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STRUCTURAL CHANGES IN KOREA'S EXPORTS AND THE ROLE OF THE EC MARKET

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* The factor proportion hypothesis in trade theory has been the subject of many empirical tests, but few have analyzed the changes in a country's factor content in different export markets over time. This paper analyzes the change in factor intensity of Korean exports towards its major trading partners, as well as the role of EC integration in Korean exports from 1978-1991. Changes in the pattern of factor intensity to variations in each of Korea's trading partners and the EC market's positive effects on Korea are traced.

Table Of Contents

Ⅰ. Introduction·····1

Ⅱ. Changes in Comparative Advantage Towards Countries·····2

Ⅲ. Factor Endowment and Korea's Comparative Advantage·····8

Ⅳ. Dynamic Changes in Korea's Comparative Advantage·····14

Ⅴ. The Role of the EC in Korea's Export Industries·····18

Ⅵ. Concluding Remarks·····23

〈References〉·····26

Ⅰ. Introduction

It is generally acknowledged that international trade flow is determined by the comparative advantage of relative factor endowments in different countries. The purpose of this paper is to test the factor proportion hypothesis in trade theory on Korea's manufacturing exports and to differentiate these export patterns towards Korea's major trading partners, i.e the U.S., EC, Japan, EFTA, and ASEAN. In addition, this paper will also analyze the role of the EC market in Korea's changing comparative advantage during 1978-1991.

To analyze the structural changes in Korean exports, 81 manufactured commodities classified by the 2-digit level of HS were employed, since Korean exports consist mostly of manufactured goods. Comparative advantage of a given country has been conventionally defined in terms of relative export performance, while neglecting imports which are greatly affected by protectionist policies.

The analysis is based on three testing procedures. First, section Ⅱ of this paper discusses how to measure comparative advantage, and by using the measurement method in this section, describes the changes in Korean export patterns towards its major trading partners. The factor intensities of each export industry are measured within the framework of the factor proportion theory. The structural changes in each trading partner's comparative advantage are estimated in section Ⅲ. Using the same regression method, the role of the EC market in time-variation of Korea's

comparative advantage is estimated in section Ⅳ.

Ⅱ. Changes in Comparative Advantage Toward Countries

In identifying the differences in a country's export patterns toward each trading partner, comparative advantage, which reflects the differences in cost as well as non-price competitiveness in each export market, must be measured. Many studies suggest various methodologies for measuring comparative advantage, which is normally determined by the actual export performance of individual countries.

However, almost all studies were designed to measure inter-country differences in comparative advantage but did not focus much on measuring a country's differences in each export market. For instance, the RCA index of Balassa (1965), which calculates the ratio of a country's share in world exports of a particular commodity to its share of world exports, has been widely utilized to measure inter-country differences in comparative advantage.[1)]

With this in mind, this study devised the CAC (Comparative Advantage by Country) index to measure the differences in Korean export patterns with each trading partner as follows:

1) The Symbols of RCA = E_{xi} / TEX / WEXi / TWEX, where EX stands for the export of commodity i of a certain country ; TEX for total exports of this country ; WEXi for total world export of commodity i ; and TWEX for total world export of all commodities.

$$CAC_{Ei} = EXi / EX / Ti / T \cdots\cdots (1)$$

where CAC_{Ei} denotes Korea's comparative advantage of commodity i in a given country E (e. g. EC); EX_i symbolizes Korea's export of commodity i to country E; EX is total Korean exports to country E; Ti is total Korean exports of commodity i, and T represents Korea's total exports of commodities.

Namely, the CAC index is calculated as the ratio of a commodity's share of total Korean exports to a certain country (e. g. EC) to the commodity share of total Korean exports of all commodities. Thus, a ratio of 1.10 (0.90) suggests that a certain commodity's share of total exports to a particular country is 10% higher (lower) than its commodity share of total Korean exports.

To identify the pattern of change in Korean exports by calculating the CAC index, 81 manufacturing export commodities with an HS 2 digit level during 1978-91[2] and their five main export regions, including the U.S., the EC 9, EFTA 6, Japan and ASEAN 6 countries were selected.[3] From this calculation, Korea's different export structures that are applied to its various trading partners could be uncovered.

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2) To calculate the CAC index, we used Monthly Foreign Trade Statistics of the Korean Customs Administration. Due to the differences in numeration between the CCCN and the HS codes in 1987, we linked in detail these slight differences.

3) EC 9 suggests that Greece, Spain, and Portugal were excluded from the total 12 EC members, while Reichitainchitain was also excluded from EFTA 7. The 6 ASEAN countries include Singapore, Malaysia, Thailand, Indonesia, the Philippines and Brunei.

In the case of Korean exports to the EC and EFTA in 1981, commodities ranking within the top ten of the CAC index consisted mainly of labour-intensive goods, such as musical instruments, leather goods & bags, clothing, etc. Yet, in 1991, commodities emerging in the top ten list were a mixture of labour-intensive goods and capital- or technology-intensive goods, such as medical instruments, office machinery, home-electrical appliances and shipbuilding(especially in the case of exports to the EFTA).

