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by

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Abstract

Although a vital part of the economy, the Korean textile industry has been challenged by the recent reduction of international trade barriers, particularly as this industry was fully integrated into GATT in 2005. The textile industries in Japan and many other countries have also faced difficulties. This study examines future prospects for the Korean industry by investigating the presence of economies of scale and relationships among the inputs of domestic capital, labor, and intermediate goods, as well as foreign intermediate goods. The findings are consistent with constant returns to scale and a substitutes relationship among all input pairs except for domestic capital and foreign intermediate goods. Thus, there appear to be no further cost reductions available through increased output and economies of scale. However, some reduction in industry output may not result in increased unit costs either. A reduction in the price of foreign intermediate goods will increase the demand for domestic capital, but also, at least in the short run, add stress to the industry as it decreases the demand for domestic labor and domestic intermediate goods.

I. Introduction

The textile industry has not received as much attention as some of Korea's heavy industries, such as steel and autos, or as the electronics industry. Nevertheless, it clearly is a vital part of the Korean economy, and its future competitiveness is, therefore, an important issue.[1] The modern textile industry had its beginnings in the mid-twentieth century, and it participated in the Korean import substitution and export promotion industrialization policies. At the turn of the century, South Korea ranked fifth among the world economies in textile exports, fourth in polyester production, and fifteenth in cotton yarn production (McNamara, 2002, p. 25). In 2005, textile and apparel exports totaled slightly over $14 billion and imports were about $7.35 billion, resulting in a trade surplus of about $6.7 billion. While this figure was down from a surplus of $8.3 billion generated in 2004, it represented an increase in the proportion of the total trade surplus accounted for by the industry. In 2005, the industry accounted for 28.8% of the total trade surplus for Korea, compared with 28.4% in 2004.[2]

In addition to its contribution to the trade balance the Korean textile industry is an important generator of domestic value added and employment. In 2004, the industry's census value added was about 14.9 trillion won, representing nearly 5% of aggregate manufacturing value added. The industry was even more significant as a generator of employment; in 2003 it accounted for about 10.3% of total manufacturing employment. Nevertheless, that figure represented a substantial decline from 11.65% in 2003, and questions have been raised regarding the future of the industry as international trade barriers for textiles have fallen.[3]

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[1] Because of a lack of consistent and separate data series for the textile and apparel industries, both industries are grouped together and the "textile industry" terminology is used to refer to both industries.

[2] *Korea Statistical Yearbook: 2004*, pp. 512-517; and *2005*, pp. 532-537.

[3] *Korea Statistical Yearbook: 2004*, pp. 508-509 and *2005*, pp. 320-321.

The Agreement on Textiles and Clothing (ATC), negotiated during the Uruguay Round, provided for the (nearly) full integration of the textile and apparel industries into GATT rules as of January 1, 2005.[4] Although some provisions allow countries to temporarily continue to place restrictions on industry imports, concern for the industry has especially increased since the arrival of the new environment beginning in 2005.[5]

McNamara (2002) provides an extensive discussion of the history and development of the Korean textile industry, including several periods of stress and restructuring. Lee (1995) investigates the revealed comparative advantage of a number of Korean industries, including textiles and clothing, using data from 1965-1992. He points out that textiles and clothing are traditional Korean export products. The average ranking of the textile industry, not including apparel, has remained high during the period. However, while certain technologically sophisticated products such as synthetic fabrics have increased or maintained their competitiveness, traditional products such as cotton fabric have lost competitiveness. Moreover, clothing had lost much of its international competitiveness by 1992. In fact, Lee argues that most labor-intensive products are losing their comparative advantages. (Lee, 1995, pp. 1201-1202, 1205). Amsden (1991, pp. 283-285) argued that the superior technology and management

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[4]While the liberalization occurred in stages, the bulk of it was delayed until 2005, so the January 1 date was especially significant (Liu and Sun, 2004, pp. 53-54).

