A Practical Way of Assessing Firms' X-Efficiency and Ability to Compete in Mature Good Industries:

The Case of Textiles and Apparel*

C-René Dominique**

I. Introduction

In both industrial and developing countries, the textile and apparel industries contribute significantly to both overall employment and exports earnings (some $60 billion in 1980). These closely related activities, referred to hereafter as simply "textiles," used to be perceived as a relatively stable industry because it was dominated by some three dozens multinational firms, located in five industrial countries (U.S.A., U.K., W. Germany, France and Japan), whose market shares were largely determined by historical precedents and colonial ties. Since the mid-1960s, however, technical innovations and the speed at which they are still being diffused, coupled with other rationalization efforts in the newly industrialized countries (NICs) have sent shock waves through the thus far considered quiet 'fief' of the multinationals. But more importantly, these changes have given rise to a series of misconceptions and policy measures in industrial countries (ICs) that have had and still are having dear consequences for both employment and industrial organization.

* The author is grateful to Muhittin Oral for his insightful comments and constructive criticisms.

** Professor of Applied Economics, School of Business, Laval University.

The bulk of the industry's outputs (SITC categories 651, 652, 653 and 841) are considered, for all intents and purposes, mature products. Hence, from the usual gamut of competitive strategies (Porter, 1980), only price competition seems effective. But the outcome of this strategy appears to have caught economists somewhat by surprise, and thus far they seem to be unable to come up with an adequate explanation for it. Simply put, the outcome was unexpected, largely because firms size is, on the average, much larger in IC's than what it is in NICs. And price competition, when significant scale economies are assumed to be present, should favor firms in IC's. Yet, it is precisely these firms that are rather on the defensive, as evidenced by their frantic behavior and the continual rise in protectionism in IC's. It would appear that when elasticity of output is close to unity and technology is well diffused, the outcome of price competition hinges more on firms' X-efficiency than on their size. But as indicated, this has not received adequate attention in the literature.

In the case of homogeneous products, the theory of price competition becomes unsatisfactory when the number of decision makers is above two and less than infinite. In the heterogeneous case, the analysis is unsatisfactory because industry boundaries cannot be defined. And in both cases, little is indeed known about the art of production itself. So this might explain in part the inadequate treatment referred to above. The purpose of this paper is to develop a simple analytical scheme which mimics as closely as possible the way multi-product manufacturing firms operate. The scheme is presented in Section II. Section III discusses the data used to test its realism. Section IV presents the main results, while the conclusions and prospects for the industry are taken up in the last section of the paper.

II. The Analytical Scheme

Recently, a number of theoretical propositions have been advanced to explain the widely observed intrafirm differences even in a competitive industry. Some attribute such differences to the entrepreneurial ability of principal agents (Lucas; Oi) while others emphasize flexibility in accommodating fluctuating demand (Mills; Mills and Schumann), or offsetting competitive advantages (Caves and Pugel; Porter, 1979). Here, we will be concerned mostly with offsetting competitive advantages arising out of differences in relative prices, and in productive system's efficiency.

For the sake of operationality, however, a few simplifying assumptions should be first discussed. Since we will be dealing with multi-product firms, the concept of 'composite' output is appropriate so as to avoid the usual difficulties of establishing industry boundaries. Also, less emphasis will be put on how static equilibria are reached through maximizing 'first principles.' As a matter of fact, it will simply be assumed that output prices are determined by fixed producers' markups; such a specification fits the data well and it is easier to manipulate. In short, the simplification attempt will center around the averaging process which, as usual, involves a trade-off between microscopic information and tractability.

