19 firms are fully integrated, which means that the three major production stages in textile manufacturing are done within one plant.

In terms of profitability, a sample of firms indicate that specialized spinning mills have relatively higher net profit after tax than fully integrated ones. Table 8 shows that spinning mills have profit after tax of 9 percent, which is 2 times higher than the integrated mills.

Most of the enterprises in the industry are family-owned. However, there are few cases of joint ventures, mostly with South Korea, Taiwan and the Peoples Republic of China.

Cost Structure. Table 9 shows the comparative cost of yarn production, while Table 10 shows the comparative cost of fabric production. There are four major cost items included in the comparative country cost analyses: materials, labor, energy, and financial cost.

In terms of total yarn cost structure, the Philippines is not competitive compared to Korea, India and the US. It costs the Philippines US\$3.65 to produce 1 kilogram of yarn, slightly lower than Japan of US\$3.80, but higher than Korea, India and the US. The Philippines is uncompetitive in the three major cost items: materials, financial, and energy. About 90 percent of yarn materials is cotton, which is mostly imported. Imported cotton is slapped with a 10 percent tariff. Thus the cost of materials would have been slightly lower had there been no tariff slapped on imported raw materials.

⁸The major industry association in textile is the Textile Mills Association of the Philippines (TMAP).

The energy cost is also very expensive in the Philippines, in fact as expensive as in Japan. Financial cost is relative higher in the Philippines. This is essentially due to imperfections in the local capital market. The Philippines is competitive only in labor. Labor cost in the yarn production in the Philippines accounts for only 2 percent, as against 14 percent in the US and Japan.

The same cost structure is found in the production of fabrics, with the Philippine uncompetitive in materials, financial, and energy costs. It takes the Philippines US\$1.195 to produce 1 kilogram of fabric, lower than Japan, but higher than India, Korea, and the US.

Government Policies Affecting Textile Development. The Philippine textile industry started in the 1950s as one of the industries supported under the import substitution growth program of the government. Incentives and protection were therefore made available to the industry to be able to increase its industrial base. Estimates indicate that the local millers enjoy up to 30 percent protection through import tariffs and non-tariff barriers. The effective rate of protection (EPR)⁹ in 1974 was 78 (Bautista, 1989). Furthermore, quantitative restrictions on imports were introduced and were further increased in the 1970s (Power and Medalla, 1986). Most of the raw materials in the textile industry were included in the list of regulated commodities and, therefore, required prior approval from the government before importation.¹⁰

However, in the 1980s, the EPR for the industry declined (see Table 11). The EPR for the primary textiles decreased from 90.6 in 1983 to 29.1 in 1988, while for secondary textiles from 111.8 in 1983 to 47.6 in 1988.¹¹ The drop was due to the liberalization program of the government. Nevertheless, the industry is still being favored and supported by the country's trade policy as shown by its positive and relatively high EPRs.

The government attempted to rehabilitate the industry through its Textile Modernization Program (TMP) in the early 1980s. The program was scheduled to be carried out in 1982 to 1985 with a financing package coming from a World Bank loan amounting to US\$157.4 million. On top of this, the millers were given suppliers credit facility amounting to US\$300 million. To avail of this set of support, participating mills were required to implement manpower training programs, energy conservation, and environmental pollution control.

The program, however, was ill-timed. It did not succeed in attaining the desired objectives

⁹This is net tariff, defined as tariff imposed on output net tariff on inputs. Protection exists if the EPR is positive.

¹⁰In the early years, the industry also received other incentives in the form of subsidized interest rates and preferential exchange rates.

¹¹Austria (1994) defines primary textiles as involving spinning, weaving/knitting, and finishing, while secondary textile as made-up textile goods (e.g., rope, carpets, rugs, etc.).

because of the economic and political uncertainties during the mid-1980s. The loan facility from the World Bank was not availed of due to the high foreign exchange risks and the deep recession that occurred after its approval. Only a small portion of the targeted investments occurred. A number of firms that registered under the program were not able to implement their project proposals. In fact, a number of firms ceased operations. Of the 20 firms which applied for modernization/rehabilitation, only 13 firms implemented their projects, most of them partially.

In 1985, the government approved the advance tax credit scheme. Under the scheme, local millers can offer tax and duty-free textiles to garment exporters with manufacturing warehouses. The Board of Investment (BOI) will then issue local millers with tax credit certificates equivalent to the tax and duty garments exporters would have paid had they bought imported raw materials. Thus, under the scheme, local millers can therefore price their textiles competitively with imported ones. The tax credit certificates can be used as payment of advance sales taxes on imports, payment of duty at the time of opening a Letter of Credit, or payment of any and all taxes owing to the national government, income tax for example.

In 1994, the government embarked on another rehabilitation program to upgrade and modernize existing textile mills through the introduction of new equipment and technology. The program is to be completed in 1998. However, unlike the first previous program, the present one does not have any financial support, but a number of incentives which include:

- (a) duty-free importation of capital equipment until December 31, 1994;
- (b) tax credit on domestic capital equipment (duty portion) until December 31, 1994;
- (c) unrestricted use of consigned equipment;
- (d) exemption from duties on imported spare parts and supplies for consigned equipment or those imported tax and duty-free provided these are brought in under the firm's bonded manufacturing warehouse.

The government's grand liberalization plan is in progress. Thus, under the Executive Order (EO) 204 which was signed in 1995, the government accelerates the reduction in tariff on textiles, garments, and the chemical inputs of the industry.

Industry Issues and Problems. To some, the industry is considered as a "sunset" industry. In fact, a number of industry participants have started trimming down operations. The reasons behind the move are the perennial problems faced by the industry, foremost of which are:

- (1) Smuggling. About 25 percent of the total domestic market for textiles is supplied by smuggled fabrics. The reason behind this is the high degree of protection on local textile through

tariff on imported fabrics and quantitative restrictions. This creates an incentive for domestic producers to buy factor inputs on an illegal market in order to reduce costs. There are 2 kinds of smuggling: technical smuggling and direct smuggling. Technical smuggling is garment exporters importing too much fabric and yarn and selling the excess in the local market, while direct smuggling is misdeclaration of the imported goods as other cheaper products, making the import cheaper.

(2) Out-dated machineries and old production technologies. Despite antiquated equipment, there are still some entrepreneurs who are reluctant to scrap obsolete machineries.

(3) High cost of raw materials and high energy costs.

(4) Very weak link with the garments industry, which is supposed to provide market for locally made fabrics.

III.b The Garments Industry

Output Performance. The history of the Philippine garments industry goes back to the 1950s as a group of cottage-level enterprises which replaced traditional activities such as home sewing, dressmaking, and tailoring. The industry began to experience rapid growth in the 1970s as it started exporting garments. Between 1972 and 1980 garment exports from the Philippines grew an average of 30 percent per year. As a result, its output growth surpassed the entire manufacturing sector (see Figure 1). However, the first half 1980s saw a substantial drop in output. The drop was primarily due to the foreign exchange crisis in the mid-1980s as a result of the economic and political uncertainties during the period. Being highly dependent on imported fabrics for its raw material needs, the foreign exchange crunch pulled down domestic production by an average of -12.2 percent in the period 1981-85.

The garments industry easily recovered in the second half of the 1980s with a growth of 14.5 percent per year from the slump in the previous period. The recovery again was primarily due to the strong pull from the export demand. However, the first half of the 1990s saw another downtrend in output growth as garment exports experienced a slowdown. At present, this slowdown raises an important issue: Whether or not the industry can experience another kick from the export sector and bounce back because of a number lingering concerns in the international market under the new GATT/WTO. There may be adverse effects on the industry as the Multi Fiber Agreement (MFA) is gradually phased out.

Contribution to the Economy. From only 1 percentage share in the GVA of the entire manufacturing sector in 1972, the share of the garments industry to the sector's GVA increased rapidly to reach almost 6.5 percent in 1991 (see Table 2). The same pattern holds for employment.

In 1972, the industry employed 19 thousand workers, or 4.3 percent of the manufacturing sector employment. With the rapid growth in exports, the industry's employment rose to 173 thousand, or 18.3 percent of the total manufacturing sector in 1991.

The rapid export expansion places the industry as the second top earner of foreign exchange, the first being the semi-conductor. In 1994, the industry sold US\$2.3 billion of garments to the rest of the world, capturing almost 18 percent of the total merchandise exports of the country during the year. In net terms, however, the industry may not be contributing that much to the foreign exchange earnings because it heavily depends on imported fabrics for its raw material requirements.

Market Structure. Table 12 shows the growing share of exports to the total output of the industry. From only 5.7 percent in 1970-74, the share of exports jumped to almost 70 percent of total industry output in 1985-87. Table 13 shows the destination of Philippine garments. The biggest markets are the US and the EC, capturing some 80 percent of the total garments exports. With the gradual dismantling of quota under the new GATT/WTO¹², these markets may be open to exporters without country-specific limits or quota, and therefore may pose a major threat to survival and future growth of the industry.

Table 14 shows the types of garments that are exported. The leading export items for garments is men's wear, 29 percent of the total garment exports. This is followed by infants wear, 20 percent, and then women's wear 8.6 percent. In terms of quota utilization in the US market, Table 15 shows that babies garment and clothing accessories capture the biggest share, more than one-quarter of the total garments exports to the US market.

Cost Structure. Table 16 shows the structure of cost of the industry. The data used was the 1991 Input-Output transaction table of the National Statistical Office. Almost 70 percent of the total cost of production is intermediate inputs, which include raw materials for production. Only 1 percent of which is electricity and 0.4 percent is financial services. Gross value added accounts for 32 percent of the total, of which 10.8 percent is labor cost.

Table 17 shows a comparative hourly labor cost in the apparel industry of countries which export to the US market. In the summer of 1995 the Philippines ranked fourth. The country with the least labor cost is Bangladesh. Peoples Republic of China, which poses a major threat to the local garments industry when the international market is eventually freed with country quotas, follows closely. Indonesia, with a very strong textile-garments industry link, is the third, but only slightly higher than the first two in terms of labor cost. The Philippines is the fourth, but a lot higher than the first three countries, in fact more than double the labor cost in China.

¹²General Agreement on Trade and Tariff (GATT)/World Trade Order (WTO).

Government Policies Affecting the Garments Industry. Republic Act 3137 of 1961, or the Embroidery Act, was one of the government policies which supported the growth of the industry during the early years. Firms registered under the Act were allowed duty and tax free importation of raw materials. This, together with low labor cost then, attracted foreign investors, especially US investors, to invest in the local garments industry.

Another important government policy implemented in the 1960s was the Basic Industries Act which provided the garment industry (among other industries) a number of fiscal incentives in the form of tax exemptions, tax credits, and tax deductions. Despite the incentives, however, the garments industry was penalized under the tariff structure. The EPR estimates for the industry are shown in Table 18. One can observe that the industry's EPRs are small relative to the textile industry in 1983. With the reduction of tariff rates under the liberalization program of the government, these EPRs dropped to negative values in 1988. Negative EPRs mean that the industry is penalized under the current tariff and tax structure.

Among other important government policies affecting the industry include:

Premiums for countryside garment enterprises. These provide incentive package for countryside garment enterprises to facilitate regional dispersal of the industry and generate employment in the rural areas. The package outlines a built-in premiums favoring regional garments entrepreneurs outside of Metro Manila in the allocation of export authorization.

- (2) Availability of short term credit facilities. These are the Export Industry Modernization Program, the P30 million revolving fund for local garments manufacturers, and the international trade financing program.

Industry Issues and Problems. As discussed above, the local garments industry is in the downtrend. Big garments firms are either closing shops or downsizing. The question is whether the industry can bounce back and recovery strongly as in the recent past in the face of the following issues and concerns:

A. Underdeveloped support industries. The weak backward linkage with the textile and garment accessories industries compelled the industry to import raw materials. The industry, on the average, imports around 70 to 75 percent of its input requirements. Other garment firms, however, import as much as 95 to 100 percent of their input needs.

One of the disadvantages of this structure is that it increases the leadtime or turn around time; the time consumed from the taking of orders to the delivery of the goods to the buyers, because the local garment makers would still have to import their raw material needs. The bureaucratic processes involved in the importation of materials would usually result in major delays in the production. The

average turn around time for the garments is 120 to 145 days, versus the norm of 60 days. Since garments is sensitive to fashion which does not last very long (a cycle of 6 to 10 months), the delay makes the local manufacturers uncompetitive in the international market.

Many garments exporters get their raw materials from abroad on consignment basis. Under the scheme, the foreign buyer of the garments provides the local garment maker the needed raw materials. This therefore assures the buyer that the garments are made of good materials and is priced lower. On the part of the local garment enterprise, the set up minimizes the risk of order cancellations and spares the firms of its efforts to raise working capital to finance raw material requirements. The present arrangement though has a number disadvantages: (i) foreign buyers can dictate the price of the garments; (ii) consignment (which is also termed are "cut-make-and-trim" reduces the local content of the finished good to mere labor. With labor as the only local content, the industry's net exports therefore are minimized. Furthermore, this reduces the local garments industry to look for other markets outside the quota areas.¹³

B. Labor relation problems. The survey of the Board of Investment identified labor relations and people-related concerns as one of the biggest problems of the industry. These concerns include: (1) high absenteeism; (2) low productivity; (3) injuries (fatal or non-fatal); (3) poor training; (4) non-effective incentives schemes which could foster unrest and labor strikes.

C. Dismantling of the quota under the new GATT/WTO. About 83 percent of garments exports are sold to the quota markets. Given the weak support link with the local textile industry and the relatively higher labor costs in the Philippines (compared to China, Indonesia, for example), the dismantling of the quota system in the international market puts a heavy burden on the garments industry. Efficiency and productivity improvement may be the only factors available for the industry to use in facing these challenges.

IV. Productivity Measurement

IV.a Methodology¹⁴

The present study adopts the framework of productivity analysis of Cororaton, et al. In particular, the study will calculate the following productivity indices of the sub-industries under the textile and garments industries listed in Section II above: (i) total factor productivity (TFP); (ii) technical efficiency (TE); and (ii) technical progress (TP). These indices are calculated using a

¹³This paragraph and the next heavily draw from the Industry Digest of the Private Development Corporation of the Philippines (PDCP): April 1992.

¹⁴This section heavily draws from Cororaton, et al.

production function approach.

As discussed in Cororaton, et al, there are generally two methods available which one can use to measure TFP: (i) the deterministic approach; and (ii) the stochastic approach (see Figure 2).¹⁵ The deterministic approach can be broken down into two branches: (a) the index number approach which does not require any explicit specification of production functions; and (b) the growth-accounting approach which requires the specification of production functions. The index number approach requires only the formulation of index numbers (usually based on distance functions), while the growth-accounting approach makes use of either factor share calculations (i.e., production function parameters are calculated as factor shares, using a given set of data), or programming methods (i.e., the production parameters are estimated using programming techniques within a deterministic framework).

The Growth-Accounting Approach. Further elaboration of the growth-accounting approach is given below.

Consider a Cobb-Douglas production function

$$(1) \quad Q_t = A(t) \cdot \prod_{k=1}^K (X_{kt})^{\alpha_k} \quad \alpha_k > 0.$$

where Q_t is output, $A(t)$ is the catch-all variable which captures technical progress, X_{kt} are factor inputs, α_k are the factor shares.

Take the time derivative of (1), divide the result by Q_t , and rearrange terms

$$(2) \quad \dot{A}(t)/A(t) = \dot{Q}/Q - \sum_{k=1}^K s_k \cdot \dot{x}_k/x_k$$

where the dots represent the time derivatives, and the s_k represents the k^{th} the input's share of output. Usually, the time derivatives are proxied by period differences of logarithmic values of Q and X , which are represented by their small letters, q and x . The term in the left-hand side of the equation represents the growth in total factor productivity, which is the difference between the growth of output and the weighted growth of factor inputs.

