**JOURNAL OF ECONOMIC DEVELOPMENT**
Volume 22, Number 2, December 1997

# Analysis of North Korea's Foreign Trade by Revealed Comparative Advantages

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This paper analyzes the characteristics of North Korean economy through her foreign trade. To do this, this paper uses the 'revealed' comparative advantage model. The empirical results show that North Korea has achieved a little success in improving the economic structures by changing her major sector from the goods using natural resources intensively in production to the goods using relatively standard technology. However, for the foreseeable future, it seems that it will be difficult for North Korea to enter the more advanced stage, where the goods using advanced technology are taking a significant portion in the trade.

## I. Introduction

Based on previous studies, it can be assumed that the trade pattern of a country reflects the nature of its domestic economy. It is well known that North Korea is relatively abundant in raw materials, such as iron ore, nonferrous metals and minerals. On the other hand, North Korea suffers from a lack of capital stock, crude oil and especially of advanced technology. This paper examines how the trade performance of North Korea reveals its comparative advantage.

Considerable efforts have been made to assess empirically national comparative advantages. Yeats (1992) categorizes these efforts into two lines. One of them is the so called revealed comparative advantage (RCA) model, which is based on pioneering studies by Balassa (1965). The other approach is based on a standard Heckscher-Ohlin model, and attempts to determine the relative labor and capital inputs of specific goods. However, any attempt at an empirical assessment of patterns of comparative advantages is basically determined by the purpose of the assessment and the nature of the data available. In this case, the main objective is to figure out the characteristics of the North Korean economy in spite of there being a scarcity of information on the country's economy. Sometimes, those characteristics can help to describe fundamental features of the country's economic system.

Since there is little information on North Korea's economic system, such as labor and capital inputs, the revealed comparative advantage model is adopted as an empirical approach to the measurement of comparative advantages. Murrell (1990) provides a comprehensive guideline for study of socialist economy, especially in study of the revealed comparative advantage and estimating endowments. In many aspects, this paper is influenced by Murrell's study.

The purpose of this paper is to analyze the fundamental properties and changes in the

* Research Fellow, Korea Institute for National Unification. The paper is based upon chapter 4 of author's Ph. D. thesis submitted to the State University of New York at Albany. The author is grateful to the advisor, Pong Lee and the editor of the journal.

North Korean economy by using the revealed comparative advantage (RCA) model. Section II explains the definition of RCA and the form which the RCA has taken. Section III describes the information employed in forming commodity aggregates. Section IV contains the empirical results. Two types of results are obtained from the different data, total volume and non-communist countries only. Section V summarizes this paper.

## II. Revealed Comparative Advantages (RCAs)

The main basis of the theory of international specialization has been the principle of comparative advantage, although the principle now goes far beyond the original explanation provided by Ricardo, who only observed differences in labor productivity. The concepts of comparative advantage and competitiveness are often confused with one other. Those are, however, quite different in reality.[1] When instability in exchange rates produce disequilibria, competitiveness is seriously disturbed and any analysis based on it is highly inadequate. Therefore any explanation of international specification increasingly has to take into account some measure of comparative advantages. In this case, the comparative advantages concerned are those that are revealed by the results of international trade.

Balassa (1965) developed the concept of revealed comparative advantage, which is the measure of the share of a given product in a country's total exports relative to the product's share in total world exports, that is, a ratio of relative export structure. In line with Balassa's suggestion, revealed comparative advantage (RCA) has taken two forms as follows:

(i) Net exports as a portion of total trade in a commodity group:

$$x_{ij} = (X_{ij} - M_{ij})/(X_{ij} + M_{ij}), \quad (1)$$

where X and M stand for the value of exports and imports respectively, i denotes a commodity group, j a country. This term expresses the net exports by country j in a commodity group i as a portion of that country's total trade for commodity group i. The measure ranges between －1 (corresponding to no exports by country j in commodity group i) and 1 (corresponding to no imports for country j in commodity group i). Even though the interpretation of this measure is subject to criticism, because imports are influenced by the system of protection used in a country, this measure has some merit: (a) it shows the significance of net flows in any commodity group; (b) its absolute value ($|x_{ij}|$) represents the portion of inter-industry trade in the total trade of the concerned commodity group ($1 - |x_{ij}|$ is the corresponding portion of intra-industry trade).