[5]For example, the agreement 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 determined that import surges 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).

of the Japanese textile industry in the 1960s made it impossible for Korean textile companies to compete on the basis of lower wage rates, and that the Korean government had to intervene with subsidies for the industry and devalue the won to stimulate exports. In a study comparing Taiwanese and Korean manufacturers, Aw, Chung and Roberts (1991, pp. 489-493) note that all of the industries *except for apparel* had substantial output growth during the 1980s. Furthermore, measures of industry dispersion of total factor productivity were in general higher for Korea than Taiwan, but highest of all for the textile, apparel, and chemical industries. However, while Korea had a larger *number of firms* in the lower tail of the productivity distribution for these industries, the greater *proportion of output* was produced by firms in the higher tail.[6]

The articles cited above certainly yield reasons to be concerned about the future of the Korean textile and, especially, the apparel industry. The purpose of this paper is to examine the returns to scale and input relationships for the Korean textile industry using a translog cost function and data for the combined textile and apparel industry from 1977-2004 in an attempt to glean further insights into the prospects for this industry in an environment where international trade restrictions for its products are falling. Some data availability problems required the use of combined textile and apparel industry data. Thus, although we use the term "textile" industry throughout the paper, we are referring to the aggregated textile and apparel industries. We use a translog cost function with inputs of domestic capital, labor, and intermediate goods, as well as foreign intermediate goods.

[6]Recently, even China has faced competitive pressures as rising energy and labor costs have resulted in diversion of production to even lower cost countries such as India, Indonesia, and Vietnam. See "Made in China May Cost You More," *San Antonio Express-News*, February 22, 2008, pp. 1C, 4C.

II. The Translog Cost Function

A transcendental logarithmic (translog) cost function was used to examine the relationships among the output and inputs of the Korean textile industry. The industry production technology is assumed to be representable by an implicit 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 unique cost function

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

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

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

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

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

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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, p. 615) for more detailed discussions of translog functions. Also see Binswanger (1974, p. 380); and Kohli (1991, pp. 103-106) for a discussion of the technological change variable.

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

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] Only three of the factor share equations are linearly independent, since

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[8]Technically, the estimation of this cost function requires that input markets be perfectly competitive. Although many of the input markets relevant to this study are not perfectly competitive, administered prices that do not change frequently in response to volume changes can perform a similar role for estimation purposes. The government of South Korean certainly had a role in influencing prices in the industry (Amsden, 1991, p. 284; and McNamara, 2002, p. 63).

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:

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

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 semidefinite.

Also, γ_{ij} must equal γ_{ji}.

their sum must be equal to unity. 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.[10] The restrictions imposed on the parameters by the linearly homogeneous in factor prices regularity requirement allow the translog cost function to be written so that only twenty parameters must be estimated.[11]

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[9]The principal advantages of using a translog cost function rather than a translog production function are found in the following features of the cost function: (1) the partial derivatives of a cost function with respect to input prices yield the corresponding input demand functions (Shephard's Lemma), (2) it follows from (1) that the partial derivative of the cost function in logarithmic form with respect to factor prices yields the cost shares, and (3) the partial derivative of the cost function in logarithmic form with respect to output yields the cost elasticity with respect to output level (Binswanger 1974, p. 377; and (Jorgenson 2000, Chapter 1).

[10]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 $_0$ is equal to zero. Although this normalization procedure was followed and 1977 was used as the base year, the estimated translog cost function was not assumed to be exact. Thus, $_0$ may not be equal to zero. Separate stochastic error terms, to reflect errors in optimizing behavior, were implicitly added to the estimated cost and share equations. The iterative Zellner-efficient method (IZEF) was used.

Barten (1969, pp. 24-25) has shown that maximum-likelihood estimates of a set of share equations with one deleted are invariant to which equation is omitted. Kmenta and Gilbert (1968) and Ruble (1968, pp. 279-286) have shown that iteration of the Zellner (1962 and 1963) procedure until convergence yields maximum-likelihood estimates.

One could argue that industry output is an endogenous variable and that an instrumental variable procedure should be used, since the regressor and the error terms may be correlated. Similar problems may arise with measurement errors; as a result, coefficient estimates may be inconsistent (Westbrook and Tybout, 1993). However, using aggregated data for the United States, Applebaum (1978, p. 94) compared the I3SLS results of Berndt and Christensen (1974) with those of his model using the maximum likelihood method and found they were similar. In addition, a potential problem with the instrumental variables methodology is that the results may be affected by the set of instrumental variables utilized.