Compared with the EC and EFTA, Korean exports to the U.S. have diversified since earlier years. Capital-intensive industries, such as office machinery, machinery and mechanical appliances, and home-electrical appliances ranked in the top ten list of the CAC index for Korean exports to the U.S. in 1981. However, this export structure did not change substantially until 1991, implying no significant structual changes in Korean exports to the U.S.

It is also difficult to find any significant change in the pattern of Korean exports to Japan and ASEAN in the sample. In the case of Korean exports to Japan, pulp and paper, articles of stone or similar materials, zinc and articles thereof, umbrellas, and musical instruments were always included in the top ten list. In the case of Korean exports to ASEAN, fertilizer, copper and articles thereof, inorganic chemicals, and industrial machines were continuously in the top ten list during 1978-1991.

Table 1 reports the computed CAC index of 15 major export commodities, which constituted about 80% of total Korean exports in

〈Table 1〉 Changes in the CAC Index for 15 Major Korean Export Commodities

	EC			EFTA			US			JAPAN			ASEAN		
	78~82	83~87	88~91	78~82	83~87	88~91	78~82	83~87	88~91	78~82	83~87	88~91	78~82	83~87	88~91
1. Sound & Tel. Equip. (15.0)	1.260	1.211	1.407	1.010	0.945	1.916	1.612	1.477	1.029	0.422	0.382	0.485	0.344	0.514	0.679
2. Clothing (12.9)	1.609	1.483	1.271	1.412	1.010	1.122	1.238	1.258	1.212	0.844	0.843	1.723	0.126	0.059	0.023
3. Other Electric Pro. & Parts (8.3)	0.707	0.760	0.660	0.176	0.078	0.287	1.611	1.407	1.098	1.016	0.866	0.839	0.575	1.594	2.480
4. Steel Pro. (7.6)	0.302	0.230	0.342	0.075	0.087	0.225	1.092	0.894	0.671	0.779	1.193	1.813	2.128	1.917	1.919
5. Textiles (6.7)	0.606	0.582	0.560	0.523	0.509	0.329	0.190	0.307	0.274	0.557	0.281	0.234	3.212	2.394	1.627
6. Footwear (5.6)	1.122	0.898	1.251	1.375	1.130	1.183	1.970	1.891	1.898	0.666	0.526	0.577	0.158	0.060	0.159
7. Vehicles & Parts (4.0)	1.044	0.756	0.481	0.078	0.042	0.503	0.354	1.134	1.959	0.173	0.094	0.125	0.820	0.225	0.263
8. Shipbuilding (3.9)	1.317	1.558	0.888	5.067	5.101	4.232	0.283	0.341	0.122	0.086	0.102	0.014	0.878	1.519	1.269
9. Travel Products & Bags (3.2)	2.226	2.143	1.483	1.971	2.132	2.076	1.592	1.457	1.465	0.432	0.405	1.277	0.057	0.064	0.055
10. Office Machines (2.4)	0.644	1.524	1.886	0.148	0.170	0.442	2.214	1.761	1.644	0.695	0.283	0.291	0.067	1.047	1.216
11. Plastic Pro. (2.4)	0.411	0.514	0.756	0.355	0.348	0.734	0.522	0.489	0.605	1.244	1.125	0.869	2.798	2.974	1.556
12. Toys & Sporting Goods (2.4)	1.513	1.178	1.874	0.910	0.777	1.434	1.895	1.779	1.317	0.514	0.518	0.969	0.137	0.120	0.160
13. Rubber & Articles (2.1)	0.540	0.927	1.229	0.466	0.699	0.445	0.890	1.013	0.779	0.241	0.186	0.343	0.520	0.636	0.668
14. Trains & Parts (1.9)	0.732	0.977	1.637	0.321	0.210	0.164	2.000	1.544	1.676	0.349	0.689	0.689	0.384	0.826	0.446
15. Home Elec. Appliances (1.6)	0.157	0.854	1.774	0.048	0.282	0.008	1.975	2.135	1.425	0.236	0.083	0.163	2.215	0.163	0.205

Note: Numbers in parentheses are average % of total Korean exports from 1989~91.

1989-1991. It reveals that each commodity has a different comparative advantage in different export markets. Namely, sound & telecommunication equipment, which is the most important export item with its share of 15.0% in total Korean exports during 1988-91, shows higher CAC index figures in exports to the EC and EFTA. Clothing(12.9%) and iron & steel (7.9%) show higher CAC index figures in exports to Japan. Textiles(7.6%) and shipbuilding(3.5%) revealed an increasing CAC index in exports to ASEAN, while CAC index figures for shipbuilding exports to EFTA have gradually declined since 1979. CAC index figures for footwear(5.6%) and vehicles(5.6%) have shown growth in exports to the U.S. Meanwhile, travel goods & bags and office machines have recorded higher index figures in exports to the EC and EFTA.