¹⁵For a recent survey of the approaches and the list of references see Kalirajan, Obwona, and Zhao (1994), and Kalirajan and Shand (1994).

In this approach, it is assumed that the observed output is obtained by using the given technology to its full potential. This means that the realized or observed output level is the frontier output, which is 100 percent technically efficient. Therefore, the growth in $A(t)$ is interpreted as only the change in technology or shifts in the production function. In reality, however, an industry (or a firm, depending upon the unit of analysis) may *not* be operating along the production frontier. In cases where the industry operates below the frontier (this is also called the "best practice" frontier) the growth accounting method will give biased estimates of technical change.¹⁶ Moreover, in the growth-accounting approach, factors of production are assumed to be paid according to the values of their marginal products. If this assumption does not hold, it can create another source of bias in the estimates of total factor productivity growth.

Stochastic Frontier Production Function Approach. The major distinguishing feature of the stochastic frontier production function approach to the growth-accounting method is the assumption regarding the existence of an unobservable production frontier function. This function corresponds to the set of maximum attainable output levels for a given combination of inputs. For each industry, this frontier, or best practice, production function can be represented as¹⁷

$$(3) \quad Q^F_i = f[X_i, t]$$

where Q^F_i is the potential output level on along the frontier production function at any particular time t , and X_i is the vector of factor inputs. The usual regularity conditions are assumed to be satisfied in $f[\cdot]$, i.e., $f' > 0$, and $f'' < 0$.

Using (3), any actual or observed output Q_i can be expressed as

$$(4) \quad Q_i = Q^F_i \cdot \exp(u_i) = f[X_i, t] \cdot \exp(u_i)$$

where $u_i \leq 0$ and $\exp(u_i)$ (with $0 < \exp(u_i) \leq 1$) is the level of technical efficiency at the observed output Q_i . The variable u_i represents the combined effects of various non-price and organizational factors which constrain the industry from obtaining its maximum possible output Q^F_i .

¹⁶As pointed out in Kalirajan, Obwona, and Zhao (1994), there are two possible sources of inefficiency: (1) technical efficiency (i.e. production below the frontier); and (2) allocative inefficiency (this will be reflected in the shares used to aggregate inputs).

¹⁷See Chyi and Wang (1994)

When there are no socio-economic constraints affecting the industry, u_i takes the value of zero. On the other, when the industry faces constraints, u_i takes the value of less than zero. The actual value of u_i depends on the extent to which the industry is affected by the constraints. Thus, a measure of technical efficiency of the i^{th} industry can be defined as

$$(5) \quad exp(u_i) = Q/Q^F_i$$

(Actual Output)/(Maximum possible output)

Equation (5) is the basic model that is generally used for measuring technical efficiency. In this model, the numerator is observable, but the denominator is not. Various methods using different assumptions have been suggested in the literature to estimate the denominator.

Taking the total derivative of the logarithm of Equation (4) with respect to time yields the following growth accounting equation

$$(6) \quad Q/Q_t = f_x \cdot (x/x_t) + f_t + (u_t)$$

where f_x and f_t denote output elasticities (not partial derivatives) of $f[\cdot]$ with respect to input X and time t , respectively. The variables with dots indicate time derivatives. Thus, equation (6) shows that output growth can be decomposed into three main components: (i) the growth of inputs weighted by their respective output elasticities; (ii) the rate of outward shift of the best-practice frontier function (which also indicates technological progress); and (iii) the change in the level of technical efficiency at time t . Thus, the total factor productivity growth of industry j at time t is

$$(7) \quad TFP_{jt} = \frac{Q_{jt}/Q_{jt}}{f_x \cdot (x_{jt}/x_{jt}) + f_{jt} + (u_{jt})}$$

Thus TFP growth is the sum of technological progress (TP) and the change in technical efficiency.

The decomposition of TFP growth of an industry using the stochastic approach is shown

graphically in Figure 3.¹⁸ The industry faces two production frontiers in periods 1 and 2: F_1 and F_2 , respectively. If the industry was technically efficient, output would be Q_1^* in period 1 and Q_2^* in period 2. However, the industry's realized output is Q_1 in period 1 and Q_2 in period 2, owing to technical inefficiency TI . Technical inefficiency is measured by the distance between the frontier output and the realized output of a given industry, i.e., TI_1 in period 1 and TI_2 in period 2. Therefore, the change in technical efficiency over time is the difference between TI_1 and TI_2 . On the other hand, technical change, or technical progress, is measured by the distance between F_2 and F_1 , i.e., $Q_2^* - Q_1^*$ (using X_2 input levels) or $Q_1^* - Q_1^*$ (using X_1 input levels).

The total output growth of the industry using this framework can be decomposed into (i) input growth; (ii) technical progress change; and (iii) technical efficiency change. Based on the Figure, the decomposition is

$$\begin{aligned}
 (8) \quad D &= Q_2 - Q_1 \\
 &= A + B + C \\
 &= [Q_1] + [Q_1^* - Q_1] + [Q_2 - Q_1^*] \\
 &= [Q_1] - [Q_1^* - Q_1] + [Q_2 - Q_1^*] \\
 &\quad + \{Q_2^* - Q_2\} \\
 &= [Q_1] + (Q_1^* - Q_1) - (Q_2^* - Q_2) \\
 &\quad + (Q_2^* - Q_1^*) \\
 &= [Q_1] - (Q_2^* - Q_2) + (Q_1^* - Q_1) \\
 &\quad + (Q_2^* - Q_1^*) \\
 &= TI_1 + \Delta T_e + \Delta Q_x
 \end{aligned}$$

where

$Q_2 - Q_1$ production output growth

¹⁸Based on Kalirajan, Obwona, and Zhao (1994).

$TI_1 - TI_2$	technical efficiency change
ΔT_e	technical change or technical progress
ΔQ_x	change in output production due to factor input growth

From (8) total factor productivity growth consisting of changes in technical efficiency over time and shifts in technology over time can be measured by

$$(9) \quad TFP = A + B$$

$$[TI_1 - TI_2] + \Delta T_e$$

It is clear from these equations that the technical change component of productivity growth captures shifts in the frontier technology.

The distinction between technical progress and technical efficiency has very important policy implications. "For a given technology, it may be interesting to know whether the gap between the 'best-practice' technologies and realized production functions is diminishing or widening over time. Technical efficiency change can be substantial and may outweigh gains from technical progress itself. It is therefore, important to know how far a firm is off its frontier at any point in time, and how quickly it can reach the frontier. For instance, in the case of developing economies which borrow technology extensively from abroad, failures to acquire and adapt new technology will be reflected in the lack of shifts in the frontier over time. The movement of the frontier over time reflects the success of explicit policies to facilitates the acquisition of new technologies. Similarly, changes in technical efficiency over time and across individual firms will indicate the success or failure of a number of important industrial or agricultural policies."¹⁹

Thus, from the above discussion the productivity indices may be interpreted as follows

(1) Change in TFP: If this is negative, it will mean that the increase in the traditional factor inputs (labor, capital, and raw materials) did not bring about an equal increase in output. Conversely, if this is positive, it means that the growth of output is bigger than the combined growth of the traditional factors inputs. Thus, TFP growth can have negative, zero, or positive values.

(2) Change in TE: If this is positive, it will indicate that the firm (or industry) moves toward the best practice frontier. That is, its output increased even if it did not increase the level of its traditional factor inputs; or simply put, even if the firm did not invest on new equipment, hire more

¹⁹See Kalirajan, Obwona, and Zhao (1994)

labor, and purchase additional raw materials, its output level increased. The question is: How did the increase in output come about? The increase in output was due to the improvement in the organizational set-up of the firm. This improvement could come in the form of improved management style, proper incentives, improvement in plant and production management (e.g., "bottom-up" decision process²⁰), and the like.

(3) Change in TP: If this is negative, it will mean that there is a deterioration in the best practice frontier, i.e., the production frontier itself shifted downwards. This could mean a lot of things: it could be due to the importation of wrong or inappropriate technology (probably due to the insufficiency in the availability of technical capability available to be able to adequately assess other technologies available in the market), or it could be due to the failure of the firm to adapt properly the newly acquired equipment to the local environment or working conditions. Investing on new equipment may increase the level of capital stock. But if this did not lead to an equal increase in output at least, then it would mean that the firm was not able to fully adapt the new equipment (and the new technology that goes along with the new equipment) to the local environment or working conditions. Thus the increase in output may be short of what has been desired. However, if TP is positive, then the firm has been getting new technology and has been adapting it appropriately to generate more output for every increase in factor inputs.

Model Specification. The original specification of Equation (4) involves a production function with a error term which is composed of two components: one which accounts for random effects, and another for technical inefficiency.²¹ The model can be expressed as

$$(10) \quad Q_i = X_i\beta + (V_i - U_i), \quad i=1,...,N$$

where

Q_i :	is the production (or logarithm of the production) of the i^{th} industry;
X_i :	is the $k \times 1$ vector of transformations of the input quantities of the i^{th} industry;
β :	is an vector of unknown parameters;
V_i :	are random variables which are assumed to be independent and identically distributed (iid) as $N(0, \sigma_V^2)$. Also, this variable is independent of U_i .
U_i :	in turn are the non-negative random variables which are assumed to account for technical inefficiency in production and are often assumed to be iid as $ N(0, \sigma_U^2) $.

²⁰It was observed during the company interviews conducted that some of the firms which are implementing schemes like "suggestion drop boxes" and incentives to workers, are satisfied with the productivity performance of their workers.

²¹See Aigner, Lovell, and Schmidt (1977), Meeusen and van den Broeck (1977), and Coelli (1994).

In the literature, Equation (10) has been modified to a more general form like²²

$$Q_{it} = X_{it}\beta + (V_{it} - U_{it}), \quad i=1,\dots,N; t=1,\dots,T$$

$$U_{it} = (U_{it}\exp(-\eta(t-T)))$$

where Q_{it} : is the production (or logarithm of the production) of the i^{th} industry in the t^{th} period;
 X_{it} : is the $k \times 1$ vector of the transformations of the input quantities of the i^{th} industry in the t^{th} period;
 β : is a vector of unknown parameters (as defined above);
 V_{it} : are random variables which are assumed to be independent and identically distributed (iid) as $N(0, \sigma_V^2)$. Also, this variable is independent of U_{it} .
 U_{it} : in turn are the non-negative random variables which are assumed to account for technical inefficiency in production and are often assumed to be iid as $|N(\mu, \sigma_U^2)|$.

In the parameterization of (11) σ_V^2 and σ_U^2 are replaced with $\sigma^2 = \sigma_V^2 + \sigma_U^2$ and $\gamma = \sigma_U^2/(\sigma_V^2 + \sigma_U^2)$, respectively.²³ Equation (11) can be estimated using maximum-likelihood methods.

Cororaton, et al tested Equation 11 with different values for η and U_{it} , capturing different distributional forms of the technical efficiency coefficient. In the present case, however, only one form was estimated, the time-varying and truncated normal distribution, i.e., η and $\mu \neq 0$. Furthermore, only Cobb-Douglas specification of the production function was estimated.²⁴

The production function and technical efficiency estimates were computed using the computer software "Frontier Version 4.1" developed by Coelli (1994) which computes for the maximum-likelihood estimates (MLEs) of the parameters of the model and the predictors for technical efficiencies.²⁵ The program uses a three-step procedure: (1) it computes for the ordinary

²²See Battese and Coelli (1992).

²³See Battese and Corra (1977).

²⁴Cororaton, et al estimated both the translog and Cobb-Douglas production function specifications.

²⁵The author gives special thanks to Tim Coelli of the University of New England (Australia) for sending us his recent Frontier program (version 4.1) and for allowing us to use the software. Without the program we could not have incorporated the stochastic frontier approach to the TFP growth analysis.

least squares (OLS) estimates of the β parameters of the production function; (2) a grid search of the μ , η , and other parameters is conducted using the OLS estimates of the β parameters; and (3) the values selected in the grid search are used as starting values in an iterative procedure using the Davidson-Fletcher-Powell method to obtain the final MLE estimates.

There is still one possible source of estimate bias left, though, in the above stochastic frontier approach to TFP estimation. It employs a restrictive assumption of Hicks-neutral technical change. Kalirajan and Obwona (1994) provides an alternative specification which relaxes this Hicks-neutral shifts assumption in the production function. The alternative method is called "stochastic coefficients frontier production function" approach (SCFP). This method can also be implemented empirically using the computer software program developed by Kalirajan. Unfortunately, we did not have the opportunity to get hold of the computer program.

Data Used. The main sources of data in the estimation were the 1983 and 1988 Census of Establishments, and the 1991, 1992, 1993 Annual Survey of Establishments of the National Statistical Office.²⁶ The sampling methods applied in these censuses and surveys are different, thus the data may not be comparable through time. To address this problem, we calculated all data from these sources in per establishment basis at the 5-digit PSIC level.

The data collected were: value of output, total employment, book value of fixed assets²⁷, and total cost of materials. All these were expressed in per establishment level. All values were expressed in 1985 real prices. The values for the industry output were deflated using the consumer prices index for clothings. Book values of fixed assets were deflated using the implicit price index for the national investment. The values for the cost of materials were deflated using the implicit price index for national imports.

IV.b Empirical Results

²⁶The productivity indices that are computed in the present study may not be totally consistent with the ones in Cororaton, et al, because of the following reasons: (i) whereas the sample of firms used in the previous study included firms employing 20 or more workers, the present study considered firms with 50 or more workers; (2) whereas the previous study considered the period from 1956 to 1992, the present one focused the analysis on the following years (because of data availability at the 5-digit PSIC level) 1983, 1988, 1991, 1992, and 1993; (3) whereas the concept of "best practise" in the previous study referred to what was the "best" for the entire manufacturing sector, the present one considered the "best practise" frontier only for the textile and garments industry. Thus, sub-industries within these two are compared with the industry "best practise", and not the entire manufacturing "best practise" frontier.

²⁷The ideal variable should have been industry capital stock derived using a perpetual inventory method where yearly investment and depreciation are utilized in the calculation. Furthermore, the resulting capital stock should have been corrected for capacity utilization to get the capital services that go into the production process (see Cororaton, et al for further discussion). However, this cannot be done at the 5-digit PSIC level of disaggregation. As such, this presents a weakness in the estimation process in the present paper. However, Kalirajan and Tse (1989) used the same book value of fixed assets in their estimation of technical efficiency for Malaysian manufacturing industries.

The unit of analysis used in the study is sub-industries of textiles and garments at the 5-digit level, group of firms having the same PSIC number in both the Census and Survey of Establishments. The ideal unit of analysis should have been individual firms, and the results would have been more effective. But this level of disaggregation is not available at the present official statistical system. Nonetheless, the results of the paper can be interpreted as the mean measures of the individual groups of firms within the textile and garments industries.

IV.b.1 Textile Industry

Technical Efficiency Coefficient. Equation 5 defines the concept of technical efficiency coefficient. It is the ratio of the actual output to the potential output of the industry. If the ratio is 1 it indicates that the actual output is equal to the potential output. This means that the industry operates along the best-practice frontier and is therefore technically efficient. If the ratio is below 1 then the actual output is below the potential level, and therefore technically inefficient. The degree of technical inefficiency is captured by the magnitude of the ratio: the farther the ratio falls below one the higher is the level of technical inefficiency.