A. Firms' Production and Costs Problems

In order to capture intrafirm differences and restrict the analysis to price competition, let us suppose that member firms in a K-firm 'group' ($k = 1, 2, \ldots, k$) have slightly different factor productivities, stemming from possible differences in technology, managerial expertise, input quality, environmental conditions, etc. Suppose also that each firm k produces the same set of $j(= 1, 2, \ldots, j)$ mature products, each related on the input side. Then, it can be said that the k^{th} firm uses a column vector of fixed endowment $\hat{R}_k$ to produce an output vector $\hat{X}_k$ from a linear process described by the coefficient matrix $\hat{A}_k = (a_{ij}^k)$, $i = 1, 2, \ldots I$. In other words, the k^{th} firm solves the production problem:

$$(1) \quad \underset{\hat{X}_k}{\text{Max}}\, F_k(\hat{X}_k) = \left\{ \hat{\lambda}_k \hat{X}_k : \hat{A}_k \hat{X}_k \leqslant \hat{R}_k, \hat{X}_k \geqslant \hat{0} \right\},$$

where $$\hat{X}_k = (X_{k1}, X_{k2}, \ldots, X_{kj})^T$$

$$\hat{\lambda}_k = (\lambda_{k1}, \lambda_{k2}, \ldots, \lambda_{kj})$$

$$\hat{R}_k = (R_{k1}, R_{k2}, \ldots, R_{kI})^T$$

$$\hat{0} = (0, 0, \ldots, 0).$$

The optimal points in the opportunity set[1] are summarized by the vector $\hat{X}_k^o = (X_{k1}^o, X_{k2}^o, \ldots, X_{kj}^o)^T$, and the optimal composite output of the kth firm, using a gradient vector $\hat{\lambda}_k$, is $\bar{X}_k^o = \hat{\lambda}_k \hat{X}_k^o$.

Assume now that manufacturing firms minimize direct and indirect costs in countless runabout ways, and the extent to which they are successful is captured in their *cost-effectiveness* in the same way that differences in factor productivities and managerial effectiveness make a difference in the way they manage their specific assets. Then, the optimal dual solution $\hat{V}^o$, from

$$(2)\quad \underset{\hat{V}_k}{\text{Min}}\ G_k(\hat{V}_k) = \left\{ \hat{V}_k \hat{R}_k :\ \hat{V}_k \hat{A}_k \geqslant \hat{\lambda}_k,\ \hat{V}_k \geqslant \hat{0} \right\},$$

is used mostly for internal adjustments, in the sense that firm k increases (decreases) the use of the ith input whenever $V_{ki} > P_{ki}$ ($V_{ki} < P_{ki}$), where P_{ki} is the market price of the ith input. Otherwise, mark-up total financial costs are minimized to yield;

$$(3)\quad C_k^o = (1 + \tau_k)(\hat{P}_k \hat{A}_k \hat{X}_k^o),$$

[1] Alternatively, we could post a_{jh} as the level of intensity of activity h(= 1, 2, ..., H), x_{jh} as the output of product j from activity h when run at unit intensity, and a_{ijh} as the amount of input i needed to produce one unit of product j in activity h at unit intensity. Then (1) becomes:

$$\text{Max } F_k(\cdot) = \Sigma\ \lambda_{kj}\, x_{kj}$$
$$\text{s.t. } x_{kj} - \sum_h x_{jh}\, a_{jh} = 0,\ \forall_j$$
$$\sum_j \sum_h a_{ijh}\, x_{jh} - R_i \leqslant 0,\ \forall_i$$
$$a_{ijh} \geqslant 0,\ \forall_i, \forall_j$$

where τ is a fixed markup over direct costs, $\hat{P}_k$ is a row vector of factor rewards. Therefore, at the end of the production period, firm k produces $\overline{X}_k^\circ$ costs C_k°.

Similarly, firm $\nu \neq k(\nu = 1, 2, \ldots, k)$ produces a feasible output vector $\hat{X}_\nu^o$, weighted by $\hat{\lambda}_\nu$ to yield $\overline{X}_\nu^o$, at costs C_ν^o, while $\hat{V}_\nu$ is used for internal adjustments if necessary.

