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Abstract

The full integration of the textile industry into GATT, which with some exceptions occurred on January 1, 2005, is likely to greatly impact the global textile and apparel industries. In particular, one prediction is that the South African industries are likely to be "decimated." The actual effect on these industries in an individual country will depend at least partly on the ability to take advantage of economies of scale and to be internationally competitive. In an endeavor to gain more insights into the future of these industries in South Africa, this study uses a cost function to investigate the presence of scale economies and the nature of input interrelationships. The findings include statistically significant economies of scale present in both industries and cross price elasticity estimates indicating that most inputs are substitutes for one another. The first result offers an opportunity to reduce unit costs, if these industries can grow their markets. However, lower prices on imported intermediate goods will likely decrease the demand for domestic inputs. The cross price elasticities of demand are relatively low in some cases, consistent with domestic input market rigidities and international trade restrictions. More recent data might bring findings of higher cross elasticities in the new international environment.

I. Introduction

The textile and apparel industries are two industries that are considered vital to many developing countries. For one thing, these industries, especially apparel, are highly labor intensive in nations which typically have a relative abundance of labor. They are also usually one of the largest sectors in terms of value added in manufacturing, and for both of these reasons South Africa regards these industries as a very important sector of the economy.[1] In 1996, the latest year for which data for these industries are published in *South African Statistics*, the textiles and apparel industries accounted for about 14.7% of total manufacturing employment (10.0% was in apparel). Together, the two industries contributed nearly 8.1% of total manufacturing salaries and wages and 6.5% of value added.[2] Thus, while the industries are substantial generators of employment opportunities, they are somewhat less important, in a relative sense, as sources of wages and salaries and value added.

Manufacturing industries (especially apparel, textiles, and motor vehicles) in South Africa have traditionally been protected from international competition by a number of government policies, including tariffs, quotas, and export incentives. However, by joining the World Trade Organization (WTO) in 1994, South Africa obligated itself to a gradual reduction of trade barriers and an opening up of its markets. In fact, the country has been making significant strides in this regard (Salinger, *et*. *al*., 1999, pp. 14-21). As a result, the firms in the apparel and textile industries know that to be successful in the future they will have to become more competitive in the international marketplace.

The African Growth and Opportunity Act (AGOA) extended U.S. Generalized System of Preferences access to qualifying African countries until 2008, and the textile and apparel industries were two critical industries that were potential beneficiaries. However, more advanced developing countries (and, after 2004, all developing countries) were faced with a rules of origin requirement for most apparel that the garments had to be made from textiles and yarn produced in the region or

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[1]See, for example, Barnes, *et*. *al*. (2004, p. 157); Kaplan (2004, p. 627); Nordås (2004, pp. 1-12); and Roberts and Thoburn (2004, pp. 125-127).

[2]Statistics South Africa, *South African Statistics: 2003*, pp. 14.8-14.10.

the United States (yarn forward rule).[3] Moreover, in the case of textiles and apparel, the benefits of AGOA have been overshadowed by the expiration of industry protection offered by the Multi-Fiber Agreement (MFA) and its successor, the Agreement on Textiles and Clothing (ATC), in January of 2005.[4]

The original MFA, which went into effect on January 1, 1974, provided for voluntary export restraints on textiles and apparel from developing countries, offering significant protection to those industries in the developed countries. However, the Agreement on Textiles and Clothing, negotiated during the Uruguay Round, provided for the gradual reduction of bilateral quotas and the integration of the textile industry into the General Agreement on Tariffs and Trade (GATT). The first stage began on January 1, 1995, and the last stage was reached on January 1 of 2005, when the textile industry was to be completely covered by GATT rules. (The latter stage was significant, affecting about 49 percent of the industry tariff lines.)[5] While the ATC included safeguard provisions that allowed countries to at least temporarily place restrictions on textile imports after January 2005, it appears that textile and apparel firms in formerly preferential trading situations will in the near future be faced with more competition in the global marketplace.[6] In fact, Keenan, Saritas, and Kroener, (2004, p. 316) state that ". . . producers in sub-Saharan Africa, are likely to see their industries

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[3]See Flatters (2002, pp. 1-3); Gibbon (2003); and Mattoo, *et. al*. (2003).

[4]For a discussion of South African trade in textiles and apparel and the effects of AGOA see Petersson (2003, especially pp. 778-788).

