COMPETITIVENESS, TECHNICAL PROGRESS AND CHANGES IN THE STRUCTURE OF MANUFACTURED EXPORTS IN BRAZIL AND SOUTH KOREA: 1968-1987

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Resumo: *O trabalho examina as mudanças na estrutura das exportações de manufaturados, no Brasil e na Coréia do Sul, e comenta sobre o padrão de competitividade e a evolução das vantagens comparativas das exportações de produtos manufaturados tradicionais e de novos. Pela diferenciação de fatores, de acordo com a extensão (volume) de insumos, o artigo tenta examinar a habilidade das duas economias em se diversificar, nos setores de tecnologia intensiva. Também avalia o desempenho global da exportação dos produtos manufaturados.*

Palavras-chave: *Competitividade Industrial; Produtos Manufaturados; Desenvolvimento Industrial; Industrialização; Exportação; Desenvolvimento Econômico; Política Econômica; Economia Sul-coreana; Economia Brasileira.*

1 INTRODUCTION

This paper examines changes in the structure of manufactured exports in Brazil and Korea and observes the pattern of competitiveness and the evolution of revealed comparative advantage in traditional manufacturing exports and new manufacturing exports. By differentiating sectors according to input contents, the paper tries to examine the ability of the two economies to diversify into technology intensive sectors. It also assesses the overall performance of manufactured exports.

The paper is organized as follows. SECTION 2 reviews very briefly the structural changes which the industries of Brazil and Korea underwent prior to the phase of export promotion and during it. Sections 3 and 4 examine the changes in the structure of manufacturing exports of the two countries, using several devices: SECTION 3 looks at changes in commodity composition, while SECTION 4 measures the revealed comparative advantage of these industries. We conclude the paper in SECTION 6.

2 EVOLUTION OF INDUSTRIAL STRUCTURE

The evolution of industrial structure is usually explained by a combination of factors. Changing income levels and the consequent increase in internal demand, import substitution, the role of foreign investment and export promotion policies are some of the elements which influence structural changes. This section has no intention of discussing the determinants of industrial structure in Korea or Brazil; rather, it simply recognizes the relationship between industrial structure and export patterns and briefly describes the evolution of the former in the two cases*.

2.1 BRAZIL

Industrialization in Brazil is a phenomenon which precedes the turn of the century. The first three decades of this century saw a rapid expansion of industry, although during this period coffee was still the most important economic activity. The great depression of 1929 led to the collapse of the

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* The determinants of the evolution of the industrial structure in Korea has been discussed in KOO (1985)[19] and WESTPHAL (1979)[35], for instance. For an analysis of the Brazilian industrial structure, see for example LOCATELLI (1985)[23], BAER, FONSECA and GUILHOTO (1987)[4] and BRAGA (1988)[10].

coffee economy and to an expansion of the industrial structure. As can be seen in TABLE 2.1, by 1939 the industrial structure was, although concentrated in consumer goods such as textiles (21.8% of value added) and food (23.3%), already quite diversified. Metal products were responsible for 7.5% of the total value added in that year, while non-metallic products, electrical equipment and chemicals accounted for 5.3%, 5.4% and 6.6%, respectively. By 1939, the share of manufacturing in the GDP was 19.2% (FUNDAÇÃO IBGE, 1990, p. 386)[16], against 25.8% in agriculture; by 1957 manufacturing had overtaken agriculture, with 24.2% against 22.8% (IBGE, p. 386[16] and BAER, 1989, p.68)[2]. The shares of agriculture and manufactures can be seen in TABLE 2.4.

The postwar took the economy further into industrialization. The country came out of the war with an excess supply of foreign reserves, on the one hand, and a repressed demand for final and capital goods, on the other hand. This, coupled with an undesirably high inflation, motivated the government to adopt an overvalued exchange rate policy to solve the balance of payments problem. The parity was maintained at prewar levels until 1953, although the fast elimination of the surplus of foreign exchange indicated that some type of exchange control was needed. The government realized that, and by 1947 an exchange control system was introduced with 5 categories of priorities, which intended to offset the effects of the overvalued exchange rate on the balance of payments. An increasingly selective system of import control was established, and by 1957 a multiple exchange rate system was implemented. The exchange rate policy was the seed of the explicit import substitution industrialization strategy which the government followed after the war. By the mid 1950s the nature of exchange controls favouring specific industrial sectors, as well as the introduction of complementary measures of the infant-industry type, the explicit bias favouring direct foreign investment, the direct involvement of the government in economic activites (PETROBRAS, the State owned oil company; BNDES, the financial institution which financed investments in infrastructure and in base industries; and the regional developmental agency SUDENE, aimed at promoting industrialization in the Northeast, are examples of this involvement) and an expansionary fiscal policy clearly indicate an explicit intention to industrialize.