Differences in output brought about by overall differences in firms' *system efficiency*, and differences in *cost-effectiveness* mainly due to differences in factor rewards are captured in the ratio:

$$(4) \qquad \beta_{k\nu} = \frac{\overline{X}^\circ_k}{X^\circ_\nu} \; \frac{C^\circ_\nu}{C^\circ_k} = X{\cdot}\delta$$

Equation 4 stresses the intrafirm production-cost asymmetry widely observed in actual markets. In other words, it emphasizes that the k[th] firm, say, may well have a more efficient productive system $(\overline{X}_k^o\ \overline{X}_\nu^o)$, which could nonetheless be more than neutralized by a cost disadvantage $(C_k^o > C_\nu^o)$ because, say, $\hat{P}_k \gg \hat{P}_\nu$. As an objective definition of the 'best available technology' is hard to pinpoint, (4) is a simple heuristic that allows us to say that firm k outranks firm ν on X-efficiency grounds if $\beta_{k\nu} > 1$. Hereafter $\beta_{k\nu}$ will be referred as an *intrafirm efficiency index*.

B. Industry-Wide Ranking

The index $\beta_{k\nu}$ is very helpful in assessing the combined efficiencies of two firms.[2] Though a measure on interval scale, it is nonetheless invariant over any linear transformation. Hence, it can be used in ordinary mathematical operations to gauge firms' standing industry-wide. For this purpose, form the square matrix $\hat{\beta} = [\, u_{k\nu}]$ after computing the relative efficiency of, say, firm k vis-à-vis every one of its competitors according to (4). Realizing that $u_{k\nu}$ is the unit cost of ν over that of k, the matrix is formed with the simple rule that each element is the ratio of the column value over the row value (u_ν/u_k).

2 For an application of this index to local industries and to trade policy formulation, see Dominique and Oral (1986), and Oral and Ozkan.

For example for k rows ν columns,

$$\hat{\beta} = \begin{bmatrix} 1 & u_{12} & u_{13} & \cdots & u_{1\nu} \\ u_{21} & 1 & u_{23} & \cdots & u_{2\nu} \\ \cdot & & & & \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdot & & & & \\ u_{k1} & u_{k2} & u_{k3} & \cdots & 1 \end{bmatrix}$$

$\hat{\beta}$ turns out to have many interesting properties. As more of them will be used later on, for the time being, it suffices to note that each row sum minus 1 produces a Δ_k value, which itself is the k^{th} firm's industry standing on X-efficiency grounds. That is:

$$(5) \quad \Delta_k = \frac{\sum_{\nu} u_{k\nu}}{K} - 1, \ \forall k \ ;$$

hence the k^{th} firm has rank r in the industry if its Δ_k value is the r^{th} largest among all Δ_k' s. More specifically, the k^{th} firm has the highest position in the ranking if:

$$(6) \quad \Delta_k = \max{}^{(r)} \left\{ \Delta_1, \Delta_2, \ldots, \Delta_k \right\},$$

where $\max^{(r)}$ is the operator selecting the largest value in the set.

C. Industry-Wide Efficiency

The ranking defined in (5) can easily be converted into an *industry-wide efficiency index* (E_k) of the k^{th} firm by noting that:

$$(7) \quad E_k = \sum_{\nu} u_{k\nu} \cdot \frac{\overline{X}^o_{\nu}}{\sum_{\nu} \overline{X}^o_{\nu}} = \hat{u}_{k\nu} . \hat{s}_{\nu} = \frac{\overline{u}}{u_k}$$

where $\overline{X}^o / \Sigma \, \overline{X}^o_{\nu}$ is the output (or market) share in equilibrium, i.e. $\hat{s}_v(s_1, s_2, \ldots, s_v)^T$, $\hat{u}_{kv} = (u_{k1}, u_{k2}, \ldots, u_{kv})$, and $\bar{u}$ is the industry unit costs. E_k is, therefore, an index of the k^{th} firm's ability to compete in terms of price.[3]

Following Hicks (1946), Samuelson (1947) and in particular Kalecki (1971), it is perfectly legitimate to assume a cluster of output prices P_{xv}'s, formed by marking up unit costs by θ. Hence, there exists a $\bar{P}$ given by:

$$(8) \quad \bar{P}_x = (1+\bar{\theta})\bar{u} = (1+\bar{\theta}) \; E_k u_k ; \forall k,$$

where $\bar{\theta}$ is the average industry mark-up.