(ii) The export performance ratio, which is a measure free of the import-restriction bias described above. This measure of revealed comparative advantage is the type most commonly found in the literature. The version chosen here is

1. According to Lafay (1987), the two essential differences between competitiveness and comparative advantage are as follows: 1) while competitiveness is measured between countries for a given commodity, comparative advantage is measured between commodities for a given country; 2) while competitiveness is subject to changes in the macroeconomic situation, comparative advantage is a reflection of structural changes in nature.

$$x_{ij} = (X_{ij} / \sum_{i=1}^{N} X_{ij}) / (\sum_{t=1}^{T} X_{it} / \sum_{i=1}^{N} \sum_{t=1}^{T} X_{it}),$$

or (2)

$$x_{ij} = (X_{ij} / \sum_{t=1}^{T} X_{it}) / (\sum_{i=1}^{N} X_{ij} / \sum_{i=1}^{N} \sum_{t=1}^{T} X_{it}),$$

where $X_{ij}$ is the amount of exports of a commodity i by country j, T is the number of countries included in the study, and N is the number of commodities. The flows $\sum_{t=1}^{T} X_{it}$ and $\sum_{i=1}^{N} \sum_{t=1}^{T} X_{it}$ correspond to the total exports of the reference zone (which could be the whole world, or simply the more restricted set of comparable countries) for commodity i and for all commodities, respectively.

When Balassa (1965) proposed this indicator, he justified considering only exports on the grounds that imports were influenced by protectionist measures. However, examining only $X_{ij}$ might fail to reflect overall comparative advantages because it ignores half of trade behavior, imports. Therefore, it is necessary to consider the imports side and the exports side together.

If the import flows are denoted by M, then one can define an analogous measure of comparative advantage to exports as follows:

$$m_{ij} = (M_{ij} / \sum_{i=1}^{N} M_{ij}) / (\sum_{t=1}^{T} M_{it} / \sum_{i=1}^{N} \sum_{t=1}^{T} M_{it}),$$

or (3)

$$m_{ij} = (M_{ij} / \sum_{t=1}^{T} M_{it}) / (\sum_{i=1}^{N} M_{ij} / \sum_{i=1}^{N} \sum_{t=1}^{T} M_{it}).$$

The indicators $x_{ij}$ and $m_{ij}$ may have opposite directions. A priori, comparative advantage must meet the conditions, $x_{ij} > 1$ and $m_{ij} < 1$, while comparative disadvantage requires $x_{ij} < 1$ and $m_{ij} > 1$. One could, however, encounter the case that $x_{ij} > 1$ and $m_{ij} > 1$, or $x_{ij} < 1$ and $m_{ij} < 1$. How can one make a conclusion about comparative advantage in those cases? As an attempt to overcome this ambiguity, one can consider the above indicators in Equations (2) and (3) along with other measures based on the trade balance (X - M), which is already introduced in Equation (1). Lafay (1992) and Murrell (1990) agree that the trade balance is more likely to be well-behaved than the exports side or imports side only, even though Lafay points out some methodological problems (three types of distortions).[2]

Since the world average of trade balance will be zero, one cannot define any statistic of the trade balance as exactly analogous to Equations (2) or (3). As Murrell (1990) suggested, therefore, the '*net*' trade performance in a commodity which is still useful as a descriptive measure with a natural scale will be examined. According to Murrell (1990, p. 31), one can define:

$$w_{ij} = x_{ij} / m_{ij} \quad (4)$$

2. Lafay (1992, pp. 212-220) points out three distortion types are as follows: (1) arising from the evolution of minority flows; (2) arising from the macroeconomic situation; (3) arising from the relative weights of the products. He also shows the ways to eliminate these distortions.