The changes in the export structure can be shown by the standard deviation of CAC indexes, which has continuously declined since 1978. This means that the comparative advantage of commodities produced in Korea has diversified because of the country's economic development. In 1991, however, the standard deviation of CAC indexes of exports to the U.S. was 0.68% in comparison to EFTA (0.78), the EC (0.86), ASEAN (1.25) and Japan (1.26).

In order to compare the whole commodity structure of Korean exports to each of its major trading partners, the Spearman rank correlation coefficients have also been calculated between Korean exports to the EC and to other countries. Table 2 presents the results.

The Spearman rank correlation coefficient of CAC indexes between

Korean exports to the EC and to the EFTA has been higher than that between exports to the EC and to other countries with about a 0.6-0.7 difference since 1978. The estimated coefficients for the EC-U.S. has declined in early years but has increased gradually since 1986. The correlation coefficients estimated for EC-Japan and EC-ASEAN were negative. In particular, the negative trend of the EC-Japan coefficient has gradually increased since 1982. This means that the Korean export structure toward Western countries, such as the EC and the U.S., has continuously changed from labour-intensive industries to capital- and technology-intensive industries, while to Japan and ASEAN, it has remained constant.

〈Table 2〉 Spearman Rank Correlation Coefficient Between the CAC index of Each Country

	EC-EFTA	EC-US	EC-JAPAN	EC-ASEAN
1978	0.686	0.507	-0.242	-0.354
1979	0.615	0.486	-0.269	-0.272
1980	0.648	0.368	-0.205	-0.303
1981	0.758	0.366	-0.126	-0.332
1982	0.771	0.502	0.005	-0.438
1983	0.749	0.475	0.015	-0.188
1984	0.610	0.319	-0.177	-0.206
1985	0.576	0.293	-0.129	0.019
1986	0.648	0.197	-0.145	-0.018
1987	0.728	0.387	-0.358	-0.123
1988	0.739	0.447	-0.469	-0.120
1989	0.745	0.438	-0.402	-0.176
1990	0.742	0.361	-0.427	-0.168
1991	0.664	0.416	-0.420	-0.246

Ⅲ. Factor Endowment and Korea's Comparative Advantage

With the emergence and wide acceptance of the neo-technological hypothesis, neo-factor proportionists have continued to emphasize the significance of labour and capital over technological factors in explaining trade flow. Capital is divided into physical and human capital, for which the latter substitutes for those technological factors. The neo-technological hypothesis emphasizes the role of technological changes, the product cycle and economies of scale in determining the pattern of comparative advantage. The neo-factor proportion hypothesis combines human capital with physical capital and relates the sum of these two factors to labour.[4)]

Lary (1968, p.196) first divided capital intensity into physical and human capital intensity in terms of flow measures as follows:

$$K_i^f = Vai = P_i^f + h_i^f = (Vai - Wi) + Wi = (Vai - Wi) + \{(Wi - W_i^u) + W_i^u\} \cdots\cdots (2)$$

Ki^f and Vai refer to the flow measure of capital intensity and value

4) Hufbauer(1970) was the first to introduce the distinction between neo-factor proportions and the neo-technological explanations of comparative advantage. The former was introduced in many studies, e.g. Brecher & Choudhri(1984), Herman(1975), Heller(1976), Leamer(1992, pp.15-20). The latter was emphasized by Gruber and Vernon(1970), Goodman & Ceyhun(1976), Soete(1981) and Owen(1983).

added per man, respectively, and p_I^f and h_I^f refer to physical and human capital intensity. W_I and W_I^u are average wages and unskilled wages, respectively. Namely, the non-wage value added per man, Vai-Wi, is taken to represent physical capital, while the skilled wage value-added per man after discounting the portion of unskilled wages from total wages is taken to represent human capital intensity.[5)]

Following Lary's introduction of physical and human capital, many studies have tried to examine the explanatory power of the neo-factor proportion hypothesis for international trade flow. While many studies (e.g. Branson & Junz, 1971, Baruh, 1986) have attempted to investigate the correlation between factor proportion and net-exports, Balassa (1977) used the RCA index as a measure of comparative advantage. Many authors(e.g. Kojima 1970, Lary 1968) have found that the factor proportion hypothesis is valid, especially for trade between developed and developing countries.