Table 19 shows the TE coefficients of the textile. The highest coefficient is the manufacture of carpets and rugs, which is followed closely by finishing mills. On the other hand, among the least efficient ones are the weaving mills, the integrated textile mills, the manufacture of nets, and the manufacture of industrial bags.

Figure 4 shows the average TE coefficients of the sub-industries for the years considered in the analysis. It shows how the different sub-industries vary in terms of technical efficiency. The mean of the average TEs is 0.855. There are only 5 sub-industries whose TE coefficients are above this average. These are:

Code	Output Contribution	5-Digit PSIC
32141	(1.42)	Manufacture of carpets and rugs.
32116	(2.07)	Finishing mills.
32112	(23.85)	Fiber and filament mills.
32122	(9.91)	Hosiery, underwear and outwear knitting mills.
32153	(0.87)	Manufacture of articles made of native materials.
	(38.12)	Total Contribution

The contributions of these sub-industries to the 1993 value of output of the industry is 38.12 percent. One should note that finishing mills is the second most technically efficient sub-industry.

On the other hand, those sub-industries with below average TEs are:

Code	Output Contribution	5-Digit PSIC
32151	(2.55)	Manufacture of cordage, rope and twine.
32121	(4.99)	<i>Fabric knitting mills.</i>
32113	(22.69)	<i>Spinning mills.</i>
32132	(0.89)	Manufacture of made-up textile goods for house furnishings.
32119	(1.37)	Spinning, weaving, texturizing and finishing textiles, not elsewhere classified (n.e.c.).
32131	(4.55)	Manufacture of textile industrial bags.
32117	(0.52)	Hand weaving.
32118	(0.70)	Manufacture of lace, narrow fabrics and small wares in narrow fabric textile mills.
32111	(14.55)	<i>Integrated textile mills.</i>
32152	(0.54)	Manufacture of nets, excluding mosquito nets.
32115	(6.70)	<i>Weaving mills.</i>
(61.88) Total Contribution		

The total output contribution of these sub-industries is 61.88 percent. One should note that the integrated mills is almost at the bottom of the list, while the weaving mills is the last in the list.

We have seen that the industry as a whole has not been performing well in terms of output growth in the last 20 years. One of the major reasons behind this is that some of the big sub-industries are technically inefficient. They have been operating below the "best practice" frontier. One implication of this is that the output level of the whole industry can still be increased through improvement in the level of technical efficiency of those sub-industries with below average TEs, especially those which contribute a big share to the total output of the industry which include: spinning mills, weaving mills, and integrated mills. This output increase can be done even if no new investment on capital equipment takes place, i.e., even if these sub-industries stick with the old and outdated machines as seen in Section II. This possibility is shown graphically in Figure 5. The entire textile industry is operating below the frontier, say point A. With the same capital equipment K_0 , total output of the industry can still be improved through improvement in technical efficiency to move to point B, or at most to point C along the frontier. This is done without additions to the existing stock of capital equipment, but with improvements in the organizational set-up in the respective sub-industries, either in management or in production operation or both. However, it requires a closer look at the specifics of the organizational set-up of these sub-industries to be able to recommend specifically which are to be improved. This can be done, for example, through productivity analysis using time and motion study.

Changes in TE, TP, TFP. Changes in technical efficiency (TE), technical progress (TP), and

total factor productivity (TFP) were computed and are shown in Table 20. It is difficult to discern a trend out of the indices computed. Thus, we summarized the results in a four-quadrant graph in Figure 6 which is divided by the zero line in the y-axis and the mid-range line in the x-axis (at -0.508). Sub-industries which are below this mid-range line are considered technically inefficient. Quadrant A shows sub-industries with positive change in TP and below average change in TE; quadrant B shows positive and above average change in TE; quadrant C shows negative change TP and below average change in TE; and lastly quadrant D shows negative change in TP and above average change in TE.

Focus on the location of the 7 big sub-industries in the graph: 32112; 32122; 32116; 32121; 32113; 32111; and 32115. Relative to the other sub-industries, 32112 (fiber and filament mills) is the second best performer in terms of technical progress and efficiency (quadrant B). Sub-industries 32122 (hosiery, underwear...) and 32116 (finishing mills) are technically efficient, but they are not doing well in terms of technical progress. Sub-industries 113 (spinning mills) and 121 (fabric knitting mills) are near the border line, but they are technically inefficient and have declining technical progress. Sub-industry 111 (integrated mills) has slightly positive technical progress but technically inefficient, and 113 (weaving mills) is technically inefficient and has declining technical progress.

The implications of these results are the following: (1) Those important industries which are technically efficient (which is related to the functioning of their respective organizational set-up) should be able to maintain this performance. These industries are 32112; 32122; and 32116. (2) Those industries with negative technical progress should look into the possibility of upgrading their equipment and adapt properly the new technology that comes with the new equipment. This should be accompanied by skills development with respect to their manpower resources. This is especially true with respect to industry 32122 and 32116. (3) Sub-industry 32111 (integrated mills) has positive technical progress. However, it is technically inefficient. Thus, this sector should look closely into its organizational structure (on how to improve it) and less on getting new equipment. Another possibility is to adapt properly existing machinery and equipment to the current norm in the sector. (4) Sub-industries 32113 and 32121 should improve both the TP and the TE, while 32115 should focus more on improving its TE so that they can contribute more to the growth of the overall output of the textile industry.

Productivity Indices Versus Comparative Advantage Index. Table 21 compares the computed productivity indices with the industry comparative advantage index which is indicated by the ratio of domestic resource cost (DRC) over the shadow exchange rate (SER)²⁸. To be able to discern a trend, Figure 7 presents a scatter diagram comparing the TP index and the 1988 DRC/SER ratio,

²⁸This comparative advantage index was computed by Austria (1994). The degree of comparative advantage is determined by the magnitude of the ratio: the lower the ratio, the higher is the comparative advantage of a particular sub-industry.

while Figure 8 the TE and the 1988 DRC/SER. To facilitate the analysis, the scatter diagram in Figure 7 is divided by the two boundaries along the y-axis (at the DRC/SER of 1 and 2) and one boundary along the x-axis, at the mid-range of the computed TEs, at -0.508. In Figure 8 the same boundaries along the y-axis are drawn, but along x-axis the dividing line is at the mid-range of the computed TPs. Based on the location of the sub-industries in Figure 7, efforts have to be exerted to improve the efficiency of those sub-industries within the area bounded by DRC/SER of 1 and 2 and technical efficiency of -0.508. These sub-industries have comparative advantage, but they are technically inefficient. Output in these industries can still be improved without new investments. In the same manner, to upgrade the technical progress of the overall industry, investment on capital equipment can be focused on sub-industries located in the similar area in Figure 8.

IV.b.2 Garments Industry

Technical Efficiency Coefficients Table 22 presents the TE coefficients of the sub-industries in the garments industry. The results are to be interpreted in the same manner as in the previous section. The most technically efficient sub-industries in garments are: 32222 (women's, girls' and babies' garments manufacturing) and 32229 (other ready-made clothing). Sub-industries 32221 (men's and boy's garment manufacturing) and 32292 (manufacture of hats...) have mid-range technical efficiency coefficients, while 32230 (embroidery establishment) has the lowest coefficient. Given this, it seems that the industry is fortunate (relative to the textile industry) that those sub-industries which are contributing a substantial share to the total industry output are technically efficient.

Changes in TE, TP, TFP. The period averages of changes in technical efficiency, technical progress, and total factor productivity are shown in Table 23. From the number one should note that while TFP growth are negatives, the TE change are all positive. The contraction in the TFP growth came from the deterioration in the TP. This set of results is consistent with what was found in Cororaton, et al. These results would have one important implications: either the industry as a whole has not been acquiring new technology or has acquired but has not been adapting it properly to the local setting. Based on the company interviews conducted (discussed in detail below) it is more of the former because firms have not been upgrading their equipment. For example, the sewing machines used are generally of the old model, existing for the last 15 to 20 years. Also, the negative contribution of TP could be due to the poor skills development of workers as a result of fast turnover of workers (again to be discussed in detail below). It has become a general practice for garment firms to hire workers on a contract basis to avoid possible labor problems and disruptions.

Productivity Indices Versus Comparative Advantage Index. Figures 9 and 10 compare the productivity indices with the measure of comparative advantage (see also Table 24). In both diagram one can observe that the top three contributors to the industry output are technically efficient, relatively favorable in terms of technical progress and have competitive edge in terms of domestic resource cost. The implication is that investment on new equipment to bring in new technology,

coupled with skills development of workers may bring about output gains for the industry.

Results of Company Interviews

The above productivity analyses were conducted using sub-industry data at the 5-digit PSIC disaggregation and at the national level. As such, the results could be interpreted as the mean of the group of firms within the 5-digit PSIC code. Although this could already give a general picture of the issues on productivity, the views and experiences of specific firms are missed out. In some cases, this could also be important. Thus, to fill this gap, we conducted company interviews, to get a feel of the sentiments and industry experiences of specific industry members.

Before the conduct of the company interviews, we did a number of preliminary steps.

i. Design of the questionnaire. We designed a set of questions (shown in the Appendix). The questions asked in the questionnaire sheet range from the size of the firm to issues which the firms thought as the major determinants of productivity and technology status, to issues affecting their behavior/attitude with respect to the state-of-the-art technology in their respective field of operations, and to government policies affecting/influencing their investment behavior on technology improvement.

ii. Design of the sample. We selected a few firms to interview. The selection was based on the size of the firm in terms of sales and assets. We attempted to contact big firms, medium-sized firms, and small-scale firms, to be able to distinguish between size and productivity/technology status. We sent the questionnaire to the selected firms so that they can take a look at the questions to be asked before we conducted the proper interview. Unfortunately, we got a few respondents, only 6 companies²⁹. Below, we summarized the general results of the company interviewed conducted.

Firm Structure. The companies interviewed were corporations, and majority of them are on joint ventures with Japanese, American, and British corporations. The ownership structure ranged from 70 percent Filipino owned to 100 percent. Only one of the companies interviewed has branches/subsidiaries abroad. The firms are involved in different product lines: textile manufacturing, garments such as "intimate" product lines such as panties, bra, and the like, children knitted sports wear. The firms are medium to large-scale with capitalization ranging from less than P4 million to P15 million, and with the number of workers employed ranging from 200 to 1000 workers.

²⁹As promised, we could not list the names of the companies that were interviewed.

2. **Productivity Enhancing Measures.** Some firms are implementing programs to automate with their processes with the use of computers. Some firms also sending out their regular and permanent workers for training and seminars. Others are implementing different production schemes and processes and are providing incentives to workers to improve productivity. Others are spending on research and development (R&D), but this spending are generally meant for automation and for computerization, while others are just waiting for R&D results conducted by their foreign partners, like Mitsubishi of Japan.
3. **Technology and Technological Changes.** Some firms are pushing for a strong supervisory training to improve productivity. Others have just acquired the most modern spinning mills in the country and are keeping the mills at the top level in the last 5 years. Others are experimenting with different production processes like production line type and modular type (wherein workers can be rotated in the different production stages). Some have claimed that the latter is relatively efficient. Some firms are just "passive" with respect to technological changes. Some have expressed the view that financing of technological improvement is a binding constraint, while others the availability of skilled workers and limited market access.
4. **Technology Transfer.** The existing technology used in the companies is almost general to the industry and not firm-specific. Some of the equipment acquired have not been modified in any significant way, but remained intact since acquired. Some of the equipment are not patented, licensed or affiliated with other transnational corporations (TNCs).
5. **Government Policies.** Some companies commented that the bureaucratic processes involved in the importation of materials cause the major delay. Incentives and other government support do provide help in transferring technology.

Other General Impressions From the Company Interviews. A number of insights apart from the ones asked in the questionnaire were gathered during the company interviews. Among the important and relevant ones are:

A. The garments industry does not have enough flexibility to explore other markets because materials are imported on consignment basis, usually with big US buyers. This affects productivity because the market is seasonal, highly irregular, and fashion sensitive. Irregular market, coupled with labor market problems, compelled garment makers not to retain skilled workers on a permanent basis. In fact, laborers are hired on a contractual basis, usually on a 6-month working contract.

B. Flexibility would have been attained had the local textile industry been able to supply

the garments' raw material requirements. Garments industry is not buying from the local textile industry because locally made fabrics are not competitive both in terms of price and quality.

C. Competitiveness of the locally made garments is negatively affected by the long turn-around time. Demand for garments is highly sensitive to fashion which usually lasts for 6 to 10 months. Thus, quick turn-around time (i.e., from sourcing of raw materials to production, and finally, to the delivery of the goods to the buyers) is a very important factor in international market. However, the garments industry is not competitive in this area because it has to import its raw material requirements. The bureaucratic procedures involved in the importation of raw materials, the delay in the customs, and the outdated machineries all results in long delays in the delivery of garments to the buyers.

D. Fast turnover of workers affects the development of skills, and therefore of labor productivity. Generally, the industry practice is that workers (usually women) in the garments industry are hired to work for at most 6 months only. This lack of employment security/tenure may affect negatively workers' work ethics, morale, and therefore labor productivity. However, this may require an in-depth study to determine exactly the industry's cost and benefit of not having a permanent work force.³⁰

E. There are independent modernization initiatives by some companies in the industry. Some production processes are computerized, e.g., the automation of the pattern-making process, the cutting, etc. However, existing sewing machines are of the old model. In fact, some machines were acquired second hand, with ages ranging from 15 to 20 years of old. There are no significant investment done on new machines.³¹ In fact, some computerized sewing machines are not used, because they do not fit well with the present skills of the garment workers. Those firms which bought new machines which are computer-assisted were compelled to modify the machines from computerized ones to manually operated ones. Generally, garment making is not very sensitive to new technologies, especially in modern sewing machines, but very dependent on labor skills and design. However, the present structure of the garments industry does not allow for skills development of workers as discussed above.

F. Some garment firms are practising production line process (wherein each one does

³⁰There may be a host of factors behind this structure which may possibly include: (a) The desire to minimize labor disruptions. The garments is labor-intensive. As such, it is sensitive to strikes, especially if workers are unionized by militant labor groups. To avoid labor disruptions, it seems that workers are hired on a contractual basis. (b) The objective to minimize other workers benefits, since regulated minimum wages are already set at high rates. This will have to be looked at in great detail, but this strategy seems to reduce labor costs, which is claimed by the industry members to be the biggest portion of the total production costs.

³¹This can be partly explained by the fact that there are no break through in sewing machines, except for the fact that some machines are already computerized.

one thing only from the beginning to the end of the process), while others modular process (wherein everyone can be rotated in all stages of the production process). In some firms the latter is efficient. It can also enhance the skills of the workers, from the beginning of the production line up to the end of the process. Some firms are providing incentives to workers, on top of the minimum pay the workers get. In some firms, this scheme improves the productivity of the workers. Some firms put suggestion drop boxes to be able to get feedback from the workers.

G. Some garment firms however, have not introduced changes in the pattern-making and cutting process, but stick instead with the old methods where processes are done manually. From the interviews, there seems to be a generally observation that the industry is not very aggressive in terms of upgrading existing technology to improve competitiveness.

H. The general impression is that the garments industry can be classified into two types: the highly efficient firms which are mostly located in the export processing zones; and the relatively less efficient ones operating outside the zones. Highly efficient firms have high foreign participation. They are investing significantly on new technology and computerization. Their plant operations are organized in such a way that they conform with international practices and standards. Some of these firms are owned by Taiwanese and Koreans, and are operating profitably in general. The latter firms, however, are mostly owned by Filipinos, i.e., the major shareholders are Filipinos. However, they do have foreign direct buyers. These foreign buyers do provide new technologies, but not as much as the highly efficient ones.