[5]The January 2005 date is highly significant since nearly half of the liberalization measures were delayed until 2005. The earlier effects of the ATC were also diminished because the number of items covered by it was increased from the original MFA and the importing countries were allowed to choose which items were to be covered by the various stages. See Liu and Sun (2004, pp. 53-54) and Nordås (2004, pp. 13-15).

[6]The arrangement that admitted China to the WTO included a provision that allowed the other members to place restrictions on all imports subject to the ATC until 2008, as well as a China-specific measure that is effective until 2013 (Liu and Sun, 2004, p. 54). The United States did argue that resulting increases in imports in early 2005 were disrupting domestic markets and reimposed limits on imports of some Chinese textiles in April of that year (Federal Reserve Bank of Atlanta, 2005, p. 13).

decimated" as a result of the integration of the textile and clothing industries into GATT.

Clearly, the ability to further exploit economies of scale to achieve unit cost reductions is only one factor in achieving international competitiveness. Firms will need to have appropriate technology and operate with both technical and economic efficiency. However, existence of scale economies will certainly assist firms in their efforts to increase their ability to compete internationally if they can grow their markets. In addition, the relationships among the inputs used in the production process, particularly with respect to domestic inputs and foreign intermediate goods, will likely affect the impacts of these changes in international trade rules on both the demand for South African domestic inputs and the country's balance of payments. While we acknowledge that other things are also important to the success of a firm in these industries, this study is limited in scope to examining the evidence with regard to scale economies as well as the demand relationships among the inputs.

II. The Translog Cost Model

Because of the flexibility that it allows with respect to the estimated parameters, a transcendental logarithmic (translog) cost function was used to examine the nature of the production and cost relationships among the output and inputs for both the South African textile and apparel industries. The production technology of these industries is assumed to be representable by a general transformation function:

$$\tau(Y, K, L, D, F, T) = 0, \qquad (1)$$

where Y is real output, K is capital, L is labor, D is domestically produced intermediate goods, F is imported intermediate goods, and T represents time-related components, including technological change.[7] If the transformation function in (1) has a strictly convex input structure, there exists a

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[7]See Jorgenson (2000, Chapter 4), Greene (2000, pp. 640-644), Berndt and Christensen (1973); Christensen, Jorgenson, and Lau (1973); and Guilkey, Lovell, and Sickles (1983) for more detailed discussions of translog functions. See Binswanger (1974, p. 380); and Kohli (1991, pp. 103-106) for a discussion of the technological change variable.

unique cost function

$$TC = f(Y, P_K, P_L, P_D, P_F, T), \quad (2)$$

where P_K is the price of capital, P_L is the price of labor, P_D is the price of domestically produced intermediate goods, and P_F is the price of imported intermediate goods.

The exact cost function specified in (2) can be approximated with the translog cost function

$$\ln(TC) = \alpha_0 + \alpha_T T + \alpha_Y \ln Y + (1/2)\delta_{YY} (\ln Y)^2 + \sum_i \beta_i \ln P_i \quad (3)$$

$$+ 1/2 \sum_i \sum_j \gamma_{ij} \ln P_i \ln P_j + \sum_i \rho_{Yi} \ln Y \ln P_i$$

$$+ \sum_i \gamma_{iT} T \ln P_i + 1/2\, \gamma_{TT} T^2,$$

where *i, j* = *K*, *L*, *D*, and *F*.[8]

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[8]Technically, the estimation of this cost function requires that input markets be perfectly competitive. Although the input markets relevant to this study are not perfectly competitive, administered or negotiated prices (such as union and minimum wage rates) that do not change frequently in response to volume changes can perform a similar role for estimation purposes.

The minimum requirements for the cost function to describe a "well-behaved" technology are that it be (1) linearly homogeneous in input prices, (2) positive and monotonically increasing in input prices and output, and (3) concave in input prices. These regularity conditions for the cost function require the following restrictions on its parameters:

(1) linearly homogeneous in input prices:

$$\sum_i \beta_i = 1, \quad \sum_i \rho_{iY} = 0, \sum_i \gamma_{iT} = 0, \text{ and } \sum_i \gamma_{ij} = 0 \text{ for all } j,$$

where *i, j* = *K, L, D, F*;

(2) monotonically increasing in input prices and output:

$$\frac{\partial \ln TC}{\partial \ln P_i} \text{ and } \frac{\partial \ln TC}{\partial \ln Y} > 0, \text{ and}$$

(3) concavity in input prices.