However, human capital intensity is normally measured by the wage value-added per man under the assumption that wage rates for unskilled labour are the same across all industries, due to the difficulty in calculating them for individual industries. More seriously, because wages are determined by the quality of labour, as well as other factors including the power

5) Until now, no unique method to measure capital intensities has been determined. The flow measure that is value-added per man, instead of capital stock, could be a powerful measure of capital intensity. However, Balassa (1977, p.17) investigated that the flow and the flow measures of capital intensity are highly correlated with a Spearman rank correlation coefficient of 0.956.

of labour unions, wage levels could be considered as production costs rather than capital.[6)]

To identify the differences between the neo-factor proportionist and neo-technologist view point, this study estimated various factor intensities in 81 Korean export industries in 1983 and 1988.[7)] First, to be consistent with Lary in his flow measurement of capital intensity, we measured wage compensation in value-added per man as human capital intensity and kept a portion of value-added per man (Va) as capital intensity.[8)] Secondly, two types of labour intensities were calculated in terms of Va and a portion of wages in Va. Therefore, if an industry has a small amount of Va or its share of wages in Va is large, this industry could be assumed to be a labour-intensive industry. Finally, we also calculated technology intensity in terms of R&D cost per man, which includes the cost of researchers, equipment, and imported technologies.[9)]

As shown in Table 3, Spearman rank correlation coefficients

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6) For instance, mainly due to a strengthening of labour unions, Korea's nominal wages have increased an average of 20.42% in comparison to a 13.54% increase in labour productivity during 1988-91. Source, Korea Bank, 1992, 'Monthly Statistics,' December.

7) The data for all factor intensities were obtained from the Industrial Census(Volume Ⅰ & Ⅱ) of the Economic Planning Board of Korea, which has been published every 5 years since 1985.

8) The Korean Industrial Census defines value-added as the value of production reduced by direct production costs, such as material and energy costs. However, we calculated value-added using the same method but added to it depreciation value, and advertisement and research expenses, which are among the many indirect production costs.

9) There are also different suggestions for measuring technology intensity. For instance, R&D expenditure performs best in the Branson and Junz (1971) study, whereas Baldwin (1971) finds the number of engineers and scientists to be the most important explanatory factor.

〈Table 3〉 Spearman Rank Correlation Coefficients Between Factor Intensities.

	L_1	L_2	P_C	H	T
L_1	1	0.919	-0.965	-0.865	-0.606
L_2	*	1	-0.919	-0.631	-0.528
P_C	*	*	1	0.764	0.551
H	*	*	*	1	0.539
T	*	*	*	*	1

Note: L_1) labour intensity measured by reverse rank of value-added per man(1/vai).
L_2) labour intensity measured by share of wages in value-added per man.
P_C) physical capital intensity. H) human capital intensity. T) technology intensity.

between each factor intensity are different. First of all, the estimated correlations of the two different labour intensities with physical capital intensities are negatively high at -0.97 and -0.92, respectively. Thus, high physical capital-intensive industries correspond to low labour-intensity industries.

In particular, the correlation between physical and human capital intensity is higher at 0.764 in comparison to those of technology intensity with physical and human capital intensity at 0.551 and 0.539, respectively. From these results, it is uncertain whether or not human capital can substitute for the technology factor in explaining international trade flows, as neo-factor proportionists purport. Moreover, if human capital is used together with physical capital intensity as an independent variable, the problem of multicollinearity would be serious.

Based on the aforementioned correlations between factor intensities, this study formulated the following equation (3) to analyze the sources of

Korea's comparative advantage in its various export markets :

$$\log CAC_{EI} = \alpha + \beta^{p}\log Pi + \beta^{t}\log Ti + \beta^{d}Di \cdots\cdots\cdots\cdots\cdots\cdots (3)$$

where CAC_{EI} refers to the CAC index of commodity i exported from Korea to country E (e.g. the EC), and P and T are physical capital and technology intensity, respectively. D is a dummy variable, which assigns 1 for 14 natural resource-intensive industries (e. g. fishery products and cement) and 0 for other industries. Because of the importance of natural resources as a production factor, they are included in our analysis.

β^{p} or β^{t} can be interpreted as CAC index elasticity with respect to physical capital and technology intensity. A positive(negative) value of β^{p} or β^{t} means that the higher(lower) the physical or capital intensity of the industries is the higher(lower) the CAC index of the industry. The positive(negative) value of β^{d} implies that the resource-intensive industry has a higher(lower) CAC index than other industries, given the same physical capital and technology intensity.

As an example, the regression results for Korean exports to the EC in 1988 are:

$$\log CAC_{E}88 = 3.847 - 0.676\log P + 0.291\log T - 1.430D \cdots\cdots (4)$$

$$(1.870) \quad (2.484) \qquad (1.901) \qquad (3.239)$$

$$R^2 = 0.242$$

$$F = 7.879$$

In the equation, the t-values in parentheses are significant at the 5% level. The coefficient of the multiple correlation is not lower as we can generally see from the cross-section study. F-statistics are high enough to reject the hypothesis that all the coefficients are zero. More importantly, the coefficients for physical and natural resource intensity are negative, while the coefficient for technology intensity is positive. Labor intensity is not explicitly included in the regression estimation. Yet, as we mentioned above, an industry with low physical capital intensity can be identified as a high labor-intensive industry.[10)]

This means that, in comparison with its other export markets, Korea has a lower comparative advantage in physical capital and natural resource-intensive exports to the EC. At the same time, Korea has a high comparative advantage in labour, as well as in technology-intensive industries, even though its comparative advantage in technology intensive-industries had been lower than those in labor-intensive industries until 1988.