During this period, Brazil engaged enthusiastically in the wave of developmentalism which dominated Latin America and many other developing areas. As briefly told above, a strong presence of the State and a combination of domestic and foreign private capital have contributed to final

and intermediate goods industries blossoming everywhere. The instruments of this strategy created a bias against exports, which began to be remedied in the last years of the Goulart regime. Thus, in late 1963 special exchange rates were introduced to favour exports, in an attempt to attract the much needed exchange reserves*.

The early sixties were a period of economic and political instability in Brazil, culminating with the military coup of 1964. By 1968, however, the economy resumed growth again: the beginning of what was to be the period of highest growth rates ever to be experienced in the Brazilian history Industry underwent a second phase of import substitution, in which the capital goods sector expanded considerably. Between 1967 and 1973, manufacturing industry grew at an average annual rate of 11.7%, while machinery, electrical and communication products grew at the higher annual rates of 17.1%, 15.8% and 21.2%, respectively. It has been estimated that the capital goods industry grew at an average annual rate of 18.1% and that the intermediate goods industry grew at a 13.5% average annual rate and that, most impressively, the durable consumer goods industry grew at 23.6% annually, on average, throughout the same period of 1967-1973**.

TABLE 2.1 also makes clear the relative importance gained by the chemicals industry, and shows the expected decline of the relative importance of textiles and food. The degree of aggregation of the data provided in the table does not allow a thorough examination of the industrial transformation within these sectors, which was, no doubt, very significant. It does, however, serve as a clear indication that Brazil has experienced industrial expansion from a very early stage, which led to a relatively high degree of diversification throughout various manufacturing segments.

2.2 KOREA

The early industrial development of Korea took place during the colonial period, when North and South were still one country. As illustrated in tables 2.2 and 2.3, some manufacturing activities already existed by 1912 (6% of gross output value), although the economy was clearly dominated by

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* For excellent reviews of the evolution of industrialization and the various industrial policies adopted, see WINPENNY (1972)[17], BAER (1989)[2], SUZIGAN (1990)[33] and MOREIRA (1993)[24].
** These figures are from FUNDAÇÃO IBGE Estatísticas Históricas do Brasil, pp. 359-60[16] and BONELLI, R. and WERNECK, D. (1978)[8].

agricultural activities, which in that year were responsible for 85% of the total gross output value. Moreover, by 1936 34% of the total output in the economy consisted in manufacturing. The diversification within the manufacturing industry was considerable. While by 1911 food products represented 51% of the total output value, and chemical products, for instance, only represented 2%, by 1939 these shares had changed to 22% for food products and 33% for chemicals. Other sectors had also been developed by 1939: metal products accounted for 9% of the total output value, machinery 4% and non-metallic mineral products 3%.

At the level of aggregation available and given the difference in the sources of data, it is difficult to establish exactly how the Korean and Brazilian manufacturing industries compared at that time. It is certain, however, that both economies have been experiencing some development in manufacturing since the turn of the century. Both had in common the complete dominance of textiles and food production in the first few decades*. In 1939, 45.1% of the manufacturing gross value added of Brazil consisted of textiles and food production, and in Korea 35% of the total manufacturing output consisted of food and textiles production in that year. While Korea appears to have developed its chemical sectors quite early, the diversification of the Brazilian manufacturing industries as a whole seems to have been greater in the first decades than the Korean.

The Korean War of 1950-1953 brought about significant consequences for the whole industrial structure of what became known as South Korea. During the Japanese domination, when the first industries were created, their geographical distribution had been such that while the heavy industries concentrated in the North, the South was left with the light industries such as textiles and food manufacturing. Extended infrastructure had also been developed in the North, in part because electric power resources and mineral deposits were located there. Thus, when the war ended in 1953 and the country was divided along the 38th parallel, South Korea retained a much smaller portion of the industrial infrastructure than the North. Moreover, the considerable destruction during the war meant that the country was not left with much. Nevertheless, the process of reconstruction was fast.

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* This is a typical feature of industries developing through import substitution. These are the first markets to be developed in primary exporting economies and are, consequently, one of the first to develop scales for domestic production.

By 1953, South Korean GNP was composed as follows: 46% in the agricultural sector, 43% in services, 6% in manufacturing and 2% in social overhead sectors. But the fifties saw a decrease in agriculture and the fast growth of the industrial sector, which reflected the socio-economic restructuring following the end of Japanese colonization and consequent structural changes such as the land reform. It was a decade of weak growth rates, economic instability and eventual stagnation towards the end of the decade. Still, the country began a period of reconstruction, import substitution and industrialization of non-durable consumer goods, which was largely financed by foreign aid and loans, and promoted by a network of tariffs and quotas.