Since E_k, u_k and $\Sigma\, \bar{X}^o_v$ can be directly observed, one is tempted at this point to write out the system in full as

$$(9) \quad \begin{bmatrix} u_{11} & u_{12} & u_{13} & \cdots & u_{1v} \\ u_{21} & u_{22} & u_{23} & \cdots & u_{2v} \\ \cdot & & & & \\ \cdot & & & & \\ \cdot & & & & \\ u_{k1} & u_{k2} & u_{k3} & \cdots & u_{kv} \end{bmatrix} \begin{bmatrix} S_1 \\ S_2 \\ \cdot \\ \cdot \\ \cdot \\ s_v \end{bmatrix} = \begin{bmatrix} E_1 u_1 \\ E_2 u_2 \\ \\ \\ \\ E_k u_k \end{bmatrix}$$

It so happens that (9) has many solutions due to the singularity of the $\hat{\beta}$ matrix. Hence market shares are none other than a system of weights, exogenous to the productive structure in the short-run[4].

[3] Although a relative measure, E_k is also a control parameter. It takes on the value of unity for the two extreme cases of monopoly and for perfect competition if firms' technological heterogeneity is assumed away. In all other cases, its value is inversely proportional to a firm's X-inefficiency.

[4] This result seems to have implications for the two conflicting paradigms of industrial organization, i.e. the traditional structure-conduct-performance flow of causality which is supposed to lead to collusion and monopoly rents, and the alternative efficient-structure proposition (Demsetz; Carter) which sees such rents as rewards to 'superior ability.' Casual empiricism seems to support both views (e.g., Clarke, Davies and Waterson), hence the debate lingers on. Equation (9) above is saying that a market share distribution which reflects productive superiority alone in the short run is a coincidence or is a long run outcome if large inefficient firms remain passive to the end. Or else, 'superior ability' must mean superiority in *producing* and in *marketing*, something which is not clear in the original Demsetz's paper.

In fact, it can be stated more formally that:

> The relative efficiency of any two firms and, therefore, the industrywide ranking implied by E_k is invariant with respect to any market share distribution[5].

Using (8), it can be shown that the Lerner's or Cournot's index of monopoly for the k^{th} firm is:

$$(10)\quad M_k = [1 - \frac{1}{E_k(1+\bar{\theta})}]$$

but its profit sales ratio, say, is

$$(11)\quad \pi_k/S = M_k\, s_k\,;$$

in other words, productive efficiency confers high relative market power, which nonetheless might not be translated into high profits due to insignificant market shares in the short run. The scheme then predicts a battle for market shares in the presence of non scale cost differences.

D. Dynamic Consideration

Given the presence of non scale cost differences, the ensued battle for market shares may take various forms, i.e., price cuttings and the willingness to accept lower profits, acquisitions, mergers, attempts to differentiate products and even appeals to governments for protection. But these may remain after all short run palliatives unless they affect the $\hat{\beta}$ matrix. To see this more clearly, assume that at the point of production, the quantity of the i^{th} input used by the k^{th} firm to produce one unit of product j is

$$q_{ki} = a^{k}_{ij}\; X^{o}_{kj}\,,$$

and the share of the i^{th} input in total variable cost is

[5] For the proof, see Dominique and Oral (1985).

$$w_{ki} = \frac{P_{ki}\, q_{ki}}{\Sigma P_{ki}\, q_{ki}} \; ; \forall i.$$

Then the rate of change in the intra-firm efficiency index (β_{kv}), given in (4), over a small time interval Δt is:

$$(12) \quad \dot{\beta}_k = \frac{d}{dt} \ln [X(t)\, \delta(t)] = \frac{d}{dt} \ln [u_{kv}(t)] \, ;$$