The indicators defined in Equations (2), (3) and (4) are referred to by the name '*revealed comparative advantages* (RCAs).' The interpretation of these indicators is very simple. The indicators $x_{ij}$ measures the share of country j's exports that are in commodity group i relative to the share of world exports that are in commodity group i. Therefore, $x_{ij}$ shows the performance of exports in commodity group i of country j relative to the rest of the world. The popularity of the RCAs is accounted for by this ease of interpretation and the evident information contained in the measures. If one finds, for example, that the RCA of a country is high for a commodity group requiring the intensive use of capital, one can conclude that the country has a relatively large endowment of capital. This simplicity of interpretation underlies the use of these indicators in my study as in many previous studies.

## III. Categorization of Commodities for RCAs

Ethier (1984) points out that, given some restrictions, a country on the average tends to import those goods which use (relatively) intensively its relatively scarce factors. The term, '*on the average tends*,' leads us to interpret the measure of RCAs as probabilistic information. Based on this argument, one can reduce the possibility of making an erroneous conclusion by the grouping the commodities when constructing RCAs. Hence in order to derive judgments about any specific feature of the North Korean economy from its trade data alone, one can adopt some categories of commodities for which trade reliably reflects the structure of the North Korean economy.

The RCAs are, now, defined as follows:

$$x_{ik} = \left(\sum_{n\in G_i} X_{nk} \Big/ \sum_{n=1}^{N} X_{nk}\right) \Big/ \left(\sum_{n\in G_i}\sum_{t=1}^{T} X_{nt} \Big/ \sum_{n=1}^{N}\sum_{t=1}^{T} X_{nt}\right), \tag{5}$$

$$m_{ik} = \left(\sum_{n\in G_i} M_{nk} \Big/ \sum_{n=1}^{N} M_{nk}\right) \Big/ \left(\sum_{n\in G_i}\sum_{t=1}^{T} M_{nt} \Big/ \sum_{n=1}^{N}\sum_{t=1}^{T} M_{nt}\right), \tag{6}$$

$$w_{ik} = x_{ik} \,/\, m_{ik} \ , \tag{7}$$

where $X_{nk}$ is the level of exports of a commodity n by North Korea, $M_{nk}$ is the equivalent figure for imports. Also T is the number of countries included in the analysis, N is the total number of commodities, and $G_i$ is the group i which contains commodities having a particular property. The numerator in Equations (5) and (6) is the percentage share of North Korean exports and imports of the commodity group i in total exports and imports, respectively. The denominator is the percentage share of world's exports and imports of the commodity group i in total exports and imports, respectively.

The interpretation of this measure is as follows: (i) if North Korea has a comparative advantage in exporting a certain product group, then the share of the product group in North Korea's total exports will be greater than the share of the product group in the world's total exports (in this case the RCA index will be greater than 1; otherwise, it will be less than 1); (ii) when $x_{ik}$ is larger than $x_{jk}$ for some commodity groups i and j, it indicates that North Korea has more endowment of some composite of the factors used intensively in the production of the commodity

in group i than that of in the commodity group j. This conclusion can be approximately qualified in a multi-commodity and multi-factor world (Murrell (1990), pp. 89-90).

There is some literature which shows how to categorize the commodities for measuring the RCAs. In order to establish a table for groupings (Table 1), some information from the work of previous studies is adopted. To test several hypotheses of international trade theory, Hufbauer (1970) developed empirical measures which include *factor proportions*, *human skills*, *scale economies*, *consumer-goods ratio* and *product cycle*. Among them, only the measures of *consumer-goods ratio* is used to categorize the commodities because this category can provide some information which will be helpful for understanding the changes in North Korea's industrial policy. In his study the *consumer-goods ratio* is measured as the percentage of commodity output and imports purchased in Japan in 1960, by "final consumers" directly and on the "second round."[3] Commodities are assigned to the category of '*industrial goods for producers'* when the value of this ratio is less than 0.1 and to the category of '*industrial goods for consumers'* when it is greater than 0.8.