While the late fifties were characterized by import substitution in non-durable consumer goods, the sixties combined export promotion of labour-intensive manufactures with further import substitution in sectors such as cement, fertilizers, refined petroleum, textile yarn and fabrics.

The 1970s continued the export promotion strategy, while industrial expansion targeted skilled labour and technology intensive production and exports, when the country began to show some comparative advantage. A secondary phase of import substitution also took place in the 1970s, in selected heavy and chemical industries*.

According to a study by FUJITA and JAMES (1989)[15], the heavy industrialization of Korea in the 1970s was as strongly induced by export promotion as it was by import substitution. They calculated an effect of import substitution on the output growth of heavy industries which represents over 60% of the total domestic final demand. Thus, the Korean industrial structure followed a path similar to that of Brazil, in the sense that import substitution occurred in two stages, and that the capital goods sectors were developed alongside export promotion in the consumer goods and some intermediate sectors**.

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* PARK (1981)[26] argues that the traditional comparative advantage which Korea had developed in unskilled labour-intensive sectors was being lost, first because of rapid increases in real wages, secondly because of the increasing competition from other LCDs which had embarked in export-orientation, and finally because following the oil crisis widespread protectionist measures were imposed by developed countries which affected mostly labour-intensive manufactures.

** OHNO and IMAOKA (1987)[23] call this import substitution export promotion industrialization path "dual-industry growth", which they discuss in detail.

It would be unreasonable to say that South Korea began from scratch in most industrial sectors. Although it may be true that much of the manufacturing industrial capacity was lost during the war, the effort of reconstruction was certainly much smaller than if the country had always been an agricultural society. Still, tables 2.4 and 2.5 show that the structural distribution of GDP in Brazil was much less modified between 1965 and 1990 than the Korean: while industry represented 33% of the total GDP of Brazil already by 1965, achieving 39% in 1990, in Korea the industrial share in GDP was 26% in 1965 and 45% in 1990. Manufacturing alone accounted for 26% of GDP in Brazil in 1965, and this share persisted in 1990. Manufacturing in Korea, on the other hand, represented 19% of GDP in 1965 and 31% in 1990. Table 2.5 further illustrates the speed of growth of the various productive sectors in Korea and Brazil: between 1965 and 1980, the growth rates of total GDP was 9% in Brazil, while its manufacturing sector grew by 9.8%; meanwhile, in Korea the total GDP growth rate was 9.5% but manufacturing was growing much faster, with a growth rate of 18.8%. The relative slow down in the eighties did not reverse this general tendency of the Korean manufacturing export expansion. Brazilian manufacturing grew less than total GDP (at a 1.7% rate of growth vis-à-vis the 2.7% overall rate of growth), while Korean manufacturing maintained a higher growth rate than the average in the productive sectors (12.7% and 9.7%, respectively).

3 CONTENT OF INPUTS

This section examines the changes in factor intensity in the exports of Brazil and Korea. Its main purpose is to establish the extent to which the two countries have been able to shift specialization towards exports in those sectors which require a greater input of skilled labour and intensive use of technologies.

Two devices are used to establish the relative specialization of Brazil and Korea in exports of manufactures which require qualified labour. SECTION 3.1 examines the relationship between the growth rate of exports in the various manufacturing sectors in Brazil and Korea and the growth rate of real wages in the respective manufacturing sectors. The test assumes that sectors which have undergone significant increases in their wage rates are those which have come to require more qualified labour, which is an extension of the logical assumption that more qualified labour is better paid than unqualified labour. Thus, the purpose of the test is to see whether the two countries have developed endogenous technological capabilities at the pace

necessary to keep up with international competition, or whether they have had to progressively specialize relatively more in those sectors which require less intensity of qualified labour.

In SECTION 3.2, an alternative method is applied to investigate the input contents of the manufactured exports in the two countries. Based on a classification used in BONTURI and LORD (1992)[9], SECTION 3.2 classifies the manufactured exports of Brazil and Korea according to input contents, contrasting their respective profiles at different points in time. The purpose of such analysis is to measure the degree of transformation which each country has undergone throughout the years and, specifically, how much each has been capable of specializing in sectors intensively in human capital and technology.