A sufficient condition for concavity of the cost function is that the Hessian matrix of second partial derivatives with respect to factor prices is negative

The parameters of the translog cost function (3) can be estimated indirectly by estimating the coefficients of the cost share equations, S_i, where

$$S_i = \beta_i + \rho_{Yi} \ln Y + \sum_j \gamma_{ij} \ln P_j + \gamma_{iT} T,$$

and *I*, *j* = *K*, *L*, *D*, and *F*.[9]

The restrictions imposed on the parameters by the regularity requirement that the cost function be linearly homogeneous in factor prices allow the translog cost function to be written so that only twenty parameters need to be estimated.[10] The additional assumption of homotheticity requires that

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semidefinite.

Also, γ_{ij} must equal γ_{ji}.

[9]See Binswanger (1974, p. 377) for a discussion of the advantages of estimating a cost function rather than a production function, and Jorgenson (2000, Chapter 1) for a discussion of the choice of cost function to be estimated.

[10]The linearly homogeneous in prices assumption requires that

$\beta_F = (1 - \beta_K - \beta_L - \beta_D)$,

$\gamma_{FF} = [(1/2)\gamma_{KK} + (1/2)\gamma_{LL} + (1/2)\gamma_{DD} + \gamma_{KL} + \gamma_{KD} + \gamma_{LD}]$,

$\gamma_{KF} = -(\gamma_{KK} + \gamma_{KL} + \gamma_{KD})$,

$\gamma_{LF} = -(\gamma_{KL} + \gamma_{LL} + \gamma_{LD})$,

$\gamma_{DF} = -(\gamma_{KD} + \gamma_{LD} + \gamma_{DD})$,

$\rho_{YF} = -(\rho_{YK} + \rho_{YL} + \rho_{YD})$, and

$\gamma_{FT} = -(\gamma_{KT} + \gamma_{LT} + \gamma_{DT})$.

the ρ_{Yi} terms equal zero, and the more restrictive assumption of homogeneity requires that δ_{YY} also equal zero (Christensen and Green, 1976, p. 661). The number of parameters to be estimated in the cost share equations can be similarly reduced. Only three of the factor share equations are linearly independent, since they must sum to one. Thus, for example, $S_F = 1 - S_L - S_K - S_D$, and the share equation for imported intermediate inputs was eliminated in the estimation procedure.

The three factor share equations, S_K, S_L and S_D, have fifteen free parameters. Inclusion of the translog cost function (3) in the model to be estimated would add five more parameters, α_0, α_T, α_Y, δ_{YY} and γ_{TT}.[11] Separate stochastic error terms, assumed to reflect errors in optimizing behavior, were implicitly added to the cost and share equations.

The cost function and share equations were estimated by using the Zellner-efficient method and iterating on the estimated covariance matrix until convergence was achieved (IZEF method).[12] Time series data for the available industrial census years from 1956 to 1991 were utilized. Although some data from the 1993 and 1996 industrial censuses are also available, we could not obtain data on imports of intermediate goods on an industry-specific basis for those years.[13] Because of the limited

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[11]If the data are normalized so that total cost, the output quantities, and the input prices are equal to one in the base period and *if the translog cost function is exact*, the logarithm of α_0 is equal to zero. Although this normalization procedure was followed in the present study with 1991 the base year, the estimated translog cost function was not assumed to be exact so that α_0 is not necessarily equal to zero.

[12]See Barten (1969, pp. 24-25); Kmenta and Gilbert (1968); Ruble (1968, pp. 279-286), and Zellner (1963) for an explanation of the IZEF procedure, which yields maximum likelihood estimates.

[13]The following data were utilized to estimate the cost function. Total cost was equal to the sum of total salaries and wages, cost of materials, rent paid, depreciation, and net profit in thousands of rand for each respective industry. Total output was calculated as the gross output of each industry in current rand (thousands) divided by a producer price index (1990 = 100) for apparel or textiles, as appropriate. Given the available data, the price of capital was the interest rate on first mortgage bonds before 1963, the yields on new issues of company stock debentures and notes from 1963-1980, and after 1980 by yields on company loan securities traded on the stock exchange. An index of the price of labor for each industry was calculated based on the available data in the *Yearbook of Labour Statistics* published by the International Labour Office. Because it was the only reasonably appropriate data available, the price of domestic intermediate goods was given by the price index for materials in mechanical engineering (1990 = 100). The price of imports was given by the unit value of imports for each respective industry through 1988

data availability, the model was restricted to that corresponding to a homogeneous production function. In addition, the time trend variables were omitted from the final model because they were insignificant and in some cases resulted in more violations of the regularity conditions. A dummy variable was inserted in the estimated relationships for each industry with a value of one from 1970 onward to reflect a change in the industrial classifications in South Africa.