10) In fact, if labour intensity rather than physical capital intensity is implied, the coefficients of labour intensity(L) would be highly positive, while other coefficients would be quite similar to the results in equation(3), as follows:

$$\log CAC_{88} = 5.622 + 0.843 \log L + 0.342 \log T - 1.596D$$
$$(1.985) \quad (2.434) \quad (2.153) \quad (3.714)$$

$R^2 = 0.272$

$F = 11.476$

Ⅳ. Dynamic Changes in Korea's Comparative Advantage

Since economic development in both exporting and importing countries should be accompanied by changes in the factors of comparative advantage, the coefficients in regression (3) should change predictably over time. Therefore, the dynamic changes in comparative advantage in different Korean export markets during 1983-88 should be investigated. However, in order to apply the average factor intensity between the two years (1983 and 88), it is necessary to assume that the relative ranking order for each factor intensity does not change noticeably over time as determined by Lee (1986).

The estimated results are illustrated in Table 4. First, β^p coefficients are the highest and are statistically significant in exports to ASEAN during the years examined, while those to Japan are relatively low and insignificantly different from zero in the early period but significantly different from zero in the latter period of the sample. However, those in the EC, the U.S., and EFTA all show negative signs and are generally significant. In particular, among these countries, the negative sign of β^p coefficients in Korean exports to the U.S. are the highest and most significant during all of the sample years.

These results imply that Korea has the highest comparative advantage for physical capital in the ASEAN market, less of an advantage in Japan, and even less of an advantage in the EC, the U.S., and EFTA. From the

〈Table 4〉 Regression Equation Estimates 1978~1991

	β^p					β^x					Dummy					R^2				
	EC	US	JAPAN	EFTA	ASEAN	EC	US	JAPAN	EFTA	ASEAN	EC	US	JAPAN	EFTA	ASEAN	EC	US	JAPAN	EFTA	ASEAN
1978-80	-0.162	-0.496	0.125	-0.585	0.740	-0.225	0.163	-0.200	0.001	0.207	-1.111	-1.107	0.290	-1.673	-0.194	0.162	0.139	0.061	0.157	0.153
	(-0.648)	(-1.744)***	(0.641)	(-1.653)***	(2.202)**	(-1.602)***	(1.013)	(-1.780)**	(0.004)	(1.082)	(-2.638)*	(-2.450)**	(0.894)	(-2.512)**	(-0.344)					
1981-83	-0.227	-0.410	0.119	-0.950	0.697	-0.138	0.104	-0.156	-0.013	0.264	-1.104	-0.930	0.318	-3.211	0.252	0.110	0.130	0.041	0.321	0.203
	(-0.779)	(-1.667)***	(0.571)	(-2.303)**	(2.350)**	(-0.837)	(0.750)	(-1.296)***	(-0.054)	(1.575)****	(-2.392)**	(-2.379)**	(0.920)	(-4.273)*	(0.535)					
1984-86	-0.284	-0.447	0.978	-0.372	0.838	0.071	0.127	-0.252	-0.132	0.191	-1.070	-0.869	0.632	-1.234	-0.369	0.106	0.196	0.130	0.129	0.206
	(-1.097)	(-2.297)**	(0.499)	(-1.219)	(2.793)*	(0.476)	(1.168)	(-2.222)**	(-0.737)	(1.126)	(-2.423)**	(-2.839)*	(1.935)***	(-2.165)**	(-0.775)					
1987	-0.519	-0.850	0.381	-0.672	0.914	0.273	0.298	-0.343	0.173	0.099	-1.478	-0.460	0.699	-1.349	-0.565	0.196	0.143	0.243	0.124	0.232
	(-1.718)***	(-2.294)*	(2.265)**	(-1.854)***	(3.343)*	(1.611)***	(1.857)***	(-3.525)*	(0.820)	(0.639)	(-3.105)*	(-1.021)	(2.497)**	(-2.060)**	(-1.270)****					
1988	-0.676	-1.012	0.478	-0.673	0.919	0.291	0.417	-0.399	0.146	0.258	-1.430	-0.426	0.589	-0.567	-0.673	0.242	0.233	0.241	0.091	0.299
	(-2.484)**	(-4.221)*	(2.668)**	(-2.083)**	(3.324)*	(1.901)***	(3.000)*	(-3.845)*	(0.767)	(1.653)***	(-3.239)*	(-1.059)	(1.975)***	(-0.932)	(-1.533)****					
1989	-0.652	-1.080	0.266	-0.574	0.598	0.318	0.491	-0.268	0.257	0.329	-1.243	-0.317	0.624	-1.637	-0.223	0.196	0.246	0.182	0.183	0.256
	(-2.305)*	(-4.407)*	(1.618)***	(-1.868)***	(2.483)**	(1.981)**	(3.461)*	(-2.814)*	(1.469)****	(2.359)**	(-2.690)*	(-0.777)	(2.278)*	(-2.806)*	(-0.555)					
1990	-0.845	-0.887	0.285	-0.664	0.667	0.479	0.416	-0.362	0.408	0.123	-0.782	-0.562	0.790	-0.598	-0.486	0.157	0.270	0.256	0.125	0.181
	(-2.584)*	(-4.287)*	(1.649)***	(-2.285)**	(2.774)*	(2.585)*	(3.473)*	(-3.617)*	(2.390)**	(0.887)	(-1.463)****	(-1.629)***	(2.744)*	(-0.965)	(-1.215)					
1991	-0.765	-0.933	0.130	-0.480	0.480	0.490	0.375	-0.358	0.177	0.172	-1.292	-0.728	0.940	-0.409	-0.460	0.281	0.274	0.270	0.061	0.153
	(-2.969)*	(-4.267)*	(0.717)	(-1.795)***	(2.100)**	(3.288)*	(2.963)*	(-3.409)*	(1.107)	(1.290)****	(3.651)	(-2.000)*	(3.118)*	(-0.767)	(-1.173)					