Therefore,

$$(13) \quad \dot{\beta}_{kv}(t) = \frac{dP_k^*}{P_k^*} - \frac{dP_v^*}{P_v^*} + \left(\sum_i w_{vi} \frac{dP_{vi}}{P_{vi}} - \sum_i w_{ki} \frac{dP_{ki}}{P_{ki}}\right)$$

where P* is the total factor productivity growth. Otherwise put, the change in relative efficiency for any two firms k and v depends on their differences in total factor productivity growth and in their shared-weighted rates of change in input prices. In the end then, this result shows that the production-cost symmetry assumption of the conventional theory of the firm can easily be relaxed for increased realism; and in the next section this scheme is utilized to grapple with the apparent turmoil in the international textiles industry.

III. The Data

The data utilized in this study refer to the year 1977 and are derived from two sources. Statistics on the 100 world largest textiles firms compiled by Textile-Wirtschaft and used in the UNCTAD's study (CNUCED), and relative unit costs data provided by two firms in the sample, which for obvious reasons prefer to remain anonymous.

The gradient vector ($\hat{\lambda}_k$) for the linear programming problem of the k^{th} firm was prices, which was subsequently converted into production run in the calculation of $\overline{X}_k^\circ$. Individual prices (P_j), $\overline{X}_k^o$ and θ_{kj} provided a check for consistency, using the formula:

$$\overline{u}_k = \sum_j \frac{P_{kj}}{(1 + 0_{kj})} \cdot \frac{X_j^\circ}{\overline{X}_k^\circ}$$

To respect the confidentiality agreement and to simplify the algebra, firms were grouped by country of origin. The distribution was as follows: 33 firms were from the U.S., 15 from the U.K., 16 from Japan, 15 from West Germany, 7 from France, 3 from Italy; the Republic of Korea, Holland and Hong-Kong had 2 each; and Argentina, Canada, Belgium, Sweden and Switzerland provided one firm each for a total of 100. Next, knowledge of individual firm's unit costs ($\overline{u}_k$) and the sample output shares ($\overline{X}_k^\circ/\Sigma_k\overline{X}^\circ$) allowed the computation of the country' weighted average unit costs ($\overline{\overline{u}}_k$), which were used to form the 14 x 14 $\hat{\beta}$ matrix discussed in the text.

The overall situation showed that the textile industry was relatively labor intensive, and that the effect of factor substitution on costs was limited. There were also slight differences in processes, but labor costs and the efficiency with which the processes were used explain firms heterogeneity. Finally, there was no indication from the data that the basic assumptions as regards constant returns to scale and fixed producers' mark-ups were unreasonable.

IV. The Results

The results are prsented in Table 1. As it can be seen, the matrix $\hat{\beta}$ essentially is a topological outline of countries' standing in the industry. As each element is a pairwise comparison between countries ν and k, the one with the highest line values outranks all its competitors on X-efficiency grounds. But for ease of interpretation, the Δ_k values are given in column 15, from which the ranking (R_k) in column 16 is derived. As was expected, the Republic of Korea had the highest rank, followed by Hong Kong, the U.S., Italy and so on. The next column in the table gives the observed market shares as of 1977, but as indicated in the text,