Unfortunately, this last analysis cannot account for the problem of changes in technological input within a same category of commodity, i.e., the fact that there are improvements in the technological content of a given product, say a television set or an item of agricultural machinery, is not reflected in the data. Nevertheless, to anticipate our findings, since our data for Korea points to very strong shifts in commodity composition measured at the aggregate level, and Brazil has almost no change, common sense suggests that it is unlikely that disaggregation would reveal shifts in composition which contradict our finding. A country experiencing strong improvements in technology within sectors would be most unlikely to reveal none across sectors.

3.1 RELATIONSHIP BETWEEN WAGE INCREASES AND EXPORT GROWTH

Two simple equations have been estimated to measure the direction of the relationship between the growth rate of wages and manufacturing export growth rate in each sector. The equation estimated for each country was of the following form:

$$x = \alpha_0 + \alpha_1 w + e$$

where:

x = the country's rate of export growth of each manufacturing sector;

w = the country's rate of growth of wages in each manufacturing sector;

α_0 and α_1 = coefficients;

e = the error term.

As said above, we use real wage levels as a proxy for degree of human capital intensity. This is a standard proxy.

3.1.1 Korea

We have run a regression for the model specified above using data for 17 manufacturing sectors for the years 1968 and 1984*. We applied a simple ordinary least squares estimation procedure, with correction for heteroskedasticity, according to the method proposed by White (1980). The results obtained from this regression were the following:

$$x_k = -0.06 + 7.98\ w_k$$
$$\text{(0.43)} \quad \text{(0.4 x 10-8)}$$

where:

x_k = the growth rate of Korean exports in each sector;

w_k = the growth rate of Korean wages in each sector.

Numbers in brackets below the coefficients are the p-values for the T-test of the null hypothesis that the coefficients are zero.

The results obtained indicate that there is a robust positive correlation between the growth rate of exports and the growth rate in sectoral average real wages. Assuming that those sectors which experienced higher growth rates of wages are those which have experienced higher growth rates of human capital intensity, the results obtained indicate that, between 1968 and 1984, the sectors in Korea which experienced higher export growth rates were also those which have become more human capital intensive. In other words, that Korea's comparative advantage has shifted in the analysed period to sectors more intensive in human capital.

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* The data used here is available from the author.

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3.1.2 Brazil

The same exercise was carried out for Brazil. In this case, the sample consisted of 18 sectors, and we have applied the same method described above. The results reached were the following:

$$x_b = 3.26 - 0.35\, w_b$$
$$(0.8 \times 10^{-0.4}) \qquad (0.91)$$

where:
$x_b =$ the growth rate of Brazilian exports in each sector;
$w_b =$ the growth rate of Brazilian wages in each sector.

Numbers in brackets below the coefficients are the p-values for the T-test of the null hypothesis that the coefficients are zero.

The results for the coefficients of "w_b" which is not significantly different from zero at standard significance level (5%), suggest that if there has been any change at all in the comparative advantage of Brazilian exports in relation to human capital intensity, it has been for more specialization in sectors which experienced less increase in human capital intensity. Thus, if there has been any shift in comparative advantage pattern with respect to human capital intensity, it has been in the direction of less human capital-intensive products.

These simple regression analyses raise a hypothesis which we shall carry further in the next sections: that Korea has been able to shift towards exports of more human capital-intensive sectors in a way that Brazil has not, despite their similarly diversified and mature industrial structures.

3.2 FACTOR INTENSITIES AND COMPETITIVENESS OF MANUFACTURED EXPORTS

A careful study by van DIJCK, in LINNEMAN (1987), on the structure of production and exports according to factor intensity has confirmed once again what many previous studies had been concluding about rankings of sectors according to factor intensity, which is that the choice of any classification is to some extent arbitrary. They all depend on the proxies used to represent factor intensities, the countries used in the sample, the sources of these data, the analysed period, the industrial classification adopted

and so on. Thus, the adequateness of this or that classification depends on the purpose for which it is intended and the constraints this poses. In our case, the following aspects must be taken into account:

a) the analysed period spans 1968 to 1987, and trade data from the United Nations, International Trade Statistics Yearbook[34], is not available under the same classification criteria for the whole period. The 3-digit classification has been expanded to account for the emergence of new types of activities, especially those in technology-intensive sectors, which have undergone significant changes in the past years. At a 2-digit level of classification, discrepancies are practically eliminated, since the re-aggregation occurs within the 2-digit limits by adding and changing 3-digit groups;

b) the study compares two countries and the performance of those with respect to each other and the rest of the world, the latter represented by an aggregate for the world market economies. In this case, a selected country-specific set of factor input coefficients will be more arbitrary than a pool of coefficients for various countries;

c) the analyses developed in this paper are not sector-specific. Rather, the arguments are presented on the basis of the general trends of the aggregates. In this case, the one-by-one ranking is not particularly important, nor will a possibly misplaced sector lead to a misinterpretation so far as the general pattern is correctly reflected by the aggregated categories.