Note : Regression coefficients that are significant at the 1% level have been denoted by *, those significant at the 5% level by **, those significant at the 10% level by ***, and those significant at the 20% level by ****.

inverse relationship between physical capital and labour intensity, these regression results also imply that Korea has the lowest comparative advantage for labour intensive-products in ASEAN, while it has a relatively high comparative advantage for such products in the EC, the U. S. and the EFTA market.

The β^t coefficients in exports to the EC and the U.S. have, in general, risen over time. The coefficients representing the EC were negative and low compared to those of the U.S, but gradually increased to show significantly positive values after 1987. Korea has rapidly increased technology-intensive exports to the EC, even in comparison with the U.S. Meanwhile, the figures representing EFTA show the same trend, but the coefficients are still lower and somewhat significant even in late periods. The coefficients for ASEAN are consistently positive, but there is no increasing trend, and they are generally insignificant during the entire period. However, from the results that show Japan's figures to be consistently negative and significant, Korea had maintained a relatively low comparative advantage in technology-intensive industries in the Japanese market until 1991.

With the exception of Korean exports to Japan, the coefficients of natural resource-intensive industries' dummy varriables, β^d, are all negative and generally significant during all periods of the sample. This means that Korea's comparative advantage for resource-intensive exports had been highest in the Japanese market until 1991.

From the aforementioned results, 3 different markets for Korean exports can be devised. First, Korea has maintained its high comparative

advantage for labour-intensive products in Western countries. Meanwhile, Korea has rapidly increased its comparative advantage for technology-intensive exports in these markets, especially in the EC market, even though it had continued to be lower in comparison to labour-intensive products until 1991. However, Korea has a relatively lower comparative advantage in physical capital and resource-intensive exports in these markets.

Second, in the Japanese market, Korea has a high comparative advantage in resource-intensive industries and also has held a positive position in physical capital-intensive industries since the middle of the 1980's, while maintaining a lower comparative advantage for technology-intensive industries. This means that Korea has no comparative advantage in technology-intensive, as well as labor-intensive industries, in its exports to Japan. Such an export structure may have been the major cause for Korea's increased trade deficit with Japan since the early 1960's. Third, unlike its exports to developed countries, Korea has maintained an high comparative advantage for physical capital-intensive products in the ASEAN market. Such a trade pattern is manifested by exports from developed to developing countries, which has often been investigated by the neo-factor proportionists. However, since the mid-80's, Korea has had an higher comparative advantage in technology-intensive industries in Western countries than in developing countries, such as ASEAN. This fact cannot be explained by neo-factor proportionists, nor by other international trade theories. This is because most theoretical literature in

international trade concentrates on production and often uses assumptions that neutralize demand as a determinant for the composition of trade.

However, such differing patterns of Korea's comparative advantage in each export market may be interpreted to mean that a country's composition of trade is determined by factor endowments, as well as by the demand of importing countries. For instance, Korea has an higher comparative advantage in technology-intensive industries in the EC market than those in the ASEAN market mainly because there is less likely to be demand for these products in the latter's market. This investigation partially supports the Linder Hypotheses, which claims that "differences in tastes are a deterrent to trade because of the cost of tailoring a product to fit local conditions."