III. Empirical Results

The estimated values of the parameters for the apparel and textile industries, respectively, are shown in Tables 1 and 2.[14] While most of these values are not important in and of themselves, the estimates of α_Y are of great interest. That is because α_Y is the cost elasticity of output, or $E_C = \partial \ln TC/\partial \ln Y$. One can then calculate an estimate of returns to scale as $(1/E_C)$. The estimates of α_Y for apparel and textiles, respectively, were .84 and .87. In both cases these values were significantly less than one at the 0.5% level of significance, but not significantly different from 1/2. Calculating the implied returns to scale coefficients from the estimated values for the cost elasticity, we obtain 1.19 for the apparel industry and 1.15 for textiles. These values indicate that both industries were operating in an output range where economies of scale were still present. This conclusion is

(1988 = 100), and after 1988 calculated from the change in the unit value of manufacturing imports, the only relevant import price data available. The share of capital was calculated as the sum of rent paid, depreciation, and net profit. The share of labor was equal to wages and salaries paid in each respective industry. The share of domestic intermediate goods was equal to the total intermediate goods expenditures less imports. The data sources, including the Bureau of Statistics, Central Statistical Service, Department of Statistics, International Labour Office, and the International Monetary Fund, are listed in the bibliography.

[14]The regularity conditions were satisfied at all data points for the apparel industry and at all but two points for the textile industry. Translog estimates may still be acceptable even though these conditions are violated at a few data points (Wales, 1977; and Caves and Christensen, 1980).

The conventional single-equation Durbin-Watson statistic for the total cost function was 2.36 for the apparel industry and 2.88 for the textile industry. Because of the limited degrees of freedom, probability values could not be calculated for either of these coefficients, although they appeared to both be in the inconclusive range at the five percent level of significance (Durbin, 1957; Malinvaud, 1970, p. 509; and Berndt and Christensen 1973, p. 95).

supported by firm interviews and the observation that a greater proportion of large than small firms were successful in South Africa in a study of these industries conducted for the U. S. Agency for International Development (Salinger, *et. al*., 1999, p. 8).[15]

The estimates of the direct price elasticities of demand for the inputs for each industry are given in Tables A1 and A2. The apparel industry direct price elasticity estimates are generally higher in absolute value than the comparable ones for the textile industry, suggesting that the demands for inputs in the apparel industry were more sensitive to changes in own price than was the case for the textile industry.[16] It is particularly interesting that the price elasticity of demand for imported intermediate goods in the apparel industry was quite high, relative to that for the other inputs. Although not nearly so high in absolute value as was the case for apparel, the estimates of price elasticity of demand for foreign intermediate goods for the textile industry were generally higher than those for labor and domestic intermediate goods and about the same as those for capital. Exceptions to this pattern occurred from 1976 onward, perhaps reflecting international reaction to apartheid policies.

The cross price elasticity of demand estimates for the inputs are given in Tables A3 and A4. These estimates are generally consistent with the hypothesis that these inputs are substitutes for one another with the exception of domestic labor and capital in the textile industry. In addition, the estimated cross price elasticities for domestic and foreign intermediate goods in the textile industry were negative for some observations, but all of these estimates were near zero. Moreover, the estimated effects of a change in the price of foreign intermediate goods on the demand for domestic

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[15]Also see the discussion in Roberts and Thoburn (2003, especially pages 89 and 97) and Gibbons (2003, p. 1822). In a study using 1984 and 1990 data for Mexico, Tybout and Westbrook (1995, pp. 70-71) did not find statistically significant returns to scale in either the textile or apparel industries. However, using Mexican cross section data for 1960, 1965, 1970, and 1975, Truett and Truett (1989, p. 26) found evidence of statistically significant economies of scale for the cotton textiles, shoes, and clothing industries for the later years of the study.