We have chosen the classification proposed by BONTURI and LORD (1991)[9]. First, they classify at the 2-digit level of SITC Rev.1, which eliminates the problem of mispecification that could arise at the 3-digit level because of the change in classification mentioned above. Secondly, they include every sector in the manufacturing category, i.e. SITC 5-8 minus 68. Finally, their classification encompasses the results of several other classifications proposed in the literature, which is also encouraging*.

The most general trends can be seen in TABLE 3.2.1, which shows that Brazil and Korea were fast growing exporters of manufactures during the

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* All methodological details are available from the author.

period 1968-1987. In the vast majority of sectors, both countries had higher average annual growth rates than the world.

A closer look at TABLE 3.2.2 indicates, however, that whereas the Korean exports of manufactures have diversified significantly between 1968 and 1987, gradually shifting towards greater specialization in the non-traditionals category, the Brazilian economy was, in that respect, quite diversified by 1968. In that year, already 70% of the Brazilian manufactured exports were of non-traditionals, having expanded only slightly to 74% by 1987. Korean exports of non-traditionals, on the other hand, expanded from 30% of the total manufactured exports to 61% during the same period. In addition, by examining TABLE 3.2.3 the path followed by exports of manufactures becomes even clearer. By 1968, Brazilian manufactured exports had reached a degree of diversification which was more or less maintained throughout the next twenty years. Although it may be seen from TABLE 3.2.3 that the proportion of manufactured exports in total exports in that country has increased considerably (from 8.1% to 49.6%) between 1968-1987. Thus, the pattern of factor intensity within the manufactured exports did not change significantly (compared with Korea); the increased share of non-traditional exports in the total exports are a result basically of the total increase of the share of manufactures as a whole. This has been the result of factors which affected more or less equally all manufactures.

The Korean evolution tells a different story. The share of manufactured exports per se did not expand significantly. By 1968, they already accounted for 80.5% of total exports, and by 1987 this had increased to 92%. The product diversification within the manufactured exports, nevertheless, strongly suggests that the country has significantly increased its capacity of competitively exporting human and· physical capital-intensive products. Whereas in 1968 Korea's non-traditional exports represented only 30.3% of its manufactured exports, by 1987 this had doubled to 61%, while traditional exports had decreased its shares within the manufactured exports from practically 70% to 39%.

In TABLE 3.2.1 we also present a so-called competitiveness index. It captures the speed of growth of exports of a certain sector in a country, in comparison with the speed of expansion of trade of the same sector in the world economy, i.e. changes in market share. A country would be gaining competitiveness in a sector in a certain period if the average annual growth rate of change of the index of competitiveness in that period is positive, and losing competitiveness if negative. The trends suggested in the paragraphs

above are confirmed by our estimations of competitiveness. The seventh and eighth columns of that table clearly indicate that Korea has been gaining competitiveness in practically all non-traditional sectors. The two exceptions are the explosives and pyrotechnic products (57) and the broad category of miscellaneous manufactured goods (89). The first category can perhaps be explained by the slow elimination of the military bias in the production structure. In the second case, this broad category of products (which are usually of low intensity in both human and physical capital relative to the other non-traditional products) is unlikely to have lost competitiveness for lack of skills □ □ At the same time, Korea has been losing competitiveness in four traditional exports, namely inorganic chemicals (52), wood and cork manufactures (63), textile yarn, fabrics and related products (65) and clothing (84).

A look at the eighth column suggests a different trend for Brazil. Although the country has expanded its manufactured exports overall, it has lost competitiveness in most chemical sectors within the non-traditionals category and in the non-electrical machinery sector (71). Moreover, it has lost competitiveness also in many unskilled labour-intensive exports.

Thus, while the loss of competitiveness of Korea in the traditional exports seems to have been compensated by an increase in competitiveness in the non-traditional exports category, Brazil has performed rather poorly in the non-traditionals category and has not been able to maintain its competitiveness in many sectors where it had a historical comparative advantage either, namely in those sectors intensive in cheap, unskilled labour and in natural resources.

The last column in our table gives the comparative perspective. The competitiveness of Brazilian exports has grown at faster rates than the Korean in most traditional sectors. The exceptions have been the leather and leather manufactures (61), where Brazil actually lost competitiveness between 1968-87, and the furniture sector (82). Meanwhile, Korean competitiveness improved at faster average annual growth rates than the Brazilian in all but two of the non-traditional sectors. It has grown less than the Brazilian in the rubber manufactures sector (62) and in the broad category of miscellaneous manufactured goods discussed above, where Korea actually lost competitiveness.