Ⅴ. The Role of the EC in Korea's Export Industries

A major purpose of the economic integration theory is to construct hypothetical estimates of what trade flow would have been in the absence of integration and compare it to the actual flow. One example is the income elasticity approach of Balassa (1975), which analyzes the changes in income elasticities of import demand for the extra-regional supplier assuming that those would have remained unchanged in the absence of integration. Another example, the Normalized Share Approach, analyzes changes in import market shares assuming that changes occur at the same

rate, as in the third market, had regional economic integration not occurred.[11)]

Differing from previous studies, this paper attempts to estimate the effects of EC integration on the dynamic changes in Korea's export structure using regression analysis. Namely, as equation (5) shows, the CAC index for Korea's exports to 3 Western markets regresses in terms of physical capital and technology intensities. In addition, a dummy variable, which assigns 1 for the EC and 0 for the U.S. and the largest EFTA countries (Austria, Switzerland, Sweden), is used. This is because by including other Korean trading patterns such as Japan and ASEAN, which have extremely different market structures and geographical locations from the EC, the effect of EC integration will be inappropriately estimated. Since many Korean export items have not been exported to small EFTA countries, only 3 EFTA countries have been included in these estimates. Additionally, 14 resource-intensive industries among the 81 export items have been excluded because of their insignificance as exports from Korea to Western countries.

$$\log CAC_{wi} = \alpha + \beta^{p} \log P_i + \beta^{t} \log Ti + \beta^{e} D_{ECi} \cdots\cdots\cdots\cdots\cdots\cdots (5)$$

CAC_{wi} refers to the CAC index for Korea's export of commodity i to Western countries, including the EC, the U.S and 3 EFTA countries.

11) This approach, pioneered by Lamfalussy(1963), has been refined by Williamson(1971).

D_{ECi} is a dummy variable for Korea's export of commodity i to the EC. β^e will, therefore, appear positive (negative) if the EC market influences Korean exports positively (negatively) in comparison to other countries, even though it has the same factor intensities.

The estimated results of equation (5) for the period of 1978-91 are shown in Table 5. The β^p and P^t coefficients are obviously the same across Western countries. They are continuously negative for β^p and vacillate from negative to positive for β^t. The β^e coefficients of the dummy variables continuously show positive signs and are significantly different

〈Table 5〉 Regression Results for the Role of EC Integration 1978-91.

	β^p	β^t	β^e	Intercept	R^2	F
1978-80	-0.058	-0.167	0.280	0.290	0.028	5.830*
	(-0.508)	(-2.597)*	(2.090)**	(0.849)		
1981-83	-0.124	-0.166	0.130	0.980	0.028	5.970*
	(-1.077)	(-2.525)**	(0.956)	(1.133)		
1984-86	-0.103	-0.085	0.300	0.393	0.019	4.006*
	(-0.944)	(-1.362)****	(2.325)**	(0.478)		
1987	-0.552	0.062	0.569	3.247	0.069	15.427*
	(-4.808)*	(0.928)	(4.131)*	(3.761)*		
1988	-0.502	0.144	0.424	2.445	0.046	9.903*
	(-4.416)*	(2.208)**	(3.165)*	(2.867)*		
1989	-0.489	0.152	0.533	2.206	0.049	10.692*
	(-4.149)*	(2.236)**	(3.833)*	(2.494)**		
1990	-0.486	0.227	0.491	1.754	0.044	9.669*
	(-4.004)*	(3.238)*	(3.433)*	(1.922)***		
1991	-0.504	0.216	0.306	2.175	0.038	8.305*
	(-4.403)*	(3.269)*	(2.249)**	(2.515)*		

from zero, except during the recession period of 1981-83. Therefore, it is clear that the EC market has had a positive influence on Korean export industries.

To analyze the different effects of each EC member country on Korean exports, dummy variables, which assign 1 to Korean exports and 6 to EC countries were added to equation (6) below.

$$\log CAC_{wi} = \alpha + \beta^{p} \log P_i + \beta^{t} \log T_i + \beta^{b} D_{Bi} + \beta^{d} D_{Di} + \beta^{f} D_{Fi} + \beta^{i} D_{Ii} + \beta^{n} D_{NEi} + \beta^{u} D_{UKi} + \beta^{e} D_{ECi} \cdots\cdots\cdots\cdots (6)$$

The variables can be explained as follows: B(Belgium and Luxembourg), D(West Germany), F(France), I(Italy), UK, NE(Netherland), and the other variables are the same as in equation(4). Therefore, if the dummy variable of each individual EC country shows a positive (negative) effect, then that country will positively (negatively) affect Korean exports in comparison to its other trade partners, which have similar industrial structures.

The estimates of the equation for each year from 1978 to 91 are shown in Table 6. The trends of the β^{p}, β^{t}, and β^{e} coefficients are generally the same as the results from Table 4, except that β^{e} for the period from 1984-86 is insignificant. At the same time, the β^{d} and β^{i} coefficients are generally positive and significantly different from zero during the entire sample period. Meanwhile, the β^{b} and β^{u} coefficients are positive and significant following the mid-1980's. However, the β^{f} and β^{n} coefficients