[16]The few degrees of freedom made the bootstrap procedure to check for statistical significance of these coefficients unworkable.

capital, labor, and intermediate goods, respectively, were essentially zero for both industries. International trade restrictions as well as domestic labor market rigidities were likely responsible for the low cross price elasticities between the price of imported intermediate products and the quantities demanded of the domestic inputs. Such a conclusion is particularly believable during the period covered by this study, when a variety of protectionist measures limited the movement of international trade between these industries in South Africa and the rest of the world.[17] In addition, there may be few opportunities for substituting foreign intermediate goods for domestic capital, and vice versa.

Increases in the prices of domestic labor and domestic intermediate goods do seem to positively impact the demand for foreign intermediate goods for the apparel industry. Similarly, a change in the price of domestic labor appears to have a direct relationship with the quantity demanded of foreign intermediate goods in the textile industry. Thus, there must have been some opportunities for substitution of imported intermediate products for domestic labor and intermediate goods. Certain international trade policies such as the "yarn forward rule" for duty free access to the U.S. markets would encourage the use of materials imported from the United States, for example.

Turning to the relationships among the domestic inputs, we see that an increase in the price of capital apparently increases the demand for domestic labor and intermediate goods in the apparel industry. Nevertheless, these estimates were quite low. The estimated values for E_{KL} were low as well, compared with those for E_{KD}. A similar relationship can be observed between the cross price elasticity estimates for capital and domestic intermediate goods for the textile industry. Thus, it seems that changes in the price of capital had little impact on the demand for the other domestic inputs, but that changes in the price of domestic intermediate goods did positively affect the demand for capital. Apparently there must be some substitutability between capital and domestic intermediate goods such that when the price of the latter rose, it gave the firms an incentive to invest in new capital

[17]For example, see (Kaplan, 2004, pp. 633-639). Kaplan argues that a shortage of cloth that meets the rules of origin requirements has been a significant constraint on the apparel industry.

equipment. While there apparently have been no great changes in the production technology of the apparel industry over the past hundred years, there have been innovations such as the automatic cutting machine that made accurate cutting of material easier (Nordås, 2004, pp. 5-6). A firm would have a greater incentive to purchase such equipment when the price of material increased. The textile industry is generally more capital intensive than the apparel industry (Nordås, 2004, p.7), which may also allow for some substitution of capital equipment for domestic materials in that industry. The greater capital intensity of the textile industry may also account for the complementary relationship between domestic labor and capital.

Tables A3 and A4 show that an increase in the price of domestic intermediate goods did appear to increase the demand for domestic labor in both industries so, again, there must be some possibility of substitution of labor (using more highly skilled labor and more care, for example) for domestic materials. Rigidities in the labor market, especially in the apparel industry, likely reduced the substitution of domestic materials for labor, however.[18] Such labor market imperfections may at least partly explain why the cross price elasticity of demand for domestic intermediate goods with respect to the price of labor, E_{DL}, was lower in both industries than was the case for E_{LD}. For example, there were restrictions on the laying off of workers (Salinger, *et. al.*, 1999,p. 63). Thus, an increase in the price of labor may not quickly result in the firm adjusting its inputs to least cost combinations.

IV. Conclusions

The results of this study clearly indicate the existence of scale economies in both the apparel and the textile industries, a finding consistent with surveys and observations of other researchers. If South Africa can grow its markets for textiles and apparel, economies of scale should enable the industries to lower their unit costs. However, Kaplan (2004, p. 633) states that South African clothing exports

[18] See Salinger, *et. al*. (1999, p 63-65) for a discussion of labor market rigidity issues in both the apparel and textile industries. Although each industry had different specific concerns with respect to labor flexibility, both viewed restrictions on their ability to manage their labor force as a problem.

have grown very slowly over the past ten years and that new investment in the industry has not been substantial. Such a situation brings concern for the future of the industry as trade restrictions fall, especially with respect to China, in the coming years. Nordås (2004, p.34) suggests that the distance of South Africa from major markets (e.g., the United States and Europe) for its products will add to the challenges for these industries. The presence of economies of scale also means that if output falls, average costs will rise. Therefore, there is ample reason for unease regarding what lies ahead for these industries in South Africa.

The direct price elasticity estimates for the inputs were in general larger in absolute value for the apparel industry than for textiles. Those results may reflect the fact that the textile industry is highly capital intensive, with a production technology that lessens the opportunities for input substitution.