These are quite revealing results. Brazil, which since 1968 had a high degree of diversification throughout a vast range of industrial sectors, has

maintained a stable but mediocre performance in terms of competitiveness in the traditional sectors and actually lost competitiveness in many non-traditional sectors. Korea not only expanded much more into the non-traditional category but has done so with increasing competitiveness. Korea has actually been gaining competitiveness within the non-traditional category and losing within the traditional manufactures group, indicating a clear shift towards successful exports of products intensive in human and physical capital. Brazil appears to have failed to make this shift successfully, although manufacturing exports as a whole have expanded significantly during the 1968-1987 period.

4 RCA

Next, we estimate an index of revealed comparative advantage (RCA), at the 2-digit and at the 3-digit levels of disaggregation for the manufacturing industry of the two countries. In SECTION 4.1 we examine four years: 1968, 1975, 1980 and 1987, while in SECTION 4.2 we restrict the analysis to 1980 and 1987. The reason for this is that already discussed in the previous section, i.e. that comparisons between pre- and post-1976 years at the 3-digit level are hampered by the change in classification criteria. In any case, SECTION 4.2 is simply designed to check whether the conclusions reached from data at the 2-digit level are in part simply a problem of the aggregation level.

4.1 ANALYSIS OF RCA FOR THE YEARS 1968, 1975, 1980 AND 1987 AT 2-DIGIT LEVEL OF DISAGGREGATION OF SITC

The present section measures an index of RCA for Brazil and Korea at a two-digit level of disaggregation of the SITC classification. Such a level of disaggregation allows only a superficial insight into the pattern of comparative advantage of the various industrial sectors of these two economies. The main purpose of this analysis, however, is only to establish the relative position of one economy with respect to the other in regard to their general trends towards exports of more or less capital intensity.

The index of revealed comparative advantage used here has been suggested by BALASSA (1977)[5], and is defined as follows:

$$RCA = \dfrac{\dfrac{SX_c}{TX_c}}{\dfrac{SX_w}{TX_w}}$$

where:
SX_c = sectoral exports from the country;
TX_c = total exports from the country;
SX_w = sectoral exports from the world;
TX_w = sectoral exports from the world.

TABLE 4.1 presents the results of our estimations for the years 1968, 1975, 1980 and 1987. Sectors are, again, classified under the categories defined in previous sections as-regards factor intensity. The last column of the table compares the performance of the two countries in 1987.

The comparison in that last column gives the misleading impression that Brazil has performed as successfully as Korea in the non-traditional exports. Among the 16 sectors in that category, the K-B coefficient, which indicates how well one economy has performed vis-a-vis the other, shows that Brazil performs better in as many sectors as Korea. A closer look at the data reveals, however, that of all the non-traditional sectors in which K-B is negative, meaning that Brazil has outperformed Korea, Brazil has RCA>1 in only two. In the first case, the explosives and pyrothechnic product category (57), the estimations show that Brazil had RCA>1 in 1975 and the estimation for 1980 shows an index of 0.968. This performance can probably be attributed to the bias in the industrial structure which resulted from the military period. By 1987, this sector had lost completely its position, with an index of 0.259. The second case of RCA>1 is in the iron and steel sector (67), in which Brazil shows RCA>1 in 1980 and in 1987. This is a typical case of high physical capital-intensity sector, with abundant use of natural resources. The import substitution strategy allowed the import of the physical capital, and Brazil has an abundant supply of iron. Furthermore, the iron & steel industry is a target industry for a country which wants to become self-sufficient in its industry, since this is the basis for many capital goods industries. Again, although our interest is in the comparative performance of the two countries, the path followed by Korea in this sector should by no means be underestimated. As can be observed, Korea had RCA approaching one by 1975, and the efficient development of that country in this sector can be fully appreciated by the estimates of the two remaining years, 1980 and 1987. When Korea decided to engage in the development of this type of

industry, it lacked capital and iron ore. Still, in a short period of time Korea became one of the lowest-cost steel-makers in the world.

In the other seven sectors in which Brazil outperforms Korea in 1987, neither actually have RCA>1. It is very possible that the level of aggregation used is hiding a better performance of certain sectors. In fact, the chemical elements and compounds sector (51) seems a likely case where this may be occurring, given the relative high estimates for RCA in 1980 and 1987 (0.816 and 0.784). Overall, however, most chemicals and machinery industries (which includes these sectors of which we speak) are recognizably sectors intensive in both human capital and technology, where the general indications from the data are that Brazil is not as competitive.