Hufbauer and Chilas (1974) divide the commodities into three categories corresponding to the nature and importance of specific production factors: '*Ricardo goods,'* '*Heckscher-Ohlin goods,'* and '*Product-cycle goods.'* '*Ricardo goods'* are characterized by the importance of natural resources in their production. '*Heckscher-Ohlin goods'* are produced with a standard technology and manufactured with a constant return to scale in the use of capital and labor. '*Product-cycle goods'* are produced with an advanced technology. The RCAs of those groups would provide some information on the changes in North Korea's economic structure, which cannot be directly observed.

Table 1 shows the classification of the aggregate goods according to whether they have a certain property. In the table, the second column describes a property for the individual goods included in the category. In the third column, the table lists names of the goods in the category. The last column is the lists of the UN's SITC codes of goods in the category.

## IV. Empirical Results

By focusing the relationship between the trade performance of a country and the characteristics of its domestic economy, this study examines the characteristics of North Korean economy. One can expect that the trade performance of North Korea could provide useful information on North Korea where the characteristics of domestic economy have not been generally known. Using the definition of the commodity group which goods use a particular resource or technology intensively in production (that is, which goods have certain property), one can deduce some information on the North Korean economy from the RCAs, the measurements on the trade performance. For example, if the commodity group use capital intensively in production, then the relevant RCAs provide information on availability of capital in North Korean economy.

3. Hufbauer defines "the final consumers" as households plus government bodies, except when government bodies are clearly purchasing for investment purposes. And "the second round" is defined as the percentage of intermediate goods which find their way to final consumption after one pass through the input-output table.

**Table 1 Grouping for Revealed Comparative Advantages (RCAs)**

| Name of Group | Property of Group | Commodity included in Group | SITC, Revision 1 |
|---|---|---|---|
| 1. Industrial goods for consumers* | Goods used predominantly by consumers | Medicinal and pharmaceutical products, perfumery, soaps, travel goods, clothing, footwear. | 541, 551, 553-4, 831, 841-2, 851. |
| 2. Industrial goods for production* | Goods used primarily for production and investment | Inorganic chemicals, radioactive materials, dyes, veneers, plywood boards, building materials, mineral, manufactures, iron and steel, metals, machinery, electrical machinery, road motor vehicles. | 513-5, 532, 631, 661-3, 671-9, 681-9, 691-2, 711-2, 714-5, 717-8, 722-4, 726, 729, 732. |
| 3. Ricardo goods** | Goods using natural resources in production | Food, wood, fibers, minerals, paper, non-ferrous metals, oils, ores, raw fuels. | 011-3, 022-5, 041-8, 051-5, 061, 071-2, 074-5, 121, 242-3, 251, 261-3, 271, 274, 281, 283, 285, 321, 331, 341, 411, 421-2, 431, 667, 687-7, 689. |
| 4. Heckscher-Ohlin goods** | Goods using a standard technology | Beverages, tobacco, cement, floor coverings, glass, pottery, ferrous metals, cars, metal, products, locomotives, ships, domestic appliance, books, furniture, clothing, jewelry, stationery. | 111-2, 122, 273, 533, 551, 553-4, 611-3, 621, 629, 651-7, 661-2, 664-6, 671-9, 691-8, 724-5, 731-3, 812, 821, 831, 841-2, 851, 892-5, 897. |
| 5. Product-cycle goods** | Goods using an advanced technology | Chemicals, medicines, plastics, dyes, fertilizers, explosives, machinery, aircraft, instruments, clocks, munitions. | 512-5, 521, 532, 541, 561, 571, 581, 711-2, 714-5, 717-8, 722-3, 726, 729, 734, 861-2, 864, 951. |

Sources: *: Hufbauer (1970); **: Hufbauer and Chilas (1974).