The hypothesis of lower substitutability among the inputs for the textile industry compared with apparel is given credibility by the estimates of input cross price elasticities. For this industry, capital and labor are apparently (weak) complements, as may be the case for domestic and foreign intermediate goods. However, except for the last two years, the cross price elasticity estimates for domestic and foreign intermediate goods were very close to zero. Moreover, in general and for both apparel and textiles, the responsiveness of the demand for domestic inputs with respect to the price of foreign intermediate goods was quite low. This finding may be partly the result of trade restrictions that limited the purchases of foreign intermediate goods and domestic input market rigidities, as well as technology issues.

In the apparel industry, the results pertaining to elasticities suggest a greater impact on the demand for foreign intermediate goods from changes in the prices of labor and capital. The price of labor seemed to have a similar impact on the demand for imports in the textile industry. Thus, there apparently was some responsiveness of imports to domestic input price changes. The elasticity estimates may also to a substantial extent be a manifestation of the fact that the cost share of foreign intermediate goods for both industries was quite small relative to those of the domestic inputs, especially labor and intermediate goods. Thus, a given percent change in a domestic input price could lead to a relatively large *percentage change* in the quantity demanded of imports.

The detailed manufacturing census data necessary to extend this study to more recent years are apparently not available. It would be interesting to see if the elasticity estimates involving foreign intermediate goods have increased since South Africa joined the WTO in 1994. One might expect that imports and, therefore, their prices will now play a larger role in the production processes of these and other South African industries.

While these industries, especially the apparel industry, have the potential to generate significant employment opportunities for South Africa, they currently face substantial challenges, both with respect to operational efficiency and proximity to international markets. The apparel industry in other countries in southern Africa has apparently recently been more successful in adapting to the new international environment, and, consequently, it is appropriate to be concerned for the prospects of the South African industry (Kaplan, 2004, p. 633; Nordås, 2004, p. 34; and Roberts and Thoburn, 2004, pp. 137-138). Roberts and Thoburn point out that while the textile industry itself is unlikely to offer many additional employment opportunities in the future, a thriving domestic textile industry could greatly assist the domestic apparel industry, and a growing apparel industry could indeed positively impact South African unemployment (Roberts and Thoburn, 2004, p. 138). It appears, however, that achieving this positive outcome will be not be an easy task for South Africa.

The small cost share of foreign intermediate goods in both the textile and apparel industries, coupled with slow growth in exports, suggests that the industries are very inwardly-focused. Their distance from international markets also suggests that they need to try to grow their domestic markets. As marginalized segments of the population become fuller participants in the modern sector of the economy, significant expansion of internal markets may be possible. Nevertheless, such a strategy is unlikely to be sufficient to save the industry from the forces of international competition.

Both the apparel and textile industries need to find ways to increase their efficiency and, therefore, their international competitiveness. It is becoming more and more difficult to compete internationally solely on the basis of low wage rates, and there are other countries with lower wage rates than South

Africa.[19] Thus, these industries need to search for and exploit any opportunities for specialization in particular niches of production where they may have a comparative advantage, as India and Italy have apparently successfully done.[20] The South African government may also wish to consider policies that would incentivize these industries to develop such internationally competitive specializations and/or efficiencies.

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[19] See, for example, "'Made in China' May Cost You More," *San Antonio Express-News*, February 22, 2008, pp. 1C, 4C.

[20] See Audet (2007), Bolisani and Scarso (1996), Keenan, *et. al.* (2004), Owen (2003), and Stengg (2001).

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Table A1 Apparel Industry Direct Price Elasticities

Year	E_{KK}	E_{LL}	E_{DD}	E_{FF}
1957	-0.978	-0.702	-0.383	-2.210
1958	-0.977	-0.702	-0.383	-2.211
1959	-0.978	-0.701	-0.383	-2.197
1960	-0.977	-0.702	-0.383	-2.185
1961	-0.978	-0.702	-0.383	-2.175
1962	-0.978	-0.702	-0.383	-2.193
1963	-0.976	-0.701	-0.384	-2.373
1964	-0.977	-0.701	-0.383	-2.222
1966	-0.977	-0.702	-0.383	-2.220
1968	-0.979	-0.702	-0.382	-2.079
1970	-0.980	-0.702	-0.381	-2.065
1972	-0.978	-0.701	-0.383	-2.014
1976	-0.974	-0.702	-0.385	-2.029
1979	-0.969	-0.700	-0.390	-1.997
1982	-0.965	-0.702	-0.390	-3.369
1985	-0.965	-0.702	-0.390	-7.604
1988	-0.959	-0.700	-0.395	-17.346
1991	-0.959	-0.698	-0.397	-3.175