The current structure of the industry that has evolved through time is such that the highly efficient ones continue their investment in modernization; to be at par with their foreign counterparts. Thus they are highly competitive. In fact, they can withstand foreign competition, especially in the high-end markets. However, the less efficient ones which cannot afford to invest on new technology are left at the margin. To survive, they resorted to sub-contracting. Subcontracting reduces production cost, especially the labor cost, because workers working for the subcontractors are usually paid on a piece-rate basis. Also, they pay lesser mandated benefits to the workers. This set up, however, entails implicit costs, because the principals cannot adequately monitor the quality of the output of the subcontractors. Since subcontractors usually have technologies which are sub-optimal, they also produce sub-optimal outputs. This results in poorer quality garments, which are relatively difficult to market abroad.

I. The garments industry may have good prospects, but not in all types of apparel/garments. Prospects are promising in a few product lines like children's wears, elaborated garments such as underwear, etc. These product lines require skilled labor. The Philippines is supposed to have a good supply of skilled workers, but in reality the supply of skilled labor is not that abundant. Vocational graduates do lack adequate training. This is because the facilities in the existing vocational schools are antiquated, far below the industry standard. This is therefore an area where government intervention is needed. The government may have to link and establish tie-ups

with the industry, so that the latter can provide assistance in terms of improving the facilities of the vocational schools. Job placements can give incentives to potential workers to go through proper and formal training in garments making. Stable jobs and job security in the industry can improve further the skills of the potential vocational and technical graduates.

J. The working conditions of some of the garments firms are mixed: a few garment factories have good working environment, while a number have sub-normal working conditions with factories poorly ventilated and very hot. This could negatively affect workers productivity. Also, majority do routinary work (especially in a production line process) which reduces workers' morale. The Department of Labor and Employment (DOLE) found that the incidence of non-compliance with labor standards is increasing at an alarming rate in the export zones, which are dominated by garment firms and semi-conductor plants. The impact of this on labor productivity is not certain, but certainly this could be an interest issue to look at in detail

K. The textile industry is considered by some industry members as a sunset industry. According to them any modernization initiative of the government will turn to waste if the program is not well handled. This comment was based on the rehabilitation program in the early 1980s which generally failed in meeting the objectives. Therefore, focused investment (i.e., specific parts of the industry) would have to be made.

L. During the initial periods of the industry, the industry was highly protected under the import substitution policy of the government. The fact that the textile millers were dominated by "traders", "not real manufacturers", this protection resulted in a structure where the industry millers were "just for profit only". Thus, no new significant investments in upgrading the production facilities took place. Re-investment also did not take place. This is clearly shown in the savings from depreciation, which were not re-invested back to the industry. Also, the highly unstable macroeconomic environment in the country presented a lot of uncertainty for long-term investments like spending on production facilities (especially in the 1970s, 1980s, and early 1990s). Thus, investors just focused on short-term investments. Smuggling was also a major reason behind the lack of investment push within the industry. Local textile millers cannot compete with low priced smuggled textiles. Some say that textile smuggling was due to high trade protection.

M. Even if investment is done, the textile industry may still not be able to improve its competitiveness, especially if investments are focused on the highly capital-intensive and energy-intensive stages: spinning and weaving/knitting. An idea has been floating that the Philippines can become competitive only in the finishing and dyeing stage which requires skilled labor. The textile industry can import the yarn and fibers. Coloring, dyeing, bleaching, design and other finishing process can be done locally, using skills and creativity of Filipino workers. The product from this processing stage can be sold to the garments industry, thereby intensifying the link between the two industries. But again, the garments industry has to recovery.

N. One strategy of improving the finishing stage of the textile industry is to attract foreign investors through small to medium scale foreign direct investment. Investment incentives may have to be provided for to be able to attract investors. Techniques and other recent technology in the finishing stage can be brought in by foreign investors, or through joint ventures. These techniques can be adopted to suit the local setting, through proper adaptation programs. But again, the government may have to provide infrastructure through improving training facilities.

VI. Summary and Policy Implications

The productivity analysis in the present study looks into the productivity issues at the 5-digit PSIC level of disaggregation for the textile and garments industries. This effort is an extension of the productivity study conducted by Cororaton et al which was done for the 25 manufacturing sectors at the 3-digit PSIC level.

The present study has three major components: (1) a comprehensive discussion of the background of the industries; (2) an analysis of the productivity indices; and (3) a summary of the company interviews. The industry background puts the discussion on productivity in historical perspective. The productivity indices which include technical efficiency, technical progress, and total factor productivity were computed using a stochastic frontier approach. The company interview results give some concrete insights of the issues and problems in terms of productivity and technology status at the firm level.

It was observed that the textile industry has been performing below par for the last 20 years. The industry background identified 5 major factors behind this poor performance: (a) smuggling of textiles; (b) out-dated machineries and old production technologies because of reluctance to scrap old machineries; (c) high cost of raw materials, and energy costs; (d) very link with the garments industry, which is supposed to be the major buyers of locally made textiles; (e) unprofitable integrated mills.

In contrast, the garments industry performed above par, in spite of the fact that support from other industries is very weak. The high growth was due to the strong pull from the export demand. However, the industry is facing a major challenge: the gradual removal of the quota system in the international market may prolong the slowdown which the industry is facing at the moment.

The analysis on productivity found that some of the sub-industries in the textile industry are technically inefficient, especially those ones which contribute a major shares to the total output of the industry. This would imply that the output of the industry can still be augmented even with the current stock of equipment, which is considered to be outdated. That is, some effort would have to be exerted to improve the organizational set-up of these industries (which may include technical management, industrial engineering, planning and control of production) to be able to increase the

level of output given the existing mix of factor inputs. However, there are sub-industries which have comparative advantage but do require new investment on equipment. These are the sub-industries with relatively high technical efficiency coefficients, but with relatively large and negative technical progress. New investment equipment or infusion of new technology will be able to improve this.

The textile industry is undergoing a rehabilitation program to upgrade existing equipment. The results on productivity indices imply that the rehabilitation should not be implemented across-the-board. Some segments of the industry are in much need for newer technology (especially those with comparative advantage like the finishing mills), while others only require improvement in the organization set-ups so as to improve efficiency.

In the case of the garments industry, the results show that the entire industry needs upgrading in the existing technology. This is shown in the positive technical efficiency contribution to the total factor productivity of all sub-industries (except embroidery) and negative technical progress.

Apart from this, the industry would also need to improve on its stock of human capital. This is because new equipment which embodies new technology may require higher skills from the workers. These changes or improvement would require the following:

(1) Aggressive in adapting new technology. It was observed that a number of the firms are passive in terms of acquiring new technology. It seems that there are no initiatives to upgrade existing processes. This is shown in the old models of the sewing machines used.

(2) Allow skills development in the work place. Due to labor problems, it has been the general practice of the industry to hire workers on non-permanent basis. This would surely affect not only labor productivity, but the total factor productivity as well because equipment may not be utilized properly if there is inadequate supply of workers who can man the equipment.

(3) Infrastructure support from the government. The garments industry has largely pursued a labor-intensive practice through excessive use of relatively self-trained workers rather than through purposive training. This production orientation may in the short term solve employment issues, maintain traditional product qualities, but it leaves global competitiveness much to be desired. In fact, this may only increase the direct labor costs per unit of production as workers learn their skills through their own initiatives with very little assistance from the industry or government. What is needed is to improve the training facilities of the vocational schools, especially for garments. What is happening is that vocational graduates do lack sufficient knowledge because the facilities in these training centers are poor, not at par with the industry standard. What is needed is a tie-up with the government and industry to improve the training facilities of the centers.

List of Tables

Table 1
Decomposition of Total Factor Productivity Growth
Using Stochastic-Frontier Approach: TFP, TP and TE
of the Garments & Textile Industry

Covered Period	Textile Industry			Garments Industry		
	TFP	TP	TE	TFP	TP	TE
1956-1970	4.08	2.62	1.46			
1971-1980	0.63	-2.16	2.79	-9.47	-11.79	2.32
1981-1992	0.56	-2.11	2.68	-0.68	-5.59	4.90
1956-1992	1.77	-0.46	2.23	-4.56	-8.43	3.87

Where: TFP- Total Factor Productivity
 TP - Technical Progress
 TE - Technical Efficiency

Source: Cororaton C., et al. "Estimation of Total Factor Productivity of Phil. Manufacturing Industries: The Estimates
 January 1996.

Table 2
Share of Textile and Clothing to Mfg. in terms of No. of Establishment,
Employment & Census Value Added, Censal Years

Industry	Number						% share to total manufacturing					
	1972	1975	1978	1983	1988	1991	1972	1975	1978	1983	1988	1991
Textiles												
No. of establishment	226	431	583	317	546	567	5.05	6.74	6.92	5.53	4.75	4.96
Employment	60,870	72,487	177,181	85,585	89,485	84,297	13.85	14.16	14.61	12.21	10.44	8.91
Value added (P million, 1985 prices)	4,185	5,308	10,605	5,856	4,977	5,361	7.31	6.39	10.67	5.82	4.53	3.91
Clothing												
No. of establishment	316	576	815	436	1,556	1,776	7.06	9.01	9.68	7.61	13.54	15.54
Employment	19,009	32,912	75,749	75,259	142,160	172,874	4.33	6.43	6.25	10.74	16.59	18.27
Value added (P million, 1985 prices)	576	913	2,469	2,790	6,371	8,807	1.01	1.10	2.48	2.78	5.81	6.42

Source: Austria, Myrna S., 1994. "Textile and Garments Industries: Impact of Trade Policy Reforms on Performance, Competitiveness and Structure". PIDS Research Paper Series No. 94-06. Makati: Philippine Institute for Development Studies, 1994
 Census of Establishment. NSO. censal years.

Table 3
Value of Exports by Major Commodity Group
For Dates Indicated
(In million US dollars)

Commodity Group	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
COCONUT PRODUCTS	733	466	474	566	582	541	503	447	643	532	638
SUGAR & PRODUCTS	279	165	103	71	74	113	133	136	110	129	76
FRUITS & VEGETABLES	262	256	275	283	306	319	326	391	371	439	429
OTHER AGRO-BASED PROD.	250	271	364	376	480	454	431	504	432	476	530
FOREST PRODUCTS	271	199	201	243	261	197	94	73	57	45	26
MINERAL PRODUCTS	494	570	539	462	764	829	723	610	633	686	774
PETROLEUM PRODUCTS	194	91	94	133	162	95	155	175	150	136	131
MANUFACTURES	2,775	2,539	2,672	3,430	4,338	5,192	5,707	6,403	7,298	8,729	10,587
Elec. & elec egpt./parts & tele.	1,329	1,056	919	1,119	1,476	1,751	1,964	2,293	2,753	3,551	4,984
Garments	603	623	751	1,098	1,317	1,575	1,776	1,861	2,140	2,272	2,371
Textile yarns/fabrics	38	39	44	68	71	87	93	100	121	118	172
Footwear	56	49	48	57	77	96	109	141	144	168	209
Travel goods and handbags	6	10	12	16	22	41	43	45	53	54	76
Wood manufactures	50	43	49	62	79	88	117	117	113	105	129
Furniture and fixtures	88	84	89	130	184	204	189	177	181	203	238
Chemicals	105	150	243	245	256	279	261	304	268	262	304
Non-Metallic mineral mfrs.	21	24	18	22	33	45	57	74	80	97	96
Machinery & transport equip.	36	30	45	78	54	115	150	181	288	363	468
Processed food & beverages	109	106	116	126	184	206	207	233	220	271	298
Iron and steel	36	40	33	32	64	76	77	53	23	50	51
Baby carr., toys, games, etc.	21	16	17	24	31	51	67	117	149	168	189
Basketwork, wickerwork & other articles of plating matls.	57	57	75	93	115	134	128	122	133	132	134
Misc. mfrd. articles, n.e.s.	59	63	67	82	102	124	133	146	163	187	193
Others	161	149	146	178	273	320	336	439	469	738	675
SPECIAL TRANSACTIONS	8	12	8	7	27	10	19	17	32	38	138
RE-EXPORTS	125	40	112	149	80	71	95	82	98	165	104
TOTAL EXPORTS	5,391	4,629	4,842	5,720	7,074	7,821	8,186	8,840	9,824	11,375	13,433

Source: BSP, Selected Economic Indicators

Table 4
Market Distribution for Local Textiles
1979-1989

Year	Production (000 MT)	Domestic	Indirect Export	Direct Export
1979	115.2	91.1	-	8.9
1980	96.2	84.5	1.8	13.6
1981	95.5	83.2	3.1	13.6
1982	80.8	86.9	2.1	11.0
1983	88.0	90.9	2.3	6.8
1984	75.6	87.4	5.4	7.1
1985	71.5	83.1	8.5	8.4
1986	93.5	77.0	18.2	4.8
1987	120.0	64.2	26.7	9.1
1988	133.0	70.7	22.5	6.8
1989	155.0	n.a.	n.a.	n.a.

Source: Austria, Myrna S., 1994. "Textile & Garments Industries: Impact of Trade Policy Reforms on Performance, Competitiveness & Structure". PIDS Research Paper Series No. 94-06, PIDS 1994, Makati City

Table 5
Forward - Backward Linkage
for Garments & Textiles

	1983	1990
Textile (Forward)	2.95	6.24
Garments (Backward)	1.31	2.49

Source: Input-Output Table 1983 & 1990.

Table 6
Installed and Operated Machinery

Type	Total No. of Machines, 1991	
	Installed (units)	Operated (units)
Ring spindles	1,500,000	1,100,000
O-E rotors	48,000	48,000
Shuttle looms	19,000	17,600
Shuttleless looms	1,614	1,614

Source: "Spinning & Weaving", Industrial Restructuring Studies
Development Bank of the Phils., 1994.

Table 7
Production Activities of Subsector Enterprises

Activities	Number of Enterprises	Percentage of Total
Spinning	46	56.8
Weaving	12	14.8
Spinning & weaving	2	2.5
Spinning & knitting	1	1.2
Weaving & knitting	1	1.2
Integrated mills	19	23.5
Total	81	100.0

Source: "Spinning & Weaving", Industrial Restructuring Studies
Development Bank of the Phils., 1994.

Table 8
Net Profit After Tax

Enterprise Orientation	Number of Enterprise	Profit After Tax (% of Net Sales)
Integrated Mills	6	4.6
Spinning Mills	10	9.0
Spinning & Weaving	1	1.8

Source: "Spinning & Weaving", Industrial Restructuring Studies
Development Bank of the Phils., 1994.

Table 9
Comparison of Cost Components in Yarn Production

Cost Element	Production Cost by Country									
	Philippines		Korea		Japan		India		USA	
	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total
Materials *	2.48	68.0	2.25	73.0	2.22	59.0	1.64	59.0	1.96	59.0
Labour	0.08	2.0	0.10	4.0	0.54	14.0	0.08	3.0	0.48	14.0
Energy	0.24	7.0	0.13	4.0	0.24	6.0	0.15	5.0	0.11	3.0
Financial Cost (Interest Rates + depreciation)	0.85	23.0	0.59	19.0	0.80	21.0	0.94	33.0	0.81	24.0
Total	3.65	100.0	3.07	100.0	3.80	100.0	2.81	100.0	3.36	100.0

* Including waste and auxillary materials

Source: "Spinning & Weaving", Industrial Restructuring Studies
Development Bank of the Phils., 1994.