## 1. North Korea's Trade with the World

**(i) Industry versus Consumers:** As usual for communist countries, North Korea was known as a country which concentrated on heavy industry and treated the consumer sector as a residual in planning decisions. Thus, one would expect that North Korea put a low priority on (will be found to have a comparative advantage in) industrial goods for consumers and a high priority on (will be found to have a comparative disadvantage in) industrial goods for production and investment. Table 2 presents the relevant empirical results.

As seen from the very high x's (very much above unity) and low m's (very much below unity) for Group 1, it can be inferred that North Korea enjoys a comparative advantage in Group

1 commodities. It might alternatively be inferred that North Korea has placed a low priority on the provision of industrial goods for consumers. This result that North Korea has a comparative advantage in industrial goods for consumers is strongly consistent with the above expectations. As for industrial goods for production (Group 2) however, the results do not support the above expectations because of the high x's (mostly greater than unity) for Group 2. It indicates weakly that North Korea has not so much a comparative disadvantage as a comparative advantage, in industrial goods for production and investment.

**Table 2 RCAs for Industrial Goods versus Consumer Goods**

| Group | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Industrial | x | 2.18 | 2.16 | 1.41 | 1.56 | 1.23 | 1.53 | 3.47 | 3.24 | 3.40 | 3.96 | 4.76 | 2.31 |
| goods for | m | 0.51 | 0.32 | 0.29 | 0.22 | 0.22 | 0.18 | 0.29 | 0.43 | 0.21 | 0.26 | 0.40 | 0.55 |
| consumers | w | 4.26 | 6.86 | 4.80 | 7.10 | 5.70 | 8.60 | 12.02 | 7.49 | 16.33 | 15.08 | 11.77 | 4.18 |
| 2. Industrial | x | 1.73 | 1.84 | 1.83 | 1.93 | 1.46 | 2.10 | 1.69 | 1.49 | 1.49 | 1.21 | 1.04 | 0.91 |
| goods for | m | 1.21 | 1.37 | 1.42 | 1.32 | 0.76 | 1.13 | 0.92 | 1.13 | 0.79 | 0.70 | 0.94 | 0.57 |
| production | w | 1.43 | 1.34 | 1.29 | 1.46 | 1.92 | 1.86 | 1.83 | 1.32 | 1.87 | 1.74 | 1.11 | 1.60 |

Sources: The United Nations' diskettes of trade data, and various issues of the *Yearbook of International Trade Statistics* and the *Vneshniaia torgovlia SSSR;*
Note: The data for China during 1970-1986 and for the former Soviet during 1991-1992 are not included.

Table 3 provides more detailed information on major items included in Group 1. It shows that North Korea has comparative advantages on SITC 551(essential oil and perfume), 841 (clothing, non-fur) and 851(footwear), and has comparative disadvantage on SITC 554(soaps, cleaning products). Even though North Korea had a comparative disadvantage on SITC 554, this disadvantage did not have significant effect on the RCAs of Group 1. As for the exports, non-fur clothing (SITC 841), which has taken up an overwhelming majority in exports, has been a leading item in exports of industrial goods for consumers (Group 1) over the period considered in this study.

**Table 3 RCAs for Major Goods in Group 1 (industrial goods for consumers)**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551. Essential oil | x | 0.03 | 13.90 | 12.72 | 12.81 | 6.81 | 5.59 | 7.40 | 6.53 | 2.02 | 1.21 | 1.15 | 0.17 |
| and perfume | m | 0.00 | 0.16 | 0.17 | 0.01 | 0.09 | 0.21 | 0.29 | 0.24 | 0.21 | 0.12 | 0.33 | 0.06 |
| 554. Soaps, | x | 0.00 | 0.08 | 0.00 | 0.31 | 0.02 | 0.03 | 1.68 | 3.45 | 0.05 | 0.03 | 0.07 | 0.02 |
| cleaning products | m | 7.61 | 4.04 | 1.33 | 0.49 | 1.51 | 0.84 | 2.34 | 7.86 | 1.96 | 1.89 | 2.69 | 2.35 |
| 841. Clothing, | x | 4.24 | 3.03 | 1.53 | 1.78 | 1.80 | 2.12 | 5.69 | 4.84 | 6.07 | 7.42 | 8.72 | 3.55 |
| non-fur | m | 0.02 | 0.02 | 0.00 | 0.02 | 0.03 | 0.07 | 0.20 | 0.17 | 0.15 | 0.26 | 0.35 | 0.64 |
| 851. Footwear | x | 1.47 | 1.52 | 1.55 | 1.59 | 0.98 | 1.41 | 1.87 | 1.15 | 0.17 | 0.16 | 0.52 | 2.80 |
| | m | 0.06 | 0.00 | 0.84 | 0.30 | 0.02 | 0.03 | 0.05 | 0.02 | 0.03 | 0.18 | 0.14 | 0.43 |