[11]As a result of the linearly homogeneous in prices assumption,

III. Empirical Results

As explained above, we used annual data from 1977-2004 for the combined textile and apparel industries. The study period was determined by the dates for which the data appeared to be most nearly comparable over time. We had to use data for the combined textile and apparel industry because data were not consistently available for each industry separately for sufficiently long time periods.[12] The final estimated form of the translog function corresponded to a

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

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

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

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

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

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

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

[12]The primary data source is Korea National Statistical Office, *Korea Statistical Yearbook*, as listed in the bibliography. The data used in the study were for *textiles, except sewn wearing apparel*, and for *sewn wearing apparel and fur articles*. Gross output was equal to the combined nominal gross output of these two industries, deflated by the producer price index for the combined textile and apparel industry. Total factor cost was given by the sum of census value added and "major production costs" for the two industries. The "major production costs" data reflected the intermediate materials purchased by the industry. The factor cost share of labor was given by summing the wages and salaries for each (textile and apparel) subindustry, and the share of capital was given by subtracting the labor share from census value added. The share of

homogeneous production function, and all time-related terms were omitted. The more restricted functional form was used because its estimation results satisfied all of the regularity conditions, while other less restricted versions did not.[13]

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intermediate goods was given by summing the "major production costs" series for each subindustry. The cost share of imported inputs was given by the sum of textile fiber imports, textile yarn and fabric imports, and apparel imports, and the share of domestic intermediate goods by the difference between the cost share of intermediate goods as a whole and imported intermediate goods. All of the total cost and share data were in millions of won. Because they were the only relevant data available, the price of domestic intermediate goods was given by the producer price index for intermediate materials in manufacturing. The price of imported intermediate goods was given by the producer import price index for textiles and apparel. The price of labor was given by a weighted average (based on number of employees, respectively) of the average daily earnings of regular employees in the textile and wearing apparel industries. The data series utilized for the price of capital were as follows: from 1977-1979, the money market rate; for 1980, the lending rate; and from 1981-1991, the corporate paper rate. These data were chosen because they appeared to be the best available for each time period, and their source was the International Monetary Fund, *International Financial Statistics Yearbook: 1993*. After 1991, the three-year corporate bond rate, published in the *Korea Statistical Yearbook* was utilized for the cost of capital. All price indices were based on the year 2000 = 100.

[13]The assumption of homotheticity requires that the ρ_{Yi} terms equal zero, and the more restrictive assumption of homogeneity requires that δ_{YY} also equal zero (Christensen and Greene, 1976, p. 661). A cost function corresponds to a homothetic production function if and only if the former function is separable with respect to output and the input prices, and the elasticity of cost with respect to output with must be constant for a homogeneous production function.

The conventional single-equation Durbin-Watson statistic for the total cost function was 2.27, in the inconclusive range at the five percent level of significance. See Durbin (1957), Malinvaud (1970, p. 509), and Berndt and Christensen (1973, p. 95) for a discussion of the Durbin-Watson statistic as a criterion for autocorrelation in the case of simultaneous equations.

A Lagrange multiplier test for serial correlation was also done on the total cost equation using lagged values of the error term ranging from one to nine periods (see Godfrey, 1988, pp. 112-117; and Greene, 2000, pp. 540-541). The null hypothesis of $\rho = 0$ could not be rejected at the 5 percent level of significance for any of the lag specifications.

In addition, the Regression Specification Error Test (RESET) was performed on the total cost equation using terms involving the dependent variable estimates up to the fourth power (Maddala, p. 478). This procedure also did not suggest any model specification errors at the five percent level of significance.

The estimated cost function coefficients and their respective *t* values are shown in Table 1. Nearly all of these estimates were significantly greater or less than zero, respectively. However, the actual values of these estimates are not particularly important in and of themselves, except for the coefficient of α_Y. The coefficient of α_Y in this case is equal to the elasticity of cost with respect to output, $E_C = \partial \ln TC/\partial \ln Y$. The reciprocal of the cost elasticity, $1/E_C$, can be used as an estimate of returns to scale. In the case of the Korean textile industry, the cost elasticity estimate of 1.05 is greater than one, which would indicate decreasing returns to scale. However, it was not significantly greater than one at the five percent significance level, so we cannot reject the hypothesis of constant returns to scale.[14] It follows from these results that if international competition forces the industry to reduce its output, its unit costs should not rise. However, an expansion of industry output cannot be expected to reduce unit costs either.

We are also very much interested in the direct and cross price elasticities of demand with respect to the various inputs. Estimates of these values can be calculated from the estimated cost function coefficients and are shown in appendix tables A1 and A2.[15] All of the estimated direct

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[14]In earlier studies Tybout and Westbrook (1995, pp. 70-71) and Westbrook and Tybout (1993) generally did not find statistically significant economies of scale in the Chilean and Mexican textile and apparel industries. Ramcharran (2001a, p. 521) found that returns to scale in the U.S. textile industry ranged from a low of 0.094 in 1975 to a high of 1.668 in 1989, and they varied throughout the study period of 1975-1993. However, he (Ramcharran, 2001b, p. 289) did find decreasing returns to scale in the U.S. apparel industry. Kouliavtsev, *et. al*.(2007, p. 10) found evidence of decreasing, constant, and increasing scale elasticity across sectors of the U.S. textile industry, using data from 1958-1996. They also found evidence of increasing scale elasticity in some sectors over time. In some cases these increases continued until the mid-1970s, followed by decreases in later years.