Table 10
Comparison of Cost Components in the Cotton Fabric Production

Cost Element	Production Cost by Country									
	Philippines		Korea		Japan		India		USA	
	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total	Cost (USD/kg)	Percent of Total
Materials *	0.590	48.5	0.558	57.0	0.536	40.0	0.411	41.0	0.477	43.0
Labour	0.040	3.5	0.058	6.0	0.261	20.0	0.042	4.0	0.237	22.0
Energy	0.115	10.0	0.061	6.0	0.115	9.0	0.063	6.0	0.055	5.0
Financial Cost (Interest Rates + depreciation)	0.450	38.0	0.302	31.0	0.409	31.0	0.494	49.0	0.334	30.0
Total	1.195	100.0	0.979	100.0	1.321	100.0	1.010	100.0	1.103	100.0

* Including waste and auxillary materials

Source: "Spinning & Weaving", Industrial Restructuring Studies
Development Bank of the Phils., 1994.

Table 11
Effective Protection Rate (EPR) of the Textile Industry
1983 and 1988

PSIC	Description	EPR	
		1983	1988
Textiles (Primary)		90.6	29.1
32111	Integrated textile	83.9	25.2
32112	Fiber and filament	71.6	24.5
32113	Spinning	126.2	29.3
32115	Weaving	169.8	27.6
32116	Finishing	54.9	22.5
32117	Hand weaving	102.9	24.2
32118	Manufacture of laces narrow fabric & small wares in narrow fabrics	90.7	24.5
32119	Spinning, weaving, texturizing & finishing, n.e.c.	65.7	27.7
32121	Fabric knitting	90.6	12.7
32122	Hosiery, underwear & outerwear knitt	56.5	68.4
Textiles (Secondary)		111.8	47.6
32131	Manufacture of textile industrial bags	78.6	90.5
32132	Manufacture of made-up textile goods for house furnishings	73.1	50.6
32133	Manufacture of canvas products	211.0	33.3
32139	Manufacture of made-up textile goods except wearing apparel, n.e.c.	63.6	89.2
32141	Manufacture of carpets and rugs	154.4	4.5
32151	Manufacture of mats and matings	213.7	65.5
32152	Manufacture of nets, excl. mosquito ne	130.0	83.7
32153	Manufacture of articles of native mat'ls	101.0	16.7
32159	Cordage, rope and twine manufacturing	73.7	41.0
32160	Manufacture of artificial leather of cloth and others	232.2	-1.5
32170	Manufacture of fiber batting, padding & upholstery filling including coir	101.0	-9.3
32199	Manufacture of miscellaneous textiles, n.e.c.		99.8

Source: Austria, Myrna S., 1994. "Textile & Garments Industries: Impact of Trade Policy Reforms on Performance, Competitiveness & Structure". PIDS Research Paper Series No. 94-06, PIDS 1994, Makati City

Table 12
Indicators of the Garment Industry's
Exposure to Foreign Competition
in the Philippines

Indicator	Period	(%)
Share in world exports of garments (X/WX)	1970-1974	0.05
	1975-1979	0.39
	1980-1984	0.66
	1985-1987	0.85
Share of exports in production (X/Q)	1970-1974	5.70
	1975-1979	22.28
	1980-1984	35.89
	1985-1987	69.46
Import penetration rate (M/(Q+M-X))	1970	1.66
	1975	1.96
	1980	0.83
	1987	13.75

X= exports

Q= domestic production

M= imports

XY=world exports

Source: Austria, Myrna S., 1994. "Textile & Garments Industries: Impact of Trade Policy Reforms on Performance, Competitiveness & Structure". PIDS Research Paper Series No. 94-06, PIDS 1994, Makati City

Table 13
Average Percentage Distribution of Phil. Exports of Garments,
by Country of Destination, 1981-1995 (per cent)

Country	1981-1984	1985-1989	1990-1994
Quota market	84.6	90.0	83.3
USA	58.4	65.8	62.4
EC	20.8	19.7	17.6
Other Europe	1.8	1.0	0.5
Canada	3.6	3.4	2.7
Non-quota market	15.4	10.0	16.7
Japan (incl. Okinawa)	2.2	1.9	3.8
Australia	1.8	0.7	0.5
Hongkong	2.2	1.7	2.5
Others	9.2	5.7	9.8

Source: Austria, Myrna S., The Effects of the MFA Phase Out on the Phil. Garments and Textiles Industries

Table 14
Philippine Exports of Garments
1991 - Aug 1995
FOB value in Million US dollars

Group	1991	1992	1993	1994	1995 (Jan- Aug)
Garments	1,740.28	2,014.31	2,133.99	2,218.81	1,564.09
Men's wear	444.82	528.57	603.88	643.62	492.41
Women's wear	155.84	165.84	163.18	191.20	154.94
Infants wear	364.69	396.25	433.90	442.83	300.63
Underwear	104.75	108.24	110.78	106.05	68.70
Nightwear/Bathrobes	52.03	66.83	56.72	51.96	35.30
Swimwear	4.55	6.18	5.37	5.55	6.00
Articles of apparel/clothing	613.60	742.39	760.14	777.60	506.11
Percent Share	1991	1992	1993	1994	1995 (Jan- Aug)
Garments (% over the Total Exports)					
Men's wear (% over Total Garments Export)	0.26	0.26	0.28	0.29	0.31
Women's wear	0.09	0.08	0.08	0.09	0.10
Infants wear	0.21	0.20	0.20	0.20	0.19
Underwear	0.06	0.05	0.05	0.05	0.04
Nightwear/Bathrobes	0.03	0.03	0.03	0.02	0.02
Swimwear	0.00	0.00	0.00	0.00	0.00
Articles of apparel/clothing	0.35	0.37	0.36	0.35	0.32
Growth Rates		1991-1992	1991-1993	1993-1994	
Garments		15.75	5.94	3.97	
Men's wear		18.83	14.25	6.58	
Women's wear		6.42	-1.61	17.17	
Infants wear		8.65	9.50	2.06	
Underwear		3.34	2.35	-4.27	
Nightwear/Bathrobes		28.44	-15.12	-8.41	
Swimwear		35.87	-13.03	3.34	
Articles of apparel/clothing		20.99	2.39	2.30	

Table 15
Market Share of Phil. Exports by Product Category
in the US, 1989-1994 (per cent)

Product Category	1989	1990	1991	1992	1993	1994
Babies garments & clothing accessories	30.90	32.96	27.45	27.46	27.48	25.18
MB shirt, not knit	2.32	2.35	3.10	2.82	3.11	3.13
Nightwear, pyjamas & underwear	13.17	14.37	13.46	13.39	11.39	11.34
MBWG knit shirts & blouses	11.20	12.92	13.01	13.27	10.88	9.23
Other MB coats of breeches & shorts	8.17	10.08	7.38	6.43	6.88	6.59
Other MB coats of synthetic fibre	6.64	8.36	7.98	9.37	9.93	12.70
MBWG knit shirts & blouses	11.20	12.92	13.01	13.27	10.88	9.23
MB breeches, trousers & shorts & headwear	5.50	6.47	4.51	3.29	3.41	3.11

Source: Austria, Myrna S., The Effects of the MFA Phase Out on the Phil. Garments and Textiles Industries

Table 16
Cost of Production in Garments
(1990 I - O Table)

	1990
Total inputs	67.79
of which:	
Electricity	1.02
Financial Services	0.39
Gross Value Added	32.21
of which	
Compensation of Employees	10.78
Other Value Added	21.44
Total	100.00

Table 17
Top 20 Suppliers to the US - 1995
Hourly Labor Cost in the Apparel Industry
(Ranked According to 1995 Rates)

Country	Summer 1990 US\$	Summer 1991 US\$	Summer 1993 US\$	Summer 1994 US\$	Summer 1995 US\$
Bangladesh	N.A.	N.A.	0.16	0.18	0.20
China P.R.	0.26	0.24	0.25	0.33	0.25
Indonesia	0.16	0.18	0.28	0.30	0.33
Philippines	0.46	0.46	0.53	0.65	0.72
Honduras	0.48	0.48	0.63	1.14	1.22
Dominican Republic	0.67	0.64	0.63	1.46	1.52
Mexico	0.92	1.17	1.08	2.29	1.61
Korea	2.46	2.75	2.71	2.96	3.29
Hong Kong	3.05	3.39	3.85	4.05	4.32
Taiwan	3.41	3.74	4.61	4.78	5.18

Source: Werner International.

Table 18
Effective Protection Rate (EPR) of the Garments Industry
1983 and 1988

PSIC	Description	EPR	
		1983	1988
	Garments: Manufacturing of wearing apparel excl. footwear	3.1	-3.5
32211	Custom tailoring	0.9	-3.4
32212	Custom dressmaking	0.9	-4.7
32221	Men's and boys' garment manufacturing	3.3	-5.4
32222	Women's, girls' and babies garment manufacturing	3.3	-4.9
32229	Ready-made clothing manufacturing, n.e.c.	3.4	2.5
32230	Embroidery establishments footwear	2.3	2.3
32291	Manufacture of raincoats by cutting & sewing except rubber	3.0	-3.2
32292	Manufacture of hats, gloves, handkerchief neckwear (except knitted & paper) and apparel belts regardless of material	1.6	-7.5

Source: Austria, Myrna S., 1994. "Textile & Garments Industries: Impact of Trade Policy Reforms on Performance, Competitiveness & Structure". PIDS Research Paper Series No. 94-06, PIDS 1994, Makati City

Table 19
Technical Efficiency of the Textile Industry
1983, 1988, 1991 - 1993

PSIC	Industry Description	1983	1988	1991	1992	1993	Ave. ('83 - '93)
TEXTILES							
32111	Integrated textile mills	0.785	0.780	0.775	0.771	0.766	0.775
32112	Fiber and filament mills	0.884	0.881	0.878	0.876	0.873	0.878
32113	Spinning mills	0.829	0.825	0.821	0.817	0.813	0.821
32115	Weaving mills	0.770	0.765	0.760	0.755	0.750	0.760
32116	Finishing mills	0.941	0.940	0.938	0.937	0.935	0.938
32117	Hand weaving	0.795	0.791	0.786	0.782	0.777	0.786
32118	Manufacture of laces, narrow fabrics & small	0.792	0.787	0.783	0.778	0.773	0.783
32119	Spinning, weaving, texturizing & finishing mills	0.801	0.797	0.792	0.788	0.783	0.792
32121	Fabric knitting mills	0.842	0.838	0.834	0.831	0.827	0.834
32122	Hosiery, underwear & outerwear knitting mills	0.883	0.880	0.877	0.874	0.872	0.877
32131	Manufacture of textile industrial bags	0.796	0.792	0.787	0.783	0.778	0.787
32132	Manufacture of made-up textile goods for	0.818	0.814	0.810	0.806	0.801	0.810
32141	Manufacture of carpets & rugs	0.952	0.951	0.950	0.949	0.947	0.950
32151	Manufacture of cordage, rope and twine	0.861	0.858	0.855	0.851	0.848	0.854
32152	Manufacture of nets, excluding mosquito nets	0.783	0.778	0.773	0.768	0.763	0.773
32153	Manufacture of articles made of native mat's	0.865	0.862	0.859	0.855	0.852	0.859

Table 20
TFP, TE and TP Changes
for the Textile Industry

Industry	1983 - 1987	1988 - 1991	1992	1993	Average 1983 - 1993
TFP Changes					
32111	-1.64	4.23	-9.44	7.30	0.11
32112	-5.53	2.90	4.29	22.88	6.13
32113	-8.30	4.42	-10.98	4.45	-2.60
32115	-9.91	5.62	-11.33	-3.79	-4.85
32116	-6.40	9.64	-35.12	-28.51	-15.10
32117	-15.12	12.45	-12.89	6.06	-2.37
32118	-7.65	0.98	-6.10	5.81	-1.74
32119	-4.79	5.66	-20.36	11.14	-2.09
32121	-3.71	2.67	-9.15	-0.44	-2.66
32122	-3.27	11.28	-19.21	0.21	-2.75
32131	-8.81	1.72	-22.04	7.78	-5.34
32132	-5.03	-0.05	-7.18	8.61	-0.91
32141	-1.13	22.34	13.28	10.63	11.28
32151	-4.21	5.96	-21.23	0.69	-4.70
32152	-10.48	15.69	2.16	-26.16	-4.70
32153	-11.19	23.15	-11.96	-6.00	-1.50
TE Changes					
32111	0.78	0.78	0.77	0.76	0.77
32112	0.88	0.88	0.87	0.87	0.87
32113	0.82	0.82	0.81	0.81	0.82
32115	0.77	0.76	0.75	0.75	0.76
32116	0.94	0.94	0.94	0.93	0.94
32117	0.79	0.79	0.78	0.78	0.78
32118	0.79	0.78	0.78	0.77	0.78
32119	0.80	0.79	0.79	0.78	0.79
32121	0.84	0.83	0.83	0.82	0.83
32122	0.88	0.88	0.87	0.87	0.87
32131	0.79	0.79	0.78	0.78	0.78
32132	0.81	0.81	0.80	0.80	0.81
32141	0.95	0.95	0.95	0.95	0.95
32151	0.86	0.85	0.85	0.85	0.85
32152	0.78	0.78	0.77	0.76	0.77
32153	0.86	0.86	0.85	0.85	0.86
TP Changes					
32111	-2.42	3.46	-10.21	6.54	-0.66
32112	-6.41	2.02	3.42	22.01	5.26
32113	-9.13	3.60	-11.79	3.64	-3.42
32115	-10.68	4.86	-12.08	-4.53	-5.61
32116	-7.34	8.71	-36.05	-29.44	-16.03
32117	-15.91	11.66	-13.67	5.28	-3.16
32118	-8.44	0.20	-6.87	5.04	-2.52
32119	-5.59	4.87	-21.15	10.36	-2.88
32121	-4.55	1.84	-9.98	-1.26	-3.49
32122	-4.15	10.41	-20.08	-0.66	-3.62
32131	-9.60	0.93	-22.82	7.01	-6.12
32132	-5.85	-0.86	-7.98	7.82	-1.72
32141	-2.08	21.39	12.33	9.69	10.33
32151	-5.07	5.10	-22.08	-0.16	-5.55
32152	-11.26	14.91	1.39	-26.92	-5.47
32153	-12.05	22.29	-12.81	-6.85	-2.36

TFP - Total Factor Productivity
TE - Technical Efficiency
TP - Technica; Progress

Table 21
Ave. TP, TE and 1988 DRC/SER
for the Textile Industry

Industry	Average TP	Average TE	1988 DRC/SER
TFP Changes			
32111	-0.66	0.77	2.2
32112	5.26	0.87	3.8
32113	-3.42	0.82	1.7
32115	-5.61	0.76	1.9
32116	-16.03	0.94	1.6
32117	-3.16	0.78	1
32118	-2.52	0.78	1.4
32119	-2.88	0.79	1.6
32121	-3.49	0.83	1.7
32122	-3.62	0.87	2.3
32131	-6.12	0.78	-0.1
32132	-1.72	0.81	1.8
32141	10.33	0.95	0.8
32151	-5.55	0.85	1.5
32152	-5.47	0.77	2.8
32153	-2.36	0.86	1.1

TE - Technical Efficiency

TP - Technical Progress

Table 22
Technical Efficiency of the Garments Industry
1983, 1988, 1991 - 1993

PSIC	Industry Description	1983	1988	1991	1992	1993	Ave. TE
32221	Men's and Boys' Garment Mfg.	0.864	0.859	0.855	0.851	0.846	0.855
32222	Women's, Girls' & Babies' Garments Mfg.	0.963	0.962	0.961	0.959	0.958	0.961
32229	Ready-made Clothing Mfg., N.E.C.	0.951	0.95	0.948	0.946	0.945	0.948
32230	Embroidery Establishments	0.597	0.587	0.576	0.565	0.555	0.576
32292	Manufacture of hats, gloves, handkerchiefs, neckwear (except knitted & paper) and apparel belts regardless of materials	0.836	0.831	0.826	0.821	0.815	0.826