Sources and note: Same as those of Table 2.

Looking closely at the RCAs of Group 2 might provide some interesting information. Table 4 shows that, among the major items of Group 2, North Korea has comparative advantages in SITC 661(cement, building product), 663(other nonmetal mineral manufactures), 672(iron and steel,

primary forms), 673(iron and steel shapes), 681(silver and platinum), 685(lead) and 686(zinc), and has comparative disadvantages in SITC 715(metalworking machinery), 717(textile, leather machinery) and 718(machinery for special industries).

This indicates that North Korea has comparative advantages in raw materials (SITC 681, 685 and 686) and its related manufactures (SITC 661, 663, 672 and 673) and disadvantage in machinery (SITC 715, 717 and 718). One can find an interesting fact that North Korea put a high priority on industrial goods for investment (capital goods) until the mid-1980s, if one accepts the classification of Watanabe and Kajiwara (1983) for capital goods.[4] Thus, the expectation that North Korea would put a high priority on industrial goods for production and investment is met with Watanabe and Kajiwara's (1983) classification.

**Table 4 RCAs for Major Goods in Group 2 (industrial goods for production)**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 661. Cement, | x | 18.34 | 14.75 | 14.62 | 19.23 | 18.68 | 19.90 | 5.00 | 7.18 | 8.07 | 11.42 | 8.93 | 2.48 |
| building product | m | 0.04 | 0.01 | 0.13 | 0.06 | 0.00 | 0.05 | 0.10 | 0.12 | 0.40 | 0.26 | 1.79 | 0.54 |
| 663.Other nonmetal | x | 34.36 | 40.49 | 27.14 | 47.79 | 44.23 | 45.63 | 61.24 | 62.02 | 62.77 | 28.05 | 11.22 | 0.32 |
| mineral products | m | 0.01 | 0.39 | 0.84 | 0.94 | 0.38 | 0.42 | 0.66 | 0.47 | 1.05 | 0.94 | 0.77 | 0.67 |
| 672. Iron and steel, | x | 2.42 | 1.47 | 2.50 | 6.98 | 1.02 | 4.76 | 3.30 | 3.71 | 5.10 | 6.39 | 9.64 | 12.38 |
| primary forms | m | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.01 | 0.00 | 0.06 | 0.00 | 0.16 | 0.63 | 2.71 |
| 673. Iron and | x | 17.31 | 16.91 | 8.82 | 10.42 | 9.79 | 14.77 | 22.71 | 22.29 | 19.57 | 12.36 | 5.06 | 0.50 |
| Steel shapes | m | 0.01 | 0.05 | 3.27 | 0.06 | 0.53 | 0.89 | 0.07 | 0.20 | 0.12 | 0.07 | 2.94 | 1.02 |
| 681. Silver and | x | 9.50 | 9.30 | 13.55 | 16.26 | 8.40 | 14.37 | 15.25 | 8.63 | 4.06 | 3.73 | 1.14 | 0.84 |
| Platinum | m | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.04 | 0.31 | 0.25 | 0.21 | 0.03 | 0.03 | 0.03 |
| 685. Lead | x | 31.37 | 50.80 | 53.70 | 89.11 | 39.07 | 59.72 | 44.29 | 43.25 | 29.57 | 12.67 | 11.57 | 17.39 |
| | m | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.07 | 2.59 | 3.75 | 8.18 | 3.64 | 1.80 | 0.99 |
| 686. Zinc | x | 34.76 | 49.22 | 52.15 | 52.19 | 28.84 | 39.73 | 26.63 | 20.59 | 35.78 | 47.25 | 57.46 | 28.85 |
| | m | 0.00 | 0.01 | 0.00 | 0.02 | 2.66 | 0.37 | 0.51 | 1.25 | 0.16 | 0.10 | 0.06 | 0.21 |
| 715. Metalworking | x | 3.77 | 5.93 | 5.00 | 2.43 | 0.58 | 0.99 | 0.45 | 0.02 | 0.53 | 2.78 | 2.06 | 0.10 |
| machinery | m | 12.38 | 17.03 | 9.24 | 20.46 | 3.20 | 6.44 | 3.69 | 7.74 | 8.76 | 1.68 | 0.71 | 2.84 |
| 717. Textile, leather | x | 0.02 | 0.00 | 0.03 | 0.02 | 0.05 | 0.07 | 0.16 | 0.25 | 0.05 | 0.12 | 0.25 | 0.43 |
| machinery | m | 3.22 | 7.74 | 5.49 | 0.32 | 1001 | 1.01 | 0.91 | 3.56 | 2.97 | 2.71 | 8.24 | 1.17 |
| 718. Machinery for | x | 0.00 | 0.01 | 0.00 | 0.07 | 0.37 | 0.01 | 0.03 | 0.30 | 0.01 | 0.06 | 0.02 | 0.05 |
| special industries | m | 2.20 | 1.24 | 4.67 | 4.42 | 0.74 | 1.77 | 2.27 | 4.91 | 2.30 | 0.95 | 1.30 | 0.55 |