Table 1

X-EFFICIENCY AND FIRMS' ABILITY TO COMPETE: 1977

k \ ν		*$\hat{\beta}$ 1	2	3	4	5	6	7	8	9	10	11	12	13	14	*Δ_k	R_k	$\hat{\beta}_k$ in %	*E_k
U.S.A.	1	1.00	1.07	1.04	1.17	1.05	1.02	.77	1.05	.97	1.35	1.08	1.31	1.19	1.04	.079	3	39.0	1.03
U.K.	2	.93	1.00	.97	1.09	.99	.95	.73	.99	.91	1.26	1.02	1.23	1.12	.97	.011	8	17.9	.96
Japan	3	.96	1.03	1.00	1.13	1.02	.97	.75	1.02	.93	1.30	1.05	1.26	1.14	1.00	.040	5	17.8	.99
W. Germany	4	.85	.91	.88	1.00	.90	.86	.66	.90	.82	1.15	.92	1.12	1.02	.88	-.080	10	6.8	.88
France	5	.95	1.01	.98	1.11	1.00	.97	.74	1.00	.92	1.28	1.03	1.25	1.13	.98	.025	6	8.2	.98
Italy	6	.98	1.05	1.02	1.15	1.03	1.00	.76	1.04	.95	1.13	1.07	1.28	1.17	1.02	.046	4	1.1	1.01
S. Korea	7	1.29	1.37	1.33	1.54	1.35	1.31	1.00	1.35	1.24	1.73	1.40	1.69	1.53	1.33	.380	1	3.5	1.33
Argentina	8	.95	1.01	.98	1.11	1.00	.96	.74	1.00	.92	1.28	1.03	1.24	1.13	.98	.023	7	.8	.98
Hong Kong	9	1.03	1.10	1.07	1.21	1.09	1.05	.80	1.08	1.00	1.39	1.12	1.35	1.23	1.07	.110	2	.9	1.06
Holland	10	.74	.79	.77	.87	.78	.88	.58	.78	.72	1.00	.81	.97	.88	.77	-.190	13	1.1	.76
Canada	11	.92	.98	.95	1.08	.97	.93	.71	.97	.89	1.23	1.00	1.21	1.09	.95	-.008	9	1.2	.95
Belgium	12	.76	.81	.79	.89	.80	.78	.59	.81	.74	1.03	.82	1.00	.90	.79	-.170	12	.5	.78
Sweden	13	.84	.89	.87	.98	.88	.85	.65	.88	.81	1.13	.91	1.11	1.00	.87	-.090	11	.9	.86
Switzerland	14	.96	1.03	1.00	1.13	1.02	.98	.75	1.02	.93	1.30	1.05	1.26	1.14	1.00	.040	5	.3	.99

* rounded off figures.

the ranking is preserved in the E_k values, which represent countries' ability to compete.

Wide cost disparities (principally in labor cost) were observed, say, between the European countries and the U.S. on the one hand, and between Europe and the NIC's, on the other. Holland and the Republic of Korea were the two extremes when U.S. labor cost was used as a normalizing factor. For example, in the 651 categories, the labor cost ratio Holland/Korea was about 11, although this disparity was significantly reduced when all inputs were taken into accounts. But Holland was not able to reverse the situation on system's efficiency neither for the 651 categories nor for the others, so the overall unit cost ratio Holland-Korea stood at 1.73. In general, the NIC's firms were not only more cost effective but, except for Argentina, had more efficient systems as well. This was particularly true in comparison with the U.S. which, it should be recalled, provided 33 very diverse firms out of a sample of 100. This result was indeed not expected.

The overall results should nevertheless be interpreted with some caution. For, as it can be seen, the 1977 market share distribution was not in line with countries' X-efficiency. In terms of market shares alone, firms in the U.K. ranked 1st, 6th etc. but many ranked above the 90th position; the same was observed in the case of the U.S. Hence within each group (except for those with one firm), firms' size and efficiency varied a great deal, and, therefore, the 14×14 matrix is less rich in terms of information than a 100×100 matrix would have been. Moreover, although Korea ranked 1st in the sample, this does not tell us anything about its world overall ranking; for, not only some sample microscopic information was lost in the aggregation process, but there might have been firms with still higher efficiency not included in the sample because of their size.

Be that as it may, barring significant change in the matrix $\hat{\beta}$, the scheme predicts that for a given average f.o.b. price and stable demand, Korea and Hong-Kong, for example, will be able to increase their market share at the expense of countries with a lower rank, or more precisely, at the expense of the least efficient firms in the sample. Financial constraints precluded a complete test of this prediction, which would imply accounting for currency realignments and changes in the $\hat{\beta}$ matrix since 1977 as shown in equation (12) above. But a cursory check of averaged export growth rates for the six countries with the highest and three with the lowest ranks was made for 1980 (Table 2); and it supports the general trend predicted by the scheme. It is also interesting to note that during that period output fell in the OECD countries with low rankings and imports increased[6]. When this is considered in conjunction with Table 2, it would seem that some internal reallocation of resources was taking place in these countries.