Table 23
TFP, TE and TP Changes
for the Garments Industry

Industry	1983 - 1987	1988 - 1991	1992	1993	Average 1983 - 1993
TFP Changes					
32221	0.09	-5.03	-7.31	-6.12	-4.59
32222	1.44	3.89	-6.74	-10.39	-2.95
32229	-0.10	3.80	-17.99	12.81	-0.37
32230	-3.93	10.43	-28.36	10.38	-2.87
32292	-14.26	14.03	-23.62	3.84	-5.00
Industry	1983 - 1987	1988 - 1991	1992	1993	Average 1983 - 1993
TE Changes					
32221	0.86	0.86	0.85	0.85	0.85
32222	0.96	0.96	0.96	0.96	0.96
32229	0.95	0.95	0.95	0.94	0.95
32230	0.60	0.59	0.57	0.55	0.58
32292	0.84	0.83	0.82	0.82	0.83
Industry	1983 - 1987	1988 - 1991	1992	1993	Average 1983 - 1993
TP Changes					
32221	-0.77	-5.89	-8.16	-6.97	-5.45
32222	0.47	2.93	-7.70	-11.35	-3.91
32229	-1.05	2.85	-18.93	11.86	-1.32
32230	-4.53	9.84	-28.93	9.82	-3.45
32292	-15.10	13.20	-24.44	3.03	-5.83

TFP - Total Factor Productivity
TE - Technical Efficiency
TP - Technical Progress

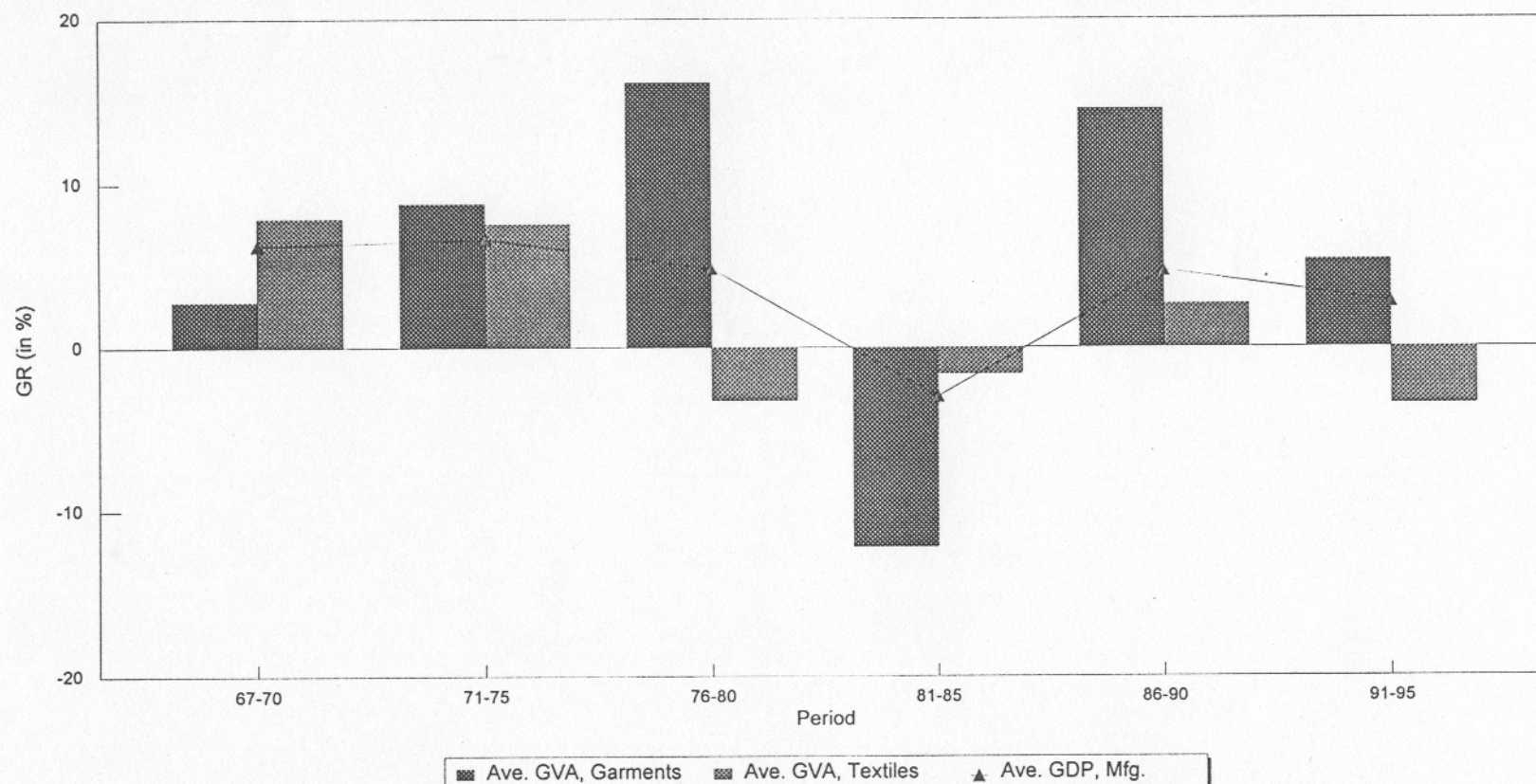
Table 24
Ave. TP, TE and 1988 DRC/SER
for the Garments Industry

Industry	Ave. TP	Ave. TE	1988 DRC/SER
TE Changes			
32221	-5.45	0.85	1.00
32222	-3.91	0.96	0.70
32229	-1.32	0.95	1.30
32230	-3.45	0.58	1.10
32292	-5.83	0.83	2.50

TE - Technical Efficiency
TP - Technical Progress

List of Figures

**Figure 1: Average GVA of the Garments & Textile Industries
vs. Average GDP of Phil. Mfg. (GR in %)**



INDUSTRY/INDUSTRY GROUP	67-70	71-75	76-80	81-85	86-90	91-95
Ave. GVA, Garments	2.8	8.8	16.2	-12.2	14.5	5.3
Ave. GVA, Textiles	7.9	7.6	-3.2	-1.6	2.6	-3.5
Ave. GDP, Manufacturing	6.2	6.6	4.8	-3.0	4.6	2.7

Figure 2
Total Factor Productivity Growth:
Methods of Measurements

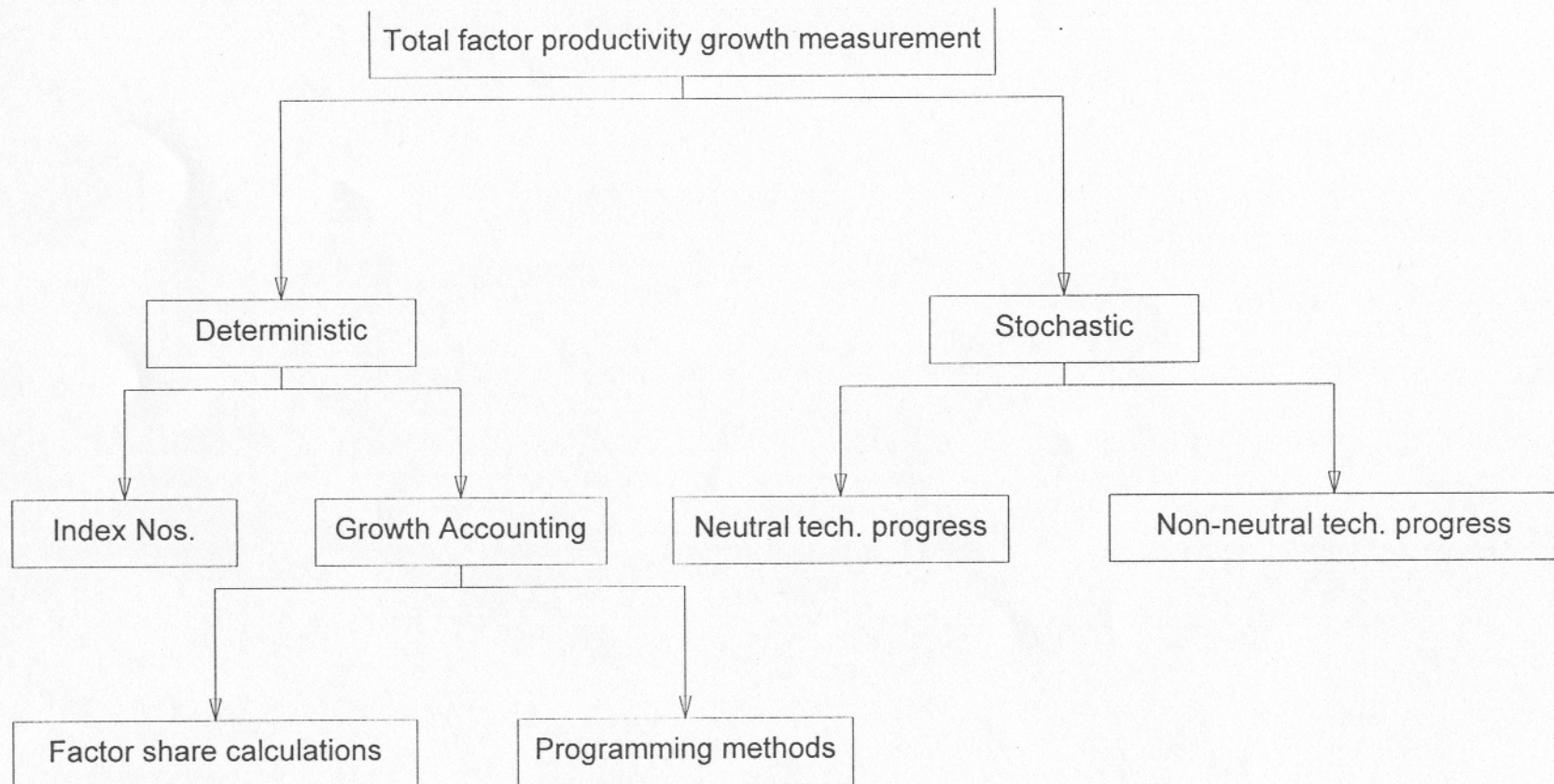


Figure 3
Decomposition of Output Growth into Technical
Efficiency

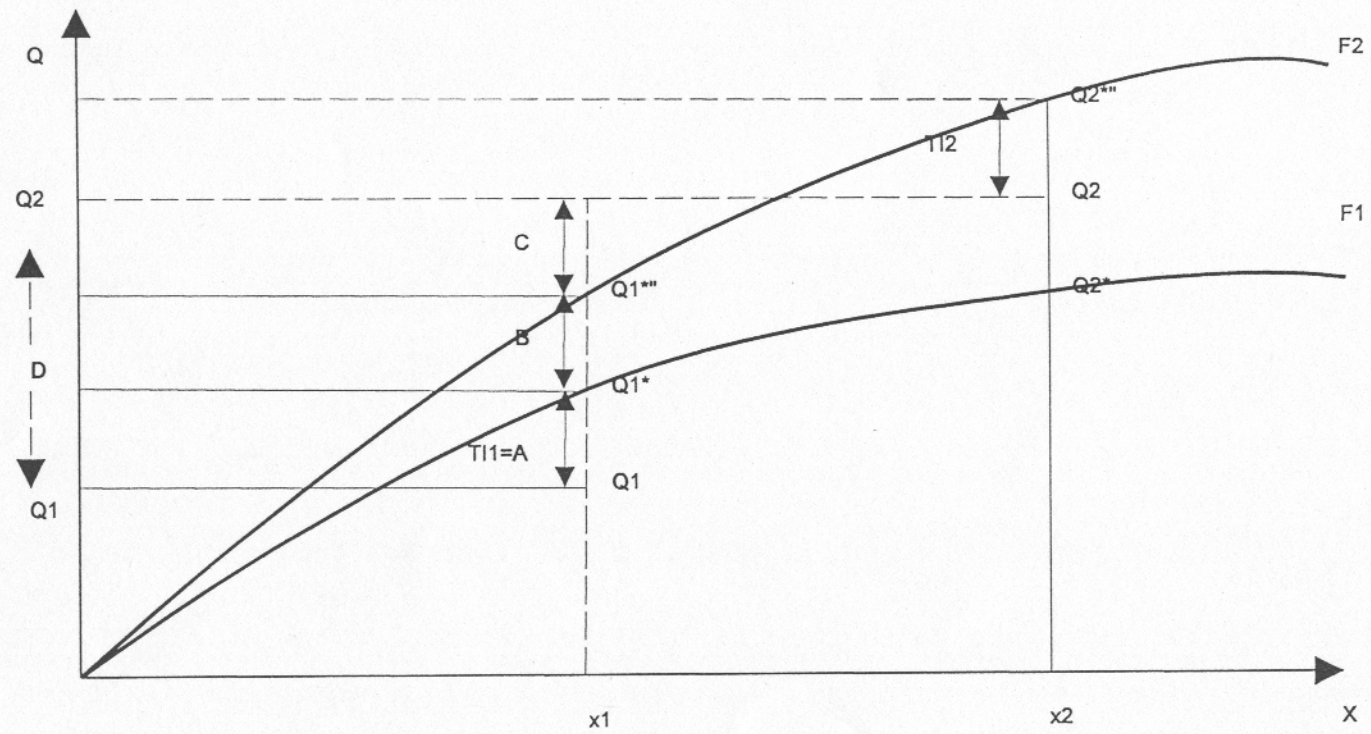
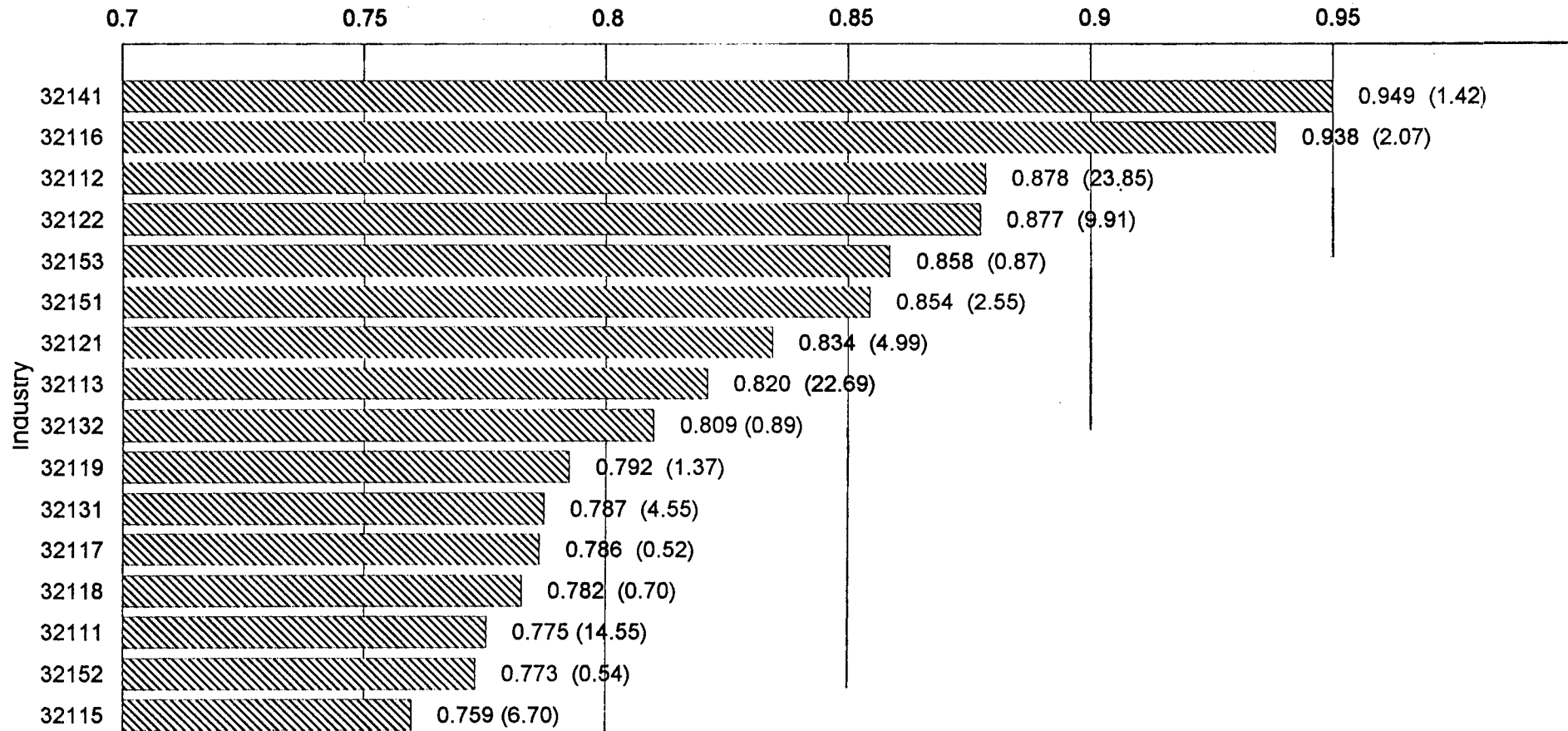