Sources and note: Same as those of Table 2.

**(ii) Technological Levels:** As a country is developed, the most important factors of production and trade should be expected to change. At the lowest stage, 'Ricardo goods,' (see the classifications in Table 1) which are characterized by the importance of natural resources

4. Watanabe, R. and Kajiwara, K.(1983), *The Times of Horizontal Specialization in Asia*(Japanese), Tokyo: JETRO. They divide the industrial goods by the purpose of use into five categories: nondurable consumer goods, durable consumer goods, labor-intensive intermediate goods, capital-intensive intermediate goods, and capital goods. Capital goods includes tools, machinery, aircraft, ships, rail road vehicles and instruments(SITC 695, 711-2, 714-5, 717-9, 722-3, 726, 729, 731, 734-5, 861).

of specific factors of production, takes up an overwhelming majority in exports. Then, as an economy steps up enough to implement modern industrial technology, 'Heckscher-Ohlin goods,' which are industrial goods using a standard technology, begin to spread over the economy. Finally, when an economy reaches one of the more advanced stages, 'Product-cycle goods,' which are produced with high technology, influence trade patterns. 'Product-cycle goods' are produced by using technologies that have not spread far from their country, or even company, of origin. For these goods, production is so intimately tied to the development of technology and to the specifics of demand that exports are made by the countries at the highest stage of development.

As for the production of 'Ricardo goods,' the empirical results in Table 5 show that, until the mid of 1970s, North Korea had comparative advantage in the goods with a high natural resource content. However, this advantage changed by the late of 1970s. Since that time North Korea has had a comparative disadvantage in 'Ricardo goods.' The empirical results on 'Heckscher-Ohlin goods' show that North Korea has continuously had comparative advantages in goods using a standard technology. The source of this advantage can be explained by the high saving rates under centrally planned systems, and the enormous implicit subsidy for heavy industry. Given those conditions, effective capital-labor ratios might well be higher than the average of the world. Accordingly, North Korea can maintain a high share of 'Heckscher-Ohlin goods' in its exports.