Table 2

COMPETITORS' ANNUAL GROWTH RATE OF EXPORTS FROM 1977 TO 1980: BY CATEGORY (IN %)

Competitor \ Category SITC	651	652	653	841
Korea	49.7	18.9	86.2	12.5
Hong-Kong	36.1	25.4	62.7	21.7
U.S.A.	27.2	9.6	47.6	36.2
Italy	22.9	16.7	24.9	26.5
Switzerland	18.6	22.7	10.9	23.8
France	13.2	18.6	20.8	18.2
Sweden	18.3	—	—	15.4
Belgium*	9.5	19.6	13.1	11.1
Holland	9.5	13.6	8.8	20.7

*including Luxemburg

Source: United Nations, *Statistical Yearbook, 1981,* United Nations, N.Y. 1983.

As a consequence of the situation depicted in Table 1, one would normally expect a series of defensive moves in OECD countries to protect market shares. In that sense, most of the mergers

6 The efficient Asian NICs were also increasing their distance vis-à-vis other developing countries. In 1977, three Asian Countries, Taiwan, Korea and Hong Kong accounted for 43.9% of the total developing countries exports of apparel to OECD markets; in 1980, the percentage had climbed to 65.9% (Keesing).

and vertical integrations that took place in the U.S., the U.K., Germany, Japan, France and in Holland during the 1970s should be seen in that light (Blackburn; CNUCED). Moreover, as employment in textiles was increasing in Korea and in Hong-Kong, it was decreasing in the OECD countries; for example, during the 1970s, the European Economic Community (EEC) registered a loss of some one million jobs in the textile and apparel industries. The situation was not that different in Japan, but to the surprise of many that country had decided to increase its capital intensity in textiles. On the other hand, in the U.S. (with about one million jobs at stake), and in the EEC (where the industry accounts for some 10% of all industrial employment) the preferred defensive measures centered around increased concentration and trade restrictions. In the end both employment and trade liberalization received a setback.

V. Conclusions

In recent years, the NICs have made significant gains in the world textiles industry. Instead of being perceived as a natural outcome of the industrial development process, these gains were (and are still) viewed with alarm in some quarters. By and large, economic analyses of the situation remain scarce, perhaps because economists are trained to see this as a problem of scale or factor substitution. But the lack of adequate studies has led businessmen and common folks to explain it in terms of the 'slave wage' theory, which normally calls for government subsidies and trade restrictions. However, when the situation is examined in terms of firms' X-efficiencies, an entirely different picture emerges. As shown here, it is true that, on the one hand, the NICs had lower labor costs (though they are rapidly increasing) but they also had higher capital costs. On the other hand, they were as (or in some cases more) efficient in using their technology (longer production-run, for example) than the industrial countries on the average. When these two aspects of the production process are accounted for, they outranked their competitors in ICs on X-efficiency grounds. In addition, distributors in ICs have deliberately sought after low cost producers in NICs. so as to increase their markups, and thus have exacerbated the situation. Therefore, the 'slave wage' explanation is too simplistic.

Our results have a deeper implication for world trade in general. Because, the NICs have tooled their economies for exports to OECD countries, pretty much the way they were encouraged to do in the early 1960s. Protectionist measures such as the Multifiber Agreement of 1974 can either frustrate their export growth rates or else encourage rerouting or false labelling in the intermediate run. And since the case of textiles can easily be extended to most labor intensive goods, measures similar to the Mulifiber Agreement could, in the long run, thwart not only their development process but the growth of world trade as well.

References

Blackburn, J.A., "The New Textile Industry: A 25 Year Revolution in the United Kingdom," *Textile Month,* Nov. 1976.