[15]Estimates of the direct price elasticity of demand for input *i* can be calculated using the estimated input shares and parameters of the cost function as

price elasticities of demand are negative, as would be expected. It is particularly interesting that the direct price elasticity of demand for imported inputs appears to be greater in absolute value than those of the domestic inputs. However, we used a bootstrap procedure (Eakin, *et. al*., 1990; and Kerkvliet and McMullen, 1997) to investigate the statistical significance of these estimates. The results of that exercise indicated the estimates of the mean values of E_{KK}, E_{LL}, and E_{DD} were significantly less than zero, but that of E_{FF} was not. The variance of the estimates of the mean values of E_{FF} during the bootstrap procedure was too high for the estimates to be statistically significant. In addition, we used the bootstrap procedure to see whether these values changed significantly over time, from the first period (1977) to the last (2004). The results indicated that there was no statistically significant change in any of the direct price elasticities over time.

The estimated cross price elasticities suggested that all of the input pairs were substitutes except for domestic capital and foreign intermediate goods, and, for most observations, domestic labor and intermediate goods. However, the results of the bootstrap procedures suggested that only the estimated mean cross price elasticities of E_{KL}, E_{LK}, E_{KD}, and E_{DK} were significantly greater than zero. These findings could reflect trade restrictions on imports of foreign intermediate goods as well as the productive relationships among the various inputs. For

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$$E_i = \frac{\gamma_{ii} + S_i - S_i}{S_i} .$$

Estimates of the cross price elasticities of demand ($E_{ij} = \partial \ln X_i / \partial \ln W_j$) can be calculated as:

$$E_{ij} = S_j + \frac{\gamma_{ij}}{S_i} .$$

example, some foreign intermediate goods might have a complementary relationship with some types of capital, labor, and domestic intermediate goods, while others might have a substitute relationship. A similar situation may exist for labor and domestic intermediate goods. One favorable implication for Korea of these results is that the complementary relationship between domestic capital and foreign intermediate goods suggests that a decrease in foreign goods prices as a result of a reduction in international trade restrictions would increase the demand for domestic capital. On the other hand, the substitutes relationship between labor and foreign intermediate goods as well as that of domestic and foreign intermediate goods indicates that a lowering of foreign goods prices would cause a decrease in demand for labor and domestic intermediate goods.

In an effort to gain more insight into the nature of the input interrelationships, we again used the bootstrap procedure to see if these values changed significantly from the beginning of the study period (1977) to the end (2004). The results indicated that the value of E_{LK} increased significantly over time at the five percent significance level, meaning that changes in the price of capital were having a proportionately greater effect on employment at the end of the period. However, the value of E_{LD} *decreased* significantly over time, suggesting that domestic intermediate goods and labor were developing a more complementary relationship. At the ten percent significance level, the value of E_{KD} *decreased* significantly over time, while the values of E_{DK}, E_{KF}, and E_{LF} *increased*. These findings reflect the patterns shown by the estimated elasticities in Table A2, but the important question is *why* these results occurred. Perhaps the demands for domestic capital and labor are becoming more sensitive to the prices of foreign intermediate goods, as the global economy expands and trade barriers come down. This situation would make the textile industry more vulnerable to international markets and increase pressure to enhance its competitiveness. The factor share of foreign intermediate goods did triple from a very small 7% in 1977 to almost 22% in 2004. Moreover, the findings of other researchers using different techniques, including surveys, discussed earlier, would be consistent with such a conclusion.[16]

The results with respect to E_{KD} and E_{DK} are a bit of a puzzle. They suggest that the demand for capital is becoming less sensitive to a change in the price of domestic intermediate goods, while the demand for domestic goods is becoming more sensitive to a change in the price of capital. The findings may merely reflect the fact that the calculated input share of capital increased by nearly 50% from 21% to 30%, while the share of domestic intermediate goods decreased by almost 40% from 57% to about 35%. In that case, a given percentage change in the price of domestic intermediate goods might be expected to have a smaller proportional effect on the demand for capital goods, since its base amount was higher, with the reverse effect for E_{DK}.