Figure 4: Ave. Technical Efficiency of Textile Industry
(Period covered- 1983, 1988, 1991-1993)



▨ Average TE

* Nos. in () are shares to total industry output

Figure 5

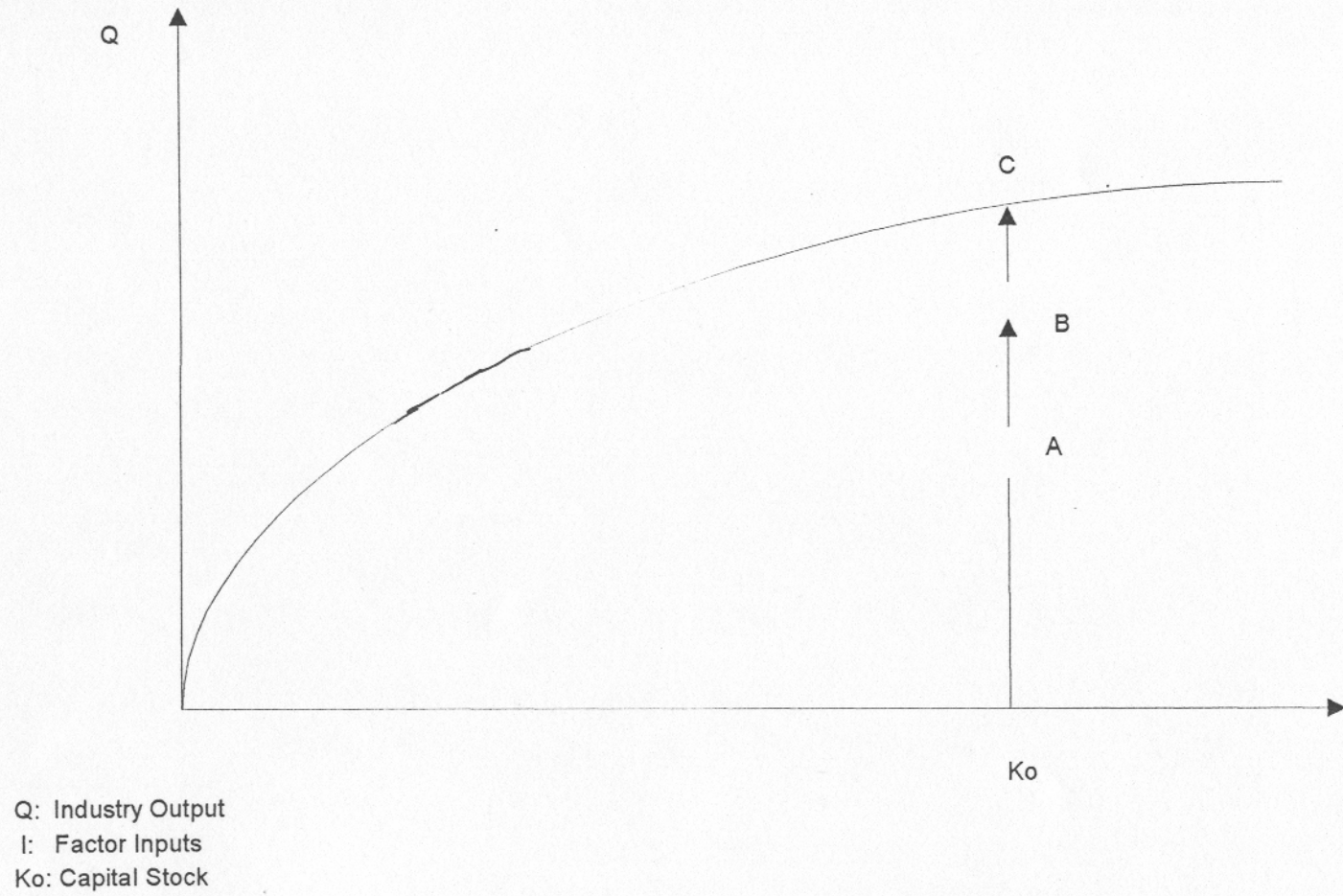
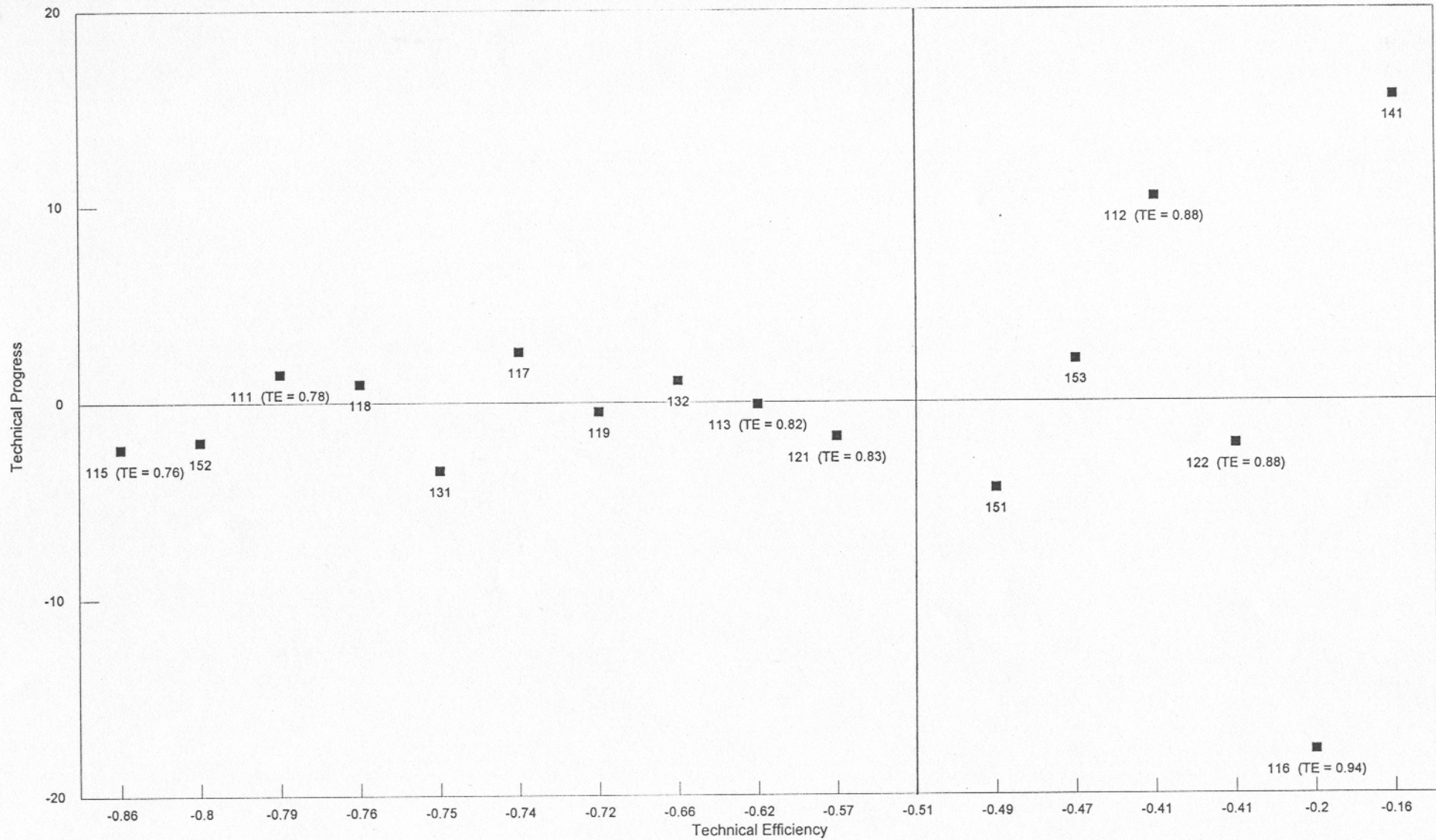
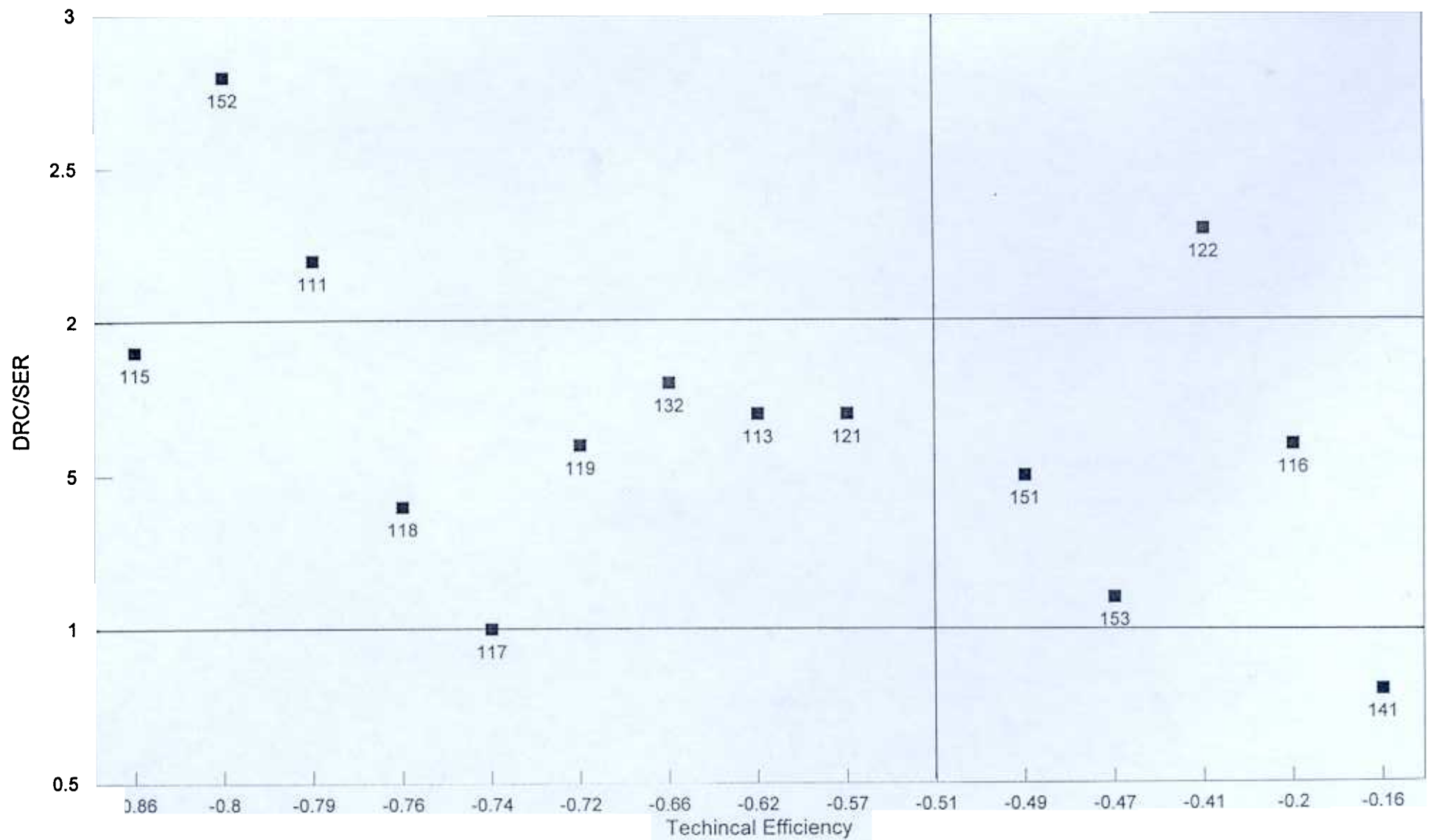