〈Table 6〉 Regression Estimates for the Role of Individual EC Countries 1978~91

	β^{p}	β^{t}	β^{b}	β^{d}	β^{f}	β^{l}	β^{ne}	β^{u}	β^{e}	**Intercept**	R^2	**F**
1978-80	-0.072	-0.157	0.262	0.202	0.202	0.183	0.037	0.233	0.408	0.464	0.025	2.488*
	(-0.738)	(-2.800)*	(1.136)	(0.886)	(0.899)	(0.793)	(0.162)	(1.030)	(1.829)**	(0.637)		
1981-83	-0.253	-0.103	0.228	0.145	0.204	0.360	0.104	-0.175	0.126	1.790	0.029	3.135*
	(-2.505)**	(-1.787)***	(0.952)	(0.604)	(0.849)	(1.504)****	(0.433)	(-0.743)	(0.540)	(2.371)**		
1984-86	-0.197	-0.049	0.270	0.063	0.413	0.300	0.149	0.045	0.210	1.135	0.017	1.826***
	(-2.027)**	(-0.880)	(1.160)	(0.272)	(1.786)***	(1.300)****	(0.647)	(0.193)	(0.927)	(1.558)****		
1987	-0.474	0.053	0.392	0.189	0.394	1.508	0.278	0.213	0.412	2.872	0.039	4.240*
	(-4.855)*	(0.932)	(1.662)***	(0.810)	(1.667)***	(1.508)****	(1.184)	(0.906)	(1.780)***	(3.935)*		
1988	-0.504	0.110	0.415	0.250	0.454	1.602	0.216	0.433	0.538	2.711	0.044	4.628*
	(-5.168)*	(1.975)**	(1.781)***	(1.128)	(2.022)**	(1.602)***	(0.974)	(1.941)**	(2.461)**	(3.734)*		
1989	-0.448	0.127	0.476	0.231	0.401	1.127	0.093	0.415	0.542	2.195	0.035*	3.814*
	(-4.618)*	(2.274)**	(2.041)**	(1.021)	(1.771)***	(1.127)	(0.410)	(1.831)***	(2.442)**	(3.035)		
1990	-0.474	0.211	0.579	0.241	0.473	0.290	-0.017	0.304	0.440	1.905	0.036	4.005*
	(-4.750)*	(3.658)*	(2.409)**	(1.030)	(2.009)**	(1.233)	(-0.072)	(1.310)****	(1.909)***	(2.560)*		
1991	-0.471	0.206	0.571	0.146	0.572	2.101	-0.057	0.289	0.589	1.905	0.046	5.265*
	(-5.132)*	(3.857)*	(2.526)*	(0.668)	(2.570)*	(2.101)**	(-0.259)	(1.324)****	(2.701)*	(2.766)*		

Note : See Table 4 below.

are insignificantly-positive during the same period.

From these estimates, Germany, Italy, Belgium and UK can be said to have positively influenced Korea's comparative advantage in comparison to France or the Netherlands. Meanwhile, with the exception of the recession period during the early 1980's, total EC markets combined positively affected Korea's export industries until 1991.

Ⅵ. Concluding Remarks

This study has examined the changes in Korea's export structure and the effects of the EC's integration process on Korea's exports during 1978-1991. Comparative advantage has been measured by the CAC (Comparative Advantage by Country) index. Concerning the problems of the neo-factor proportion theory, a regression equation which relates the CAC index to physical capital and technology intensity, as well as natural resource intensity, has been formulated and estimated. Results of the regression analysis confirm the general belief that the most significant factor influencing trade flow is the characteristics of each export market.

Three areas are of dynamic importance for Korea's comparative advantage: Western countries (the EC, the U.S, and EFTA), Japan as another advanced country, and ASEAN as a developing group. In Western countries, Korea has maintained a higher comparative advantage in labour-intensive industries, though not in physical capital- and resource-intensive industries. One important investigation of this study

found that Korea's comparative advantage had improved in technology-intensive industries in Western countries, especially in the EC market. Meanwhile, its comparative advantage for other factor-intensive industries has changed relatively little since the end of the 1970s.

Although Japan is also an industrially-advanced country like the U.S. or the EC, Korea has not exported commodities which require a high level of technology intensity to Japan. Korea has only maintained a very high comparative advantage in resource-intensive industries in Japan, while it has had less of an advantage in physical capital-intensive industries. This means that, in comparison to Western countries, Korea has a lower comparative advantage in labour, as well as in technology-intensive industries.

In the ASEAN market, Korea has maintained the highest comparative advantage in physical capital industries during the period of this study. This is a general trading pattern for exports from developed to developing countries, which has often been investigated by neo-factor proportionists. Yet, Korea has less of a comparative advantage in technology-intensive industries when compared with Western countries, while it has no advantage in resource-intensive industries. This fact may be interpreted to mean that the composition of trade is determined by factor endowments, as well as by demand factors.

To estimate the effects of EC integration, this study has applied a regression analysis using comparative advantage, which differs from other studies. The results of the regression confirm our general belief that, except

during the period of economic recession in the early 1980's, the EC has positively influenced Korean export industries since the end of the 1970's Among the EC member states, Germany and Italy have generally been a positive influence over the years, while Belgium and the UK have been a positive influence since the end of the 1980's. However, there is no evidence of EC countries having a positive effect on Korean exports.

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