IV. Conclusions

In recent years concerns have been raised regarding the long-term future of the Korean textile industry in the global economy, especially as trade restrictions specific to that industry are reduced. The results of this study offer some insights into how this increasingly competitive international environment may affect the industry. First, our findings did not allow us to reject the hypothesis of constant returns to scale in the industry. It follows that no cost advantages could be gained from increasing the scale of operations in the industry. On the other hand, at

[16] See, for example, McNamara (2002) and Lee (1995).

least over the output range included in these data, no cost *dis*advantages would be incurred if the industry were forced to reduce its output level.

The direct price elasticity estimates for the domestic inputs were all negative and significant. While the direct price elasticity estimates for foreign intermediate goods inputs were relatively high in absolute value terms, they were not significantly less than zero because of high variance in the estimated mean values. These results and those for the significance of some of the cross price elasticity estimates involving a domestic input and foreign intermediate goods may have been obtained because of uncertainties surrounding the international markets and various trade restrictions.

The findings in this study indicated that all of the textile industry inputs were substitutes except for domestic capital and foreign intermediate goods and labor and domestic intermediate goods. Thus, while a decrease in foreign intermediate goods prices would cause a decrease in demand for domestic labor and domestic intermediate goods, it would apparently stimulate demand for domestic capital. While the picture is not as bleak as it could be, cheaper foreign intermediate goods would appear to require some adjustments in the domestic labor and intermediate goods markets as the demand for those two inputs falls. If the sensitivity of the quantity demanded of domestic inputs to foreign input prices is increasing, it becomes even more important for Korean industries to increase their international competitiveness. The findings of Aw, Chung, and Roberts (1991), discussed above, regarding the relatively high number of (apparently smaller) firms in the bottom tail of the productivity distribution suggests that particular attention should be given to reasons for their lower productivity and possible ways that productivity could be improved.

It appears that in the relatively near future, the textile industry in all countries will be operating in a much more challenging environment. Thus, it is extremely important for the long term growth of the Korean textile industry that it find ways to increase productivity and, possibly, continue to find particular niches (for example, synthetics) where it can excel in international markets.

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Table A1 Direct Price Elasticities

Year	E_{KK}	E_{LL}	E_{DD}	E_{FF}
1977	-0.828	-0.547	-0.602	-1.548
1978	-0.816	-0.557	-0.623	-1.589
1979	-0.803	-0.553	-0.658	-1.422
1980	-0.796	-0.521	-0.690	-1.211
1981	-0.792	-0.503	-0.706	-1.152
1982	-0.785	-0.521	-0.720	-1.172
1983	-0.783	-0.505	-0.734	-1.122
1984	-0.793	-0.496	-0.714	-1.127
1985	-0.791	-0.503	-0.718	-1.131
1986	-0.795	-0.506	-0.710	-1.143
1987	-0.794	-0.505	-0.714	-1.135
1988	-0.788	-0.508	-0.729	-1.124
1989	-0.776	-0.539	-0.749	-1.171
1990	-0.769	-0.543	-0.768	-1.159
1991	-0.761	-0.549	-0.789	-1.157
1992	-0.754	-0.562	-0.799	-1.209
1993	-0.745	-0.559	-0.831	-1.153
1994	-0.745	-0.562	-0.831	-1.169
1995	-0.740	-0.560	-0.847	-1.139
1996	-0.739	-0.561	-0.853	-1.139
1997	-0.745	-0.563	-0.834	-1.168
1998	-0.757	-0.552	-0.807	-1.141
1999	-0.745	-0.543	-0.852	-1.071
2000	-0.744	-0.547	-0.855	-1.079
2001	-0.745	-0.539	-0.860	-1.052
2002	-0.737	-0.547	-0.882	-1.055
2003	-0.732	-0.542	-0.904	-1.026
2004	-0.726	-0.527	-0.933	-0.983