Carter, J., "Collusion, Efficiency and Anti-Trust," *Journal of Law and Economics,* 21, Oct. 1978, 435-44.

Caves, R.E. and T.A. Pugel, *Intraindustry Differences in Conduct and Performance: Variable Strategies in U.S. Manufacturing Industries,* New York Univ. Press, New York, 1980.

Clarke, R., Davies, S. and M. Waterson, "The Profitability-Concentration Relation: Market Power or Efficiency," *Journal of Industrial Economics,* 32, 1984, 435-50.

CNUCED, *Fibres et Textiles: Dimensions du pouvoir des sociétés transnationales,* TD/B/C.1/219, Nov. 1980.

Communauté économique européenne, *Etude sur l'évolution de la concentration dans l'industrie du textile en France,* coton, laine, Bruxelles, 1975.

______, *Etude de l'évolution de la concentration dans l'industrie du textile au Royaume-Unis,* Bruxelles, 1975.

Demsetz, H., "Industry Structure, Market Rivalry, and Public Policy," *Journal of Law and Economics,*16, 1973, 1-9.

Dominique, C. R. and M. Oral, "Exporting to Northern Market: The Making of an Industrial Competitivity Index," *Industry and Development,* May 1986.

______, "Toward a Theory of Efficient Structure: Oligopolistic Ranking, Market Power and Performance," Working Paper No. 85-07, LRSA, Laval University, Apr. 1985.

Gatt, *Arrangement concernant le commerce international des textiles,* GATT/1974-2, Genève, 1974.

———, *Etude des textiles: Rapport du Groupe de travail du commerce des textiles* L/3797 et Add. 1-3, Genève, 1972.

Hicks, J.R., *Value and Capital,* Oxford Univ. Press, Oxford, 1946.

Institut des Deutschen Textileinzelhandels, *Der Marktführer im Textileinzelhandel,* Zurich, 1977.

Kalecki, M., *Selected Essays on the Dynamics of the Capitalist Economy,* Cambridge Univ. Press, Cambridge, 1971.

Keesing, D.B., "Linking Up to Distant Markets: South to North Exports of Manufactured Consummer Goods," Papers and Proceedings of the 95th Annual Meeting of the American Economic Association, New York, Dec. 1982, 338-42.

Lucas, R.E., "On the Size Distribution of Business Firms," *Bell Journal of Economics,*9, 1978, 508-23.

Mills, D.E., "Demand fluctuatioin and Endogenous Firm Flexibility," *Journal of Industrial Economics,* 33, Sep. 1984, 55-71.

Mills, D.E. and L. Schumann, "Industry Structure with Fluctuating Demand," *American Economic Review,* 75, Sep. 1985, 758-67.

Oi, W.Y., "Heterogeneous Firms and the Organization of Production," *Economic Inquiry,* 21, Apr. 1983, 147-71.

Oral, M. and A.O. Ozkan, "An Empiricial Study on Measuring Industrial Competitiveness," *Journal of the Operational Research Society,* 1986, forthcoming.

Porter, M.E., "The Structure Within Industries and 'Companies' Performance," *Review of Economics and Statistics,* 61, May 1979, 214-27.

———, *Competition Strategy: Techniques for Analyzing Industries and Competitors,* The Free Press, New York, 1980.

Samuelson, P.A., *Foundations of Economic Analysis,* Harvard Univ. Press, Cambridge, 1947.

Stigler, G.J., "Production and Distribution in the Short Run," *Journal of Political Economy,* 47, Jun. 1939, 305-27.

United Nations, *Statistical Yearbook, 1981,* New York, 1983.

U.S. Department of Agriculture, *Interfibre Competition with Emphasis on Cotton: Trends and Projections to 1980,* Econ. Res. Service, Washington, D.C., 1973.

Weiss, L., "The Concentration-Profits Relationships and Antitrust," Goldschmid, H., et al., eds., *Industrial Concentration: The New Learning,* Brown, Little & Co., Boston, 1974, 240-52.