Table A2 Textile Industry Direct Price Elasticities

Year	E_{KK}	E_{LL}	E_{DD}	E_{FF}
1957	-0.564	-0.439	-0.270	-0.579
1958	-0.563	-0.439	-0.270	-0.572
1959	-0.563	-0.439	-0.270	-0.588
1960	-0.563	-0.439	-0.269	-0.562
1961	-0.563	-0.439	-0.270	-0.578
1962	-0.564	-0.439	-0.271	-0.596
1963	-0.558	-0.444	-0.270	-0.612
1964	-0.561	-0.441	-0.269	-0.568
1966	-0.564	-0.436	-0.268	-0.524
1968	-0.567	-0.435	-0.271	-0.573
1970	-0.570	-0.434	-0.272	-0.591
1972	-0.561	-0.442	-0.271	-0.601
1976	-0.559	-0.436	-0.262	-0.171
1979	-0.516	-0.456	-0.260	-0.323
1982	-0.526	-0.446	-0.252	4.530
1985	-0.518	-0.451	-0.254	0.168
1988	-0.437	-0.463	-0.252	-0.044
1991	-0.397	-0.466	-0.252	-0.169

Table A3 Apparel Industry Cross Price Elasticities

Year	E_{KL}	E_{LK}	E_{KD}	E_{DK}	E_{KF}	E_{FK}
1957	0.251	0.078	0.726	0.102	0.0004	0.245
1958	0.251	0.078	0.726	0.102	0.0004	0.245
1959	0.251	0.078	0.726	0.102	0.0004	0.243
1960	0.251	0.078	0.726	0.102	0.0004	0.242
1961	0.251	0.078	0.726	0.102	0.0004	0.240
1962	0.251	0.078	0.726	0.102	0.0004	0.243
1963	0.252	0.079	0.724	0.103	0.0004	0.267
1964	0.252	0.079	0.725	0.102	0.0004	0.247
1966	0.251	0.079	0.726	0.102	0.0004	0.246
1968	0.251	0.078	0.728	0.101	0.0004	0.227
1970	0.250	0.077	0.729	0.101	0.0004	0.225
1972	0.252	0.078	0.726	0.102	0.0004	0.219
1976	0.252	0.080	0.722	0.104	0.0004	0.223
1979	0.255	0.084	0.713	0.107	0.0004	0.222
1982	0.253	0.086	0.712	0.109	0.0003	0.402
1985	0.254	0.086	0.711	0.110	0.0002	0.950
1988	0.256	0.089	0.703	0.113	0.0002	2.215
1991	0.258	0.089	0.701	0.113	0.0003	0.381

Table A3 Con't. Apparel Cross Price Elasticities

Year	E_{LD}	E_{DL}	E_{LF}	E_{FL}	E_{DF}	E_{FD}
1957	0.623	0.281	0.0007	1.449	0.00011	0.516
1958	0.622	0.281	0.0007	1.450	0.00011	0.516
1959	0.622	0.281	0.0007	1.436	0.00011	0.518
1960	0.622	0.281	0.0007	1.424	0.00011	0.518
1961	0.622	0.281	0.0007	1.415	0.00011	0.520
1962	0.623	0.281	0.0007	1.433	0.00011	0.518
1963	0.621	0.281	0.0007	1.606	0.00009	0.500
1964	0.622	0.281	0.0007	1.460	0.00011	0.515
1966	0.622	0.280	0.0007	1.458	0.00011	0.515
1968	0.623	0.280	0.0007	1.323	0.00013	0.529
1970	0.624	0.280	0.0007	1.308	0.00013	0.531
1972	0.622	0.281	0.0007	1.260	0.00014	0.534
1976	0.621	0.281	0.0007	1.274	0.00013	0.531
1979	0.615	0.282	0.0007	1.245	0.00014	0.529
1982	0.616	0.280	0.0006	2.565	0.00004	0.402
1985	0.615	0.281	0.0006	6.643	0.00000	0.010
1988	0.610	0.282	0.0006	16.026	-0.00001	-0.897
1991	0.608	0.284	0.0006	2.382	0.00005	0.413