Figure 6: Technical Progress vs. Technical Efficiency of the Textile Industry

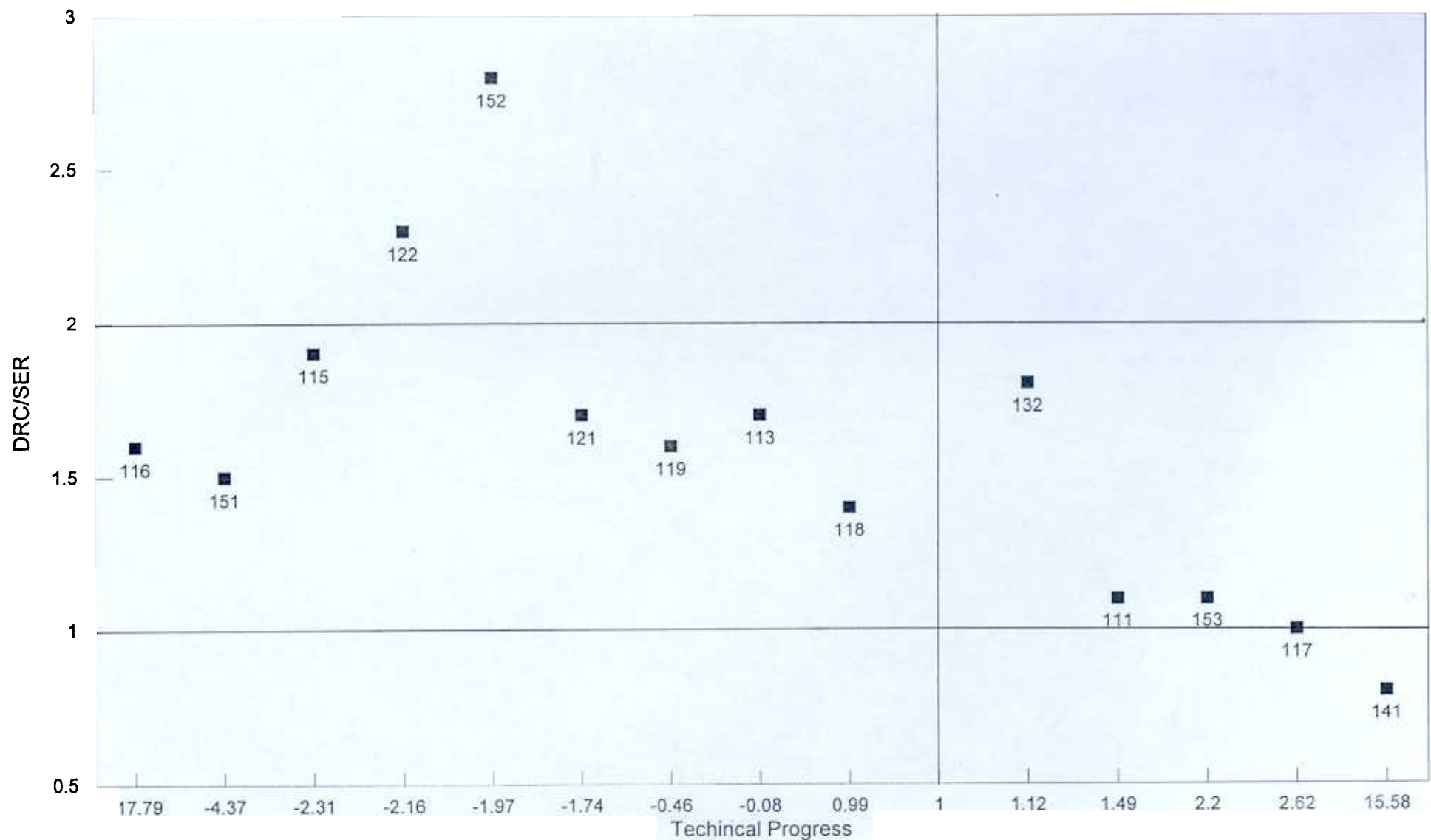


* Nos. in () are average technical efficiency coefficients

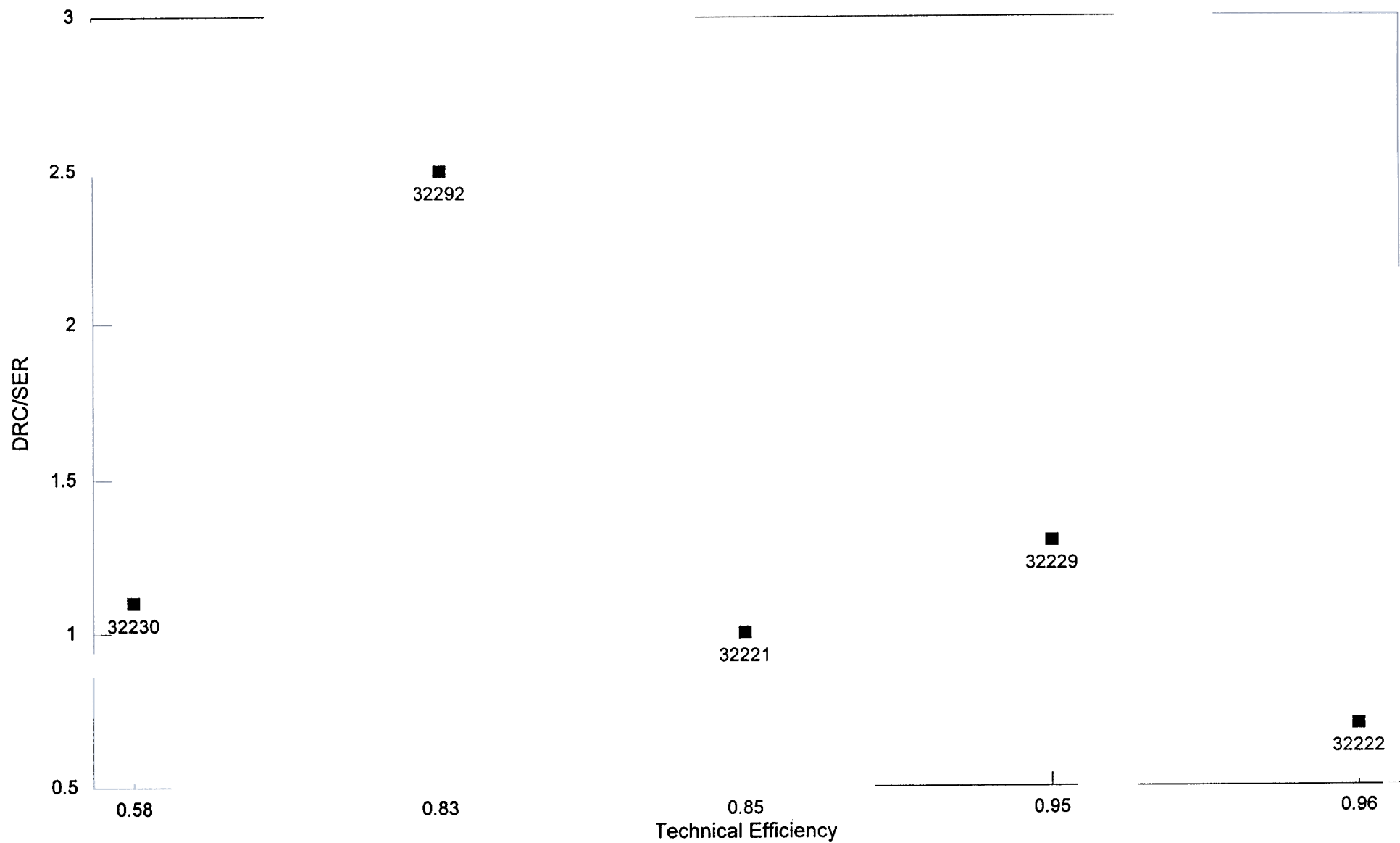
**Figure 7: Technical Efficiency vs. Comparative Advantage
for the Textile Industry**



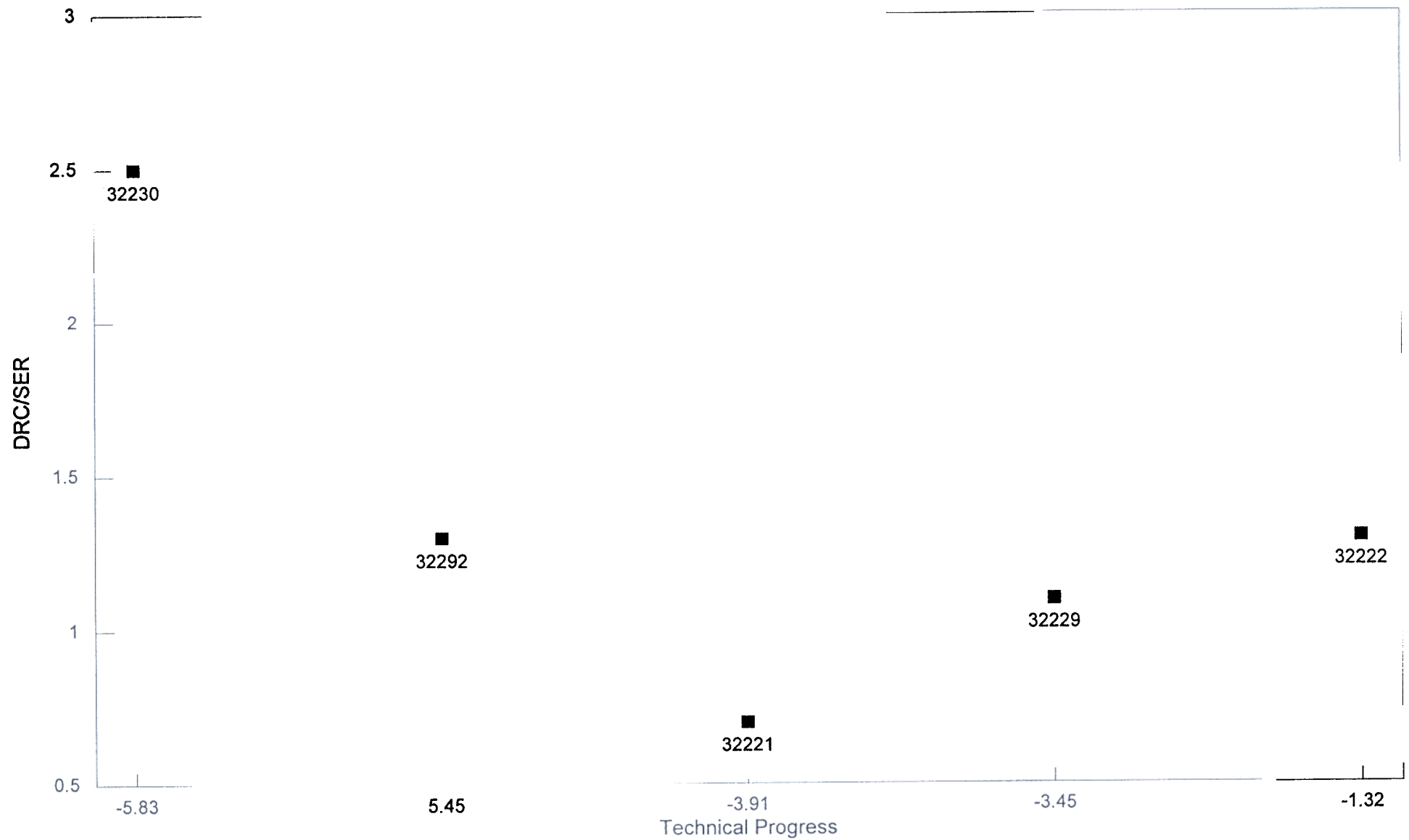
**Figure 8: Technical Progress vs. Comparative Advantage
for the Textile Industry**



**Figure 9: Technical Efficiency vs. Comparative Advantage
for the Garments Industry**



**Figure 10: Technical Progress vs. Comparative Advantage
for the Garments Industry**



Appendix: Sample Questionnaire

**TRANSFER AND ASSIMILATION OF FOREIGN
TECHNOLOGY: PHASE II (INDUSTRY CASE STUDIES)**

Sample Questionnaire

Name of Company _____

Industry _____

Address _____

Telephone No. _____

Name of Respondent : _____

Position _____

Date of Interview _____

I. FIRM STRUCTURE (Please check)

1. Business Form of Firm

1.1 Upon Establishment

Single proprietorship	
Corporation	
Joint venture	
Subsidiary	
Others (specify)	
Others (specify)	

1.2 At present

Single proprietorship	
Corporation	
Joint venture	
Subsidiary	
Others (specify)	
Others (specify)	

2. Date firm was established: _____

3. Firm Size

3.1 In terms of Capitalization

3.1.1 Upon establishment

Micro-scale (<P2M)	
Small-scale (P2 - 4M)	
Medium-scale (P4 - 15M)	
Large-scale (>P15M)	

3.1.2 At Present

Micro-scale (<P2M)	
Small-scale (P2 - 4M)	
Medium-scale (P4 - 15M)	
Large-scale (>P15M)	

3.2 Employment at Present

less than 50 workers	
51 - 100 workers	
101 - 200 workers	
201 - 350 workers	
351 - 500 workers	
501 - 1000 workers	
more than 1000 workers	

4. Composition of Manpower

NATIONALITY	% TO TOTAL MANPOWER
Filipino	
Foreigner	

5. Current Major Stockholders of Company

NATIONALITY	% SHARE
Filipino (natural born)	
Filipino-Chinese	
US	
Japanese	
Taiwanese	
Others (specify)	

6. Does your company have branches/subsidiaries overseas?

Yes

No

If yes,

Location (specify country or countries) _____

Date of start of operation overseas _____

7 What are your reasons for starting business?

Good market for products	
Profitable business	
Business inherited from family	
Others (specify)	

II. PRODUCTIVITY ENHANCING AND RESEARCH AND DEVELOPMENT (R&D) ACTIVITIES

What measures do you adopt to improve productivity?

2. What are the distinctive features of the evolution of productivity in your firm? Has the flow rate of productivity changed, and, if so, why and since when? What part does technological change play in this trend?

3. Do you conduct R&D activities?

_____ Yes

_____ No

If yes,

AREA	% OF BUDGET SPENT ON R&D ACTIVITIES
Product	
Marketing	
Human resources	
Management	
Others (specify)	

4. Has there been an increase in the budget for R&D activities during the past five years?

Yes _____ No _____

If yes, by how much (% increase)? _____

TECHNOLOGY AND TECHNOLOGICAL CHANGES

What are the main characteristics of the technological changes (processes or products) that have occurred in your firm during the last five years?

2. What are the main changes in your firm in the last five years with regards to technical operations? What is the rationale behind these changes?

3. Do you have plans to increase the degree of automation of your production process?

_____ Yes _____ No

4. Are you going to acquire new machine with higher capacity?

_____ Yes _____ No

5. On the average, what percentage of manpower is being replaced by the acquisition of a new machine? _____

6. Are you going to introduce new technology?

___ Yes _____ No

If yes, what kind of technology? _____

7. What are the factors you consider in your choice of technology?

8. If joint venture, in what way(s) is(are) technology transferred?

9. Do you think your choice of technology is the appropriate technology considering the level of development of the country?

Yes _____ No

10. What are the constraints in the choice of technology which negatively affect the competitiveness of your company's products?

IV. TECHNOLOGY TRANSFER

1. Is equipment similar to that currently in use by your firm being used elsewhere in the Philippines?

_____ Yes _____ No

2. Was your firm the first to use this type of equipment in the Philippines?

_____ Yes _____ No

3. Has the equipment that your firm is using (or has previously used) served as a model to be duplicated or purchased by domestically-owned firms?

_____ Yes _____ No

4. Is the equipment that your firm is using commercially available on the open market?

_____ Yes _____ No

5. If "yes" to No. 4, have important parts of the equipment been modified in significant ways for the use of your firm?

_____ Yes _____ No

6. If "yes" to No. 5, is the modified equipment available to domestic producers?
 _____ Yes _____ No
- 7 Are significant elements of your firm's equipment or manufacturing process patented in the Philippines
- 7 by you or your affiliated TNC?
 Yes _____ No
- 7.2 by other firms and available to your firm through licensing agreements?
 _____ Yes _____ No
8. If "yes" to either 7.1 or 7.2, is this equipment or process available to domestic firms?
 _____ Yes _____ No
9. Is there significant know how in your firm's production process that would preclude domestic firms from producing the type of products manufactured by your firm?
 _____ Yes _____ No
10. Are imported inputs in your production process patented by your firm or affiliated TNC or by some other firm and available to you through licensing arrangements?
 _____ Yes _____ No
- 1 If "yes" to No. 10, do domestic firms have access to these inputs?
 Yes _____ No

V. GOVERNMENT POLICIES AND REGULATIONS

How have government legislation and regulation influenced technology transfer and R&D activities of your firm?

2. How do you assess the following forms of government incentives and regulations concerning technology transfer and R&D? What have been the consequences of these incentives to technology transfer and R&D activities in your firm and in your industry?

GOVERNMENT INCENTIVES/REGULATIONS	CONSEQUENCES ON TECHNOLOGY TRANSFER AND R&D ACTIVITIES	
	FIRM	INDUSTRY
1. Duty drawback		
2. Lower preferential tariff		
3. Credit preferential		
4. Regulation on foreign ownership		
5. Exemption from corporate income tax		
6. Reduction in taxable income		
7. Exemption/reduction of taxes on imported capital stock		
8. Exemption/reduction of taxes on imported raw materials		
9. Exemption from capital gains tax		
10. Exemption from other taxes and fees		

3. What kind of measures would you wish the government to take in the field of technology transfer and R&D policy?