The sectors among which Korea outperforms Brazil in 1987 are much more indicative of the superiority of the competitive abilities of the former as compared to the latter. First, Korea actually has RCA>1 in four of these sectors. In rubber manufactures (62), metal manufactures (69), electrical machinery (72) and the broad category of miscellaneous manufactures (89), the table shows a strong persistence in RCA throughout the whole period under consideration (except for 1968 in the case of "72", with RCA of 0.903). Except for the group 89, which usually includes products of relatively low physical and capital intensity (as compared with the other non-traditionals), the categories 62, 69 and especially 72 consist in groups of medium to high intensity of human and physical capital. Naturally, the aggregation problem again suggests caution in this statement.

The results for traditional manufactured exports show both countries with positive RCA in a number of sectors. First, as regards the natural resource-based exports, Korea appears with RCA>1 in four groups, at least once, in the period under analysis. In 1987, Brazil outperforms Korea in three groups of sectors. In one of them, namely wood and cork manufactures (63), Brazil does rather well during the whole period under consideration, but so does Korea. The comparison of 1987 is actually misleading, since that is the only year for which K-B is negative. The dramatic rate at which Korea loses RCA in this sector (AAGR of -0.212) is probably indicative of the intended shift in emphasis of export strategy, away from traditional manufactures and towards more high intensive capital ones.

The second case where Brazil performs better than Korea is to be expected. The leather and leather products sector (61) is one in which Brazil's

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RCA is notorious and can probably be attributed not only to the cheap labour intensity nature of its production but to the availability of cattle in abundance.

Overall, the performance of Korea vis-à-vis Brazil in the natural resource-based category is somewhat surprising. Korea shows RCA in practically all sectors at least once between 1968-1980. This result lends support to the proposition that during the time in which Korea was dedicated to the exports of less sophisticated products, it actually succeeded more than Brazil, while the much poorer results of 1987 are to be understood in the context of the intended shift away from such exports.

The estimates for the unskilled labour-intensive sectors are interesting. First, Korea shows RCA>1 in four of the six sectors involved, persistently in all four years observed, which leaves no doubt as to its success. This is not unexpected, considering the abundant and well-educated labour supply in Korea. What is perhaps surprising is that there is no sign that it is losing RCA, contrary to what could perhaps be expected as that economy engaged in export of high technology-intensive products. But most surprising in these results is the poor performance of Brazil in absolute and relative terms compared to Korea. Although the greatest incidence of RCA>1 of Brazilian manufactured exports occurs within this category, two out of six are certainly disappointing.

Summing up, the performance of manufactured exports from Korea is considerably more impressive than that of Brazil. Estimations have shown that:

a) in absolute terms, Korea has RCA in more sectors than Brazil in any of the four years studied;

b) the incidences of a RCA>1 for Korea are not restricted to one category of exports;

c) where Brazil does relatively better than Korea it is rarely with RCA in the specific sector;

d) The clear lack of RCA of Korea in 1987 in traditional manufacturing sectors is rather symptomatic of the trade policy adopted in the late 1970s and 1980s, with attention shifting away from those sectors.

Thus, we may conclude that between 1968 and 1987 Korea showed a significantly greater ability to develop RCA in manufactured exports than Brazil. The results suggest that Brazil has been much less capable of gaining competitiveness in sectors of moderate and high intensity of human and physical capital than Korea has. This is even more impressive when we recall the timing of the changes which occurred in the industrial structure of the two countries, as observed in tables 2.1-2.6 and 3.2.2. The last table, in particular, shows that exports of non-traditional manufactures in Brazil were quite advanced by 1968 (70.2% of total manufactures), while this share in Korea was 30.3% in 1968. Thus, during the period studied Korea not only expanded its exports of such goods at an impressive rate but also was capable of developing RCA in sectors where Brazil could perhaps be expected to perform better on the basis of accumulated experience.

4.2 ANALYSIS OF RCA FOR THE YEARS 1980 AND 1987 AT 3-DIGIT LEVEL OF DISAGGREGATION OF SITC

As said before, in this section we measure indices of RCA for Brazil and Korea at a higher level of disaggregation for the years in which this is possible with the STIC revised classification, to check for possible misleading results obtained at the 2-digit level. The results obtained, and shown in tables 4.2.1-4.2.3, reinforce the validity of the analysis at the 2-digit level. Although more informative, the results in 3-digits do not add to our discussion and do not contradict the conclusions reached earlier regarding the trends of RCA of the two countries. In TABLE 4.1.1 we have the equivalent results at the 2-digit level. Comparing the estimated RCA indices obtained for 1980 and 1987 for the two countries with the ones at the 3-digit level in tables 4.2.1-4.2.3, we observe that the increasing or decreasing tendencies expressed in TABLE 4.1.1 are not the result of one outlier among sectors with an opposite tendency, but the result of the general trend of the components of each category.