Table A4 Textile Industry Cross Price Elasticities

Year	E_{KL}	E_{LK}	E_{KD}	E_{DK}	E_{KF}	E_{FK}
1957	-0.047	-0.037	0.610	0.139	0.0009	0.153
1958	-0.048	-0.038	0.610	0.139	0.0009	0.152
1959	-0.047	-0.037	0.610	0.138	0.0009	0.152
1960	-0.048	-0.038	0.611	0.138	0.0008	0.152
1961	-0.047	-0.037	0.610	0.138	0.0009	0.152
1962	-0.046	-0.037	0.609	0.139	0.0009	0.153
1963	-0.051	-0.038	0.608	0.133	0.0010	0.146
1964	-0.050	-0.038	0.610	0.136	0.0009	0.150
1966	-0.049	-0.039	0.612	0.140	0.0008	0.154
1968	-0.044	-0.036	0.611	0.143	0.0009	0.157
1970	-0.042	-0.035	0.610	0.146	0.0009	0.160
1972	-0.047	-0.036	0.608	0.136	0.0009	0.150
1976	-0.059	-0.045	0.617	0.134	0.0005	0.150
1979	-0.092	-0.050	0.607	0.106	0.0006	0.121
1982	-0.093	-0.057	0.619	0.111	0.0001	0.158
1985	-0.097	-0.056	0.614	0.107	0.0003	0.125
1988	-0.162	-0.064	0.599	0.080	0.0004	0.097
1991	-0.193	-0.067	0.590	0.072	0.0005	0.088

Table A4 Con't. Textile Cross Price Elasticities

Year	E_{LD}	E_{DL}	E_{LF}	E_{FL}	E_{DF}	E_{FD}
1957	0.622	0.229	0.0012	0.707	0.0000	0.001
1958	0.622	0.229	0.0012	0.710	-0.0000	-0.003
1959	0.622	0.229	0.0012	0.706	0.0000	0.003
1960	0.622	0.229	0.0012	0.712	-0.0000	-0.005
1961	0.622	0.229	0.0012	0.706	0.0000	0.003
1962	0.622	0.229	0.0013	0.701	0.0000	0.009
1963	0.623	0.231	0.0012	0.732	-0.0000	-0.030
1964	0.623	0.230	0.0012	0.721	-0.0000	-0.017
1966	0.623	0.229	0.0012	0.718	-0.0000	-0.014
1968	0.622	0.228	0.0013	0.685	0.0000	0.030
1970	0.622	0.227	0.0013	0.671	0.0000	0.048
1972	0.622	0.230	0.0013	0.694	0.0000	0.021
1976	0.623	0.230	0.0012	0.764	-0.0000	-0.075
1979	0.624	0.239	0.0011	0.881	-0.0001	-0.223
1982	0.626	0.232	0.0010	1.148	-0.0002	-0.594
1985	0.626	0.234	0.0010	1.210	-0.0002	-0.678
1988	0.627	0.242	0.0009	1.805	-0.0003	-1.481
1991	0.626	0.247	0.0009	1.579	-0.0003	-1.165

Table 1 Estimates of Apparel Industry Model Parameters
(t values)

	Homogeneous Production Function
α_0	0.220 (12.329)
α_Y	0.844 (36.448)
β_K	0.099 (11.481)
β_L	0.286 (21.454)
β_D	0.614 (83.286)
γ_{KK}	-0.006 (-0.756)
γ_{LL}	0.004 (0.154)
γ_{DD}	-0.007 (-0.596)
γ_{KL}	-0.003 (-0.215)
γ_{KD}	-0.007 (-0.782)
γ_{LD}	-0.037 (-1.089)
DUM	-0.064 (-1.840)
Log Likelihood	258.245

Table 2 Estimates of Textile Industry Model Parameters
(t values)

	Homogeneous Production Function
α_0	-0.023 (-0.720)
α_Y	0.874 (37.316)
β_K	0.082 (6.459)
β_L	0.238 (25.677)
β_D	0.679 (62.196)
γ_{KK}	0.043 (4.427)
γ_{LL}	0.070 (1.780)
γ_{DD}	0.047 (1.563)
γ_{KL}	-0.036 (-3.921)
γ_{KD}	0.009 (1.212)
γ_{LD}	-0.002 (-0.098)
DUM	-0.178 (-15.022)
Log Likelihood	315.624