Table A2 Korean Textile Industry Cross Price Elasticities

Year	E_{KL}	E_{LK}	E_{KD}	E_{DK}	E_{KF}	E_{FK}
1977	0.333	0.477	0.754	0.279	-0.260	-0.784
1978	0.336	0.468	0.730	0.290	-0.249	-0.834
1979	0.323	0.487	0.696	0.305	-0.215	-0.584
1980	0.293	0.543	0.667	0.315	-0.164	-0.307
1981	0.282	0.570	0.653	0.320	-0.143	-0.238
1982	0.287	0.553	0.640	0.328	-0.142	-0.253
1983	0.277	0.576	0.629	0.331	-0.123	-0.197
1984	0.279	0.578	0.649	0.320	-0.135	-0.211
1985	0.281	0.572	0.644	0.323	-0.134	-0.213
1986	0.284	0.565	0.652	0.318	-0.142	-0.229
1987	0.283	0.566	0.649	0.320	-0.139	-0.221
1988	0.282	0.567	0.636	0.326	-0.129	-0.204
1989	0.294	0.534	0.615	0.339	-0.133	-0.244
1990	0.294	0.533	0.598	0.348	-0.123	-0.225
1991	0.296	0.530	0.581	0.358	-0.115	-0.215
1992	0.308	0.512	0.571	0.365	-0.125	-0.268
1993	0.299	0.527	0.546	0.378	-0.100	-0.196
1994	0.304	0.520	0.546	0.378	-0.105	-0.214
1995	0.298	0.530	0.534	0.385	-0.092	-0.177
1996	0.300	0.528	0.529	0.387	-0.091	-0.175
1997	0.305	0.518	0.544	0.379	-0.105	-0.213
1998	0.296	0.530	0.566	0.364	-0.106	-0.194
1999	0.282	0.556	0.533	0.381	-0.070	-0.113
2000	0.285	0.550	0.531	0.383	-0.072	-0.120
2001	0.279	0.562	0.528	0.383	-0.062	-0.096
2002	0.283	0.556	0.511	0.393	-0.057	-0.091
2003	0.276	0.570	0.496	0.401	-0.040	-0.061
2004	0.263	0.597	0.477	0.412	-0.014	-0.020

Table A2 Con't. Cross Price Elasticities

Year	E_{LD}	E_{DL}	E_{LF}	E_{FL}	E_{DF}	E_{FD}
1977	0.106	0.028	-0.036	-0.077	0.295	2.409
1978	0.122	0.035	-0.033	-0.079	0.298	2.503
1979	0.083	0.024	-0.017	-0.030	0.328	2.036
1980	-0.028	-0.007	0.006	0.006	0.382	1.512
1981	-0.081	-0.020	0.014	0.011	0.406	1.379
1982	-0.049	-0.013	0.017	0.016	0.405	1.409
1983	-0.097	-0.025	0.025	0.019	0.427	1.300
1984	-0.101	-0.024	0.019	0.014	0.417	1.323
1985	-0.090	-0.022	0.021	0.016	0.418	1.327
1986	-0.077	-0.019	0.018	0.015	0.410	1.357
1987	-0.082	-0.020	0.021	0.016	0.414	1.340
1988	-0.085	-0.022	0.026	0.021	0.424	1.307
1989	-0.023	-0.007	0.028	0.028	0.417	1.386
1990	-0.024	-0.008	0.035	0.035	0.429	1.349
1991	-0.020	-0.007	0.039	0.041	0.438	1.332
1992	0.017	0.006	0.033	0.043	0.427	1.434
1993	-0.016	-0.006	0.048	0.053	0.459	1.296
1994	-0.003	-0.001	0.045	0.054	0.454	1.329
1995	-0.023	-0.009	0.053	0.058	0.472	1.259
1996	-0.021	-0.009	0.054	0.060	0.475	1.254
1997	-0.001	-0.001	0.047	0.056	0.455	1.325
1998	-0.024	-0.009	0.046	0.047	0.452	1.288
1999	-0.079	-0.029	0.067	0.055	0.500	1.130
2000	-0.069	-0.026	0.066	0.057	0.498	1.143
2001	-0.095	-0.034	0.072	0.055	0.512	1.092
2002	-0.085	-0.033	0.076	0.062	0.522	1.084
2003	-0.114	-0.044	0.086	0.063	0.547	1.023
2004	-0.168	-0.064	0.098	0.060	0.585	0.943

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

	Homogeneous Production Function
α_0	-0.056 (-1.962)
α_Y	1.048 (33.687)
β_K	0.211 (22.924)
β_L	0.148 (21.323)
β_D	0.571 (26.579)
γ_{KK}	-0.008 (-1.512)
γ_{LL}	0.045 (8.345)
γ_{DD}	-0.099 (-1.667)
γ_{KL}	0.039 (9.404)
γ_{KD}	0.004 (3.101)
γ_{LD}	-0.069 (-4.884)
Log Likelihood	262.011