The results obtained here are particularly meaningful because they again show that the overall conclusions hold, despite the fact that the eighties were as favourable to Brazilian exports as they were unfavourable to Korean exports. Exports from the two countries were vulnerable to changes which indirectly affected their performance. In the case of Brazil, the domestic recession led to an extra effort on the part of exporters to increase their exports, since the major market for their products, namely the domestic market, had shrunk. As indicated in the literature, the levels of domestic

activity have historically been an important determinant of export growth, since products are allocated for exports in so far as they cannot be sold internally*.

Moreover, the need to accumulate foreign reserves has meant an extra effort on the part of the government to boost exports, a tendency somewhat reverted after 1988 during the liberalization trend but which is not captured by the data. Korea, in contrast, suffered a setback during the eighties, mainly as a result of the process of redemocratization (and the relative political unrest which this involved) and of the liberalization pressures and measures which followed. The liberalization of the eighties had a negative impact on exports, especially the end of subsidies in 1983. Also, the 2-digit rates of growth experienced in the seventies had been the result of a combination of favourable circumstances which were unlikely to be sustained in the longer run.

5 CONCLUSIONS

With regard to trade performance, a comparison between Brazil and Korea must take account of the fact that Brazil is a major agricultural exporter. As can be seen in TABLE 3.2.3, while manufactured exports account for 92.2% of Korean exports in 1987, it represented only 49.6% of Brazilian exports. In comparison with the world trade, in which 85.2% consisted of manufactures by 1987, it is clear that the reliance of Korean trade on manufactures is much higher.

As far as competitiveness is concerned, this contrasting proportion has serious implications through its effect on the exchange rate. The Brazilian exchange rate is strongly influenced by the competitiveness of the country in the agricultural sector, where it is one of the world's most efficient producers. The competitive exchange rate for Korea, on the other hand, influenced by the fact that manufactures account for practically all its exports, maintains a more realistic relationship with the capacity of its manufactures to compete.

Having said that, however, the analysis developed in this paper strongly hints that the gap between the two countries cannot be accounted for by this element alone. The accomplishments of Korean manufactures in general, and of non-traditionals in particular, vis-à-vis that of the Brazilians

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* For a thorough discussion of this issue, see AMAZONAS (1994)[1].

are quite outstanding. Between 1968 and 1987, the boost in Korean manufacturing exports far outweighs the Brazilian performance. And Korea has not only expanded its exports of manufactures, it has done so with accompanying competitiveness and developing new revealed comparative advantage in an increasing number of sectors of high intensity in the use of both human and physical capital.

It has been shown that both countries industrialized during approximately the same period. It has also been shown that, although Korea has engaged in export promotion much more enthusiastically than Brazil and has become an outward oriented economy to a higher degree than Brazil has, the latter, on the other hand, had a more diversified industrial structure at one point than Korea. Nevertheless, despite this initial effort, results of a survey by the National Confederation of Industry in Brazil* have indicated that Brazilian entrepreneurs have reached the end of the eighties with serious deficiencies in most areas of technological capability.

Their industry is lacking investment in most levels of human capital and needs to assimilate technology at a faster pace than it has been doing so far if it intends to maintain its competitive edge, even in sectors which traditionally relied on the country's static comparative advantage in natural resource endowments and abundant cheap labour.

The regression analysis developed at the beginning of SECTION 2 shows this quite clearly. There we have found evidence that the Korean exports have expanded more in sectors which are increasingly intensive in human capital, while the results for Brazil indicate that if there has been any change at all in specialization in regard to human capital-intensity it has been towards specializing more into sectors which experienced less increases in human capital-intensity.

Thus, in this paper we have tried to establish the pattern of competitiveness of the two manufacturing exporters according to different categories of industries. These categories were defined on the basis of their factor intensities, and they were sufficiently broad to allow comparisons and define a trend without singularising sectors. The results reached here suggest that the contrasting performance in manufacturing exports of Brazil and

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* The author discusses the results of this survey in a larger version of this paper, which is available by request.

Korea are associated with the different levels of availability of human capital and adequate technology in those countries and the way in which they have been assimilated.

Abstract: This paper shows Brazil in comparison with South Korea, analysing the evolution of their industrial structure, export growth and competitiveness of manufactures.

Key Words: South Korean Economy; Brazilian Economy; Economic Development; Economic Policy; Industrial Competitiveness; Manufactured Products; Industrial Development; Industrialization; Export.

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