Those results such that North Korea has concentrated on 'Heckscher-Ohlin goods,' imply that North Korea has a comparative advantage in sectors where product variety is not important and where the entry of new firms is likely to play only a small role (See Murrell (1990), pp. 99-105). Those results of 'Ricardo goods' and 'Heckscher-Ohlin goods' show that North Korea has succeeded in improving the structure of its economy from the stage exporting mainly the goods using natural resource to the stage exporting mainly the goods using a standard technology. This result is almost in accord with an assessment of the overall performance of North Korea's economy, where North Korea seems to have, in some measure, succeeded in improving the structure of its economy. Reviewing the shares of commodity groups relevant to the technological level, one can find that North Korea's major sector in its trade has been changed from the 'Ricardo goods' to 'Heckscher-Ohlin goods.'[5]

The RCAs for exports (x) and trade balance (w) of 'Product-cycle goods' of North Korea are considerably lower throughout the whole period of the study as shown in Table 5. Since the spread of these kinds of products is often undertaken by multinational corporations, the absence of those corporations in North Korea can be an explanation of this disadvantage in 'Product-cycle goods.' Although, in 1984, North Korea adopted a policy of overseas economic projects and greater expansion of the economy by announcing a 'Joint Venture Law,' it did not seem to succeed in attracting foreign investors and introducing advanced technology when considering the RCAs of 'Product-cycle goods.' Looking closely at the trends in the share of 'Product-cycle goods,'

5. See the following table, in which the shares of each group in total trade are presented.

(unit: percent)

| | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3. Ricardo goods | 36 | 26 | 36 | 35 | 33 | 35 | 34 | 27 | 30 | 30 | 29 | 24 |
| 4. Heckscher-Ohlin goods | 26 | 30 | 27 | 25 | 31 | 31 | 32 | 33 | 32 | 35 | 39 | 44 |
| 5. Product-cycle goods | 23 | 26 | 21 | 23 | 10 | 11 | 13 | 18 | 16 | 13 | 14 | 13 |

however, one can see that North Korea's open-door policy, which commenced from a 'Joint Venture Law' of 1984, contributed to some extent to increasing the trade of 'Product-cycle goods.'[6]

**Table 5 RCAs by Technological Level**

| Group | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3. Ricardo goods | x | 1.18 | 1.16 | 1.45 | 1.03 | 0.88 | 0.94 | 0.83 | 0.71 | 0.67 | 1.07 | 1.18 | 0.77 |
| | m | 1.23 | 0.75 | 0.78 | 0.99 | 1.28 | 0.10 | 1.34 | 1.13 | 1.99 | 2.00 | 1.63 | 1.98 |
| | w | 0.96 | 1.55 | 1.86 | 1.05 | 0.69 | 0.86 | 0.62 | 0.63 | 0.34 | 0.53 | 0.73 | 0.39 |
| 4. Heckscher-Ohlin goods | x | 1.43 | 1.27 | 1.08 | 1.35 | 1.27 | 1.55 | 1.60 | 1.63 | 1.41 | 1.34 | 1.49 | 1.57 |
| | m | 0.40 | 0.69 | 0.96 | 0.57 | 0.71 | 0.85 | 0.72 | 0.90 | 0.62 | 0.77 | 0.93 | 0.91 |
| | w | 3.59 | 1.85 | 1.12 | 2.38 | 1.79 | 1.82 | 2.21 | 1.82 | 2.27 | 1.74 | 1.61 | 1.74 |
| 5. Product-cycle goods | x | 0.29 | 0.39 | 0.32 | 0.21 | 0.26 | 0.14 | 0.15 | 0.20 | 0.20 | 0.36 | 0.25 | 0.33 |
| | m | 1.86 | 2.03 | 1.57 | 1.98 | 0.85 | 0.97 | 1.11 | 1.24 | 0.96 | 0.64 | 0.72 | 0.63 |
| | w | 0.15 | 0.19 | 0.20 | 0.11 | 0.31 | 0.15 | 0.13 | 0.16 | 0.20 | 0.56 | 0.35 | 0.52 |

Sources and note: same as those of Table 2.

**Table 6 RCAs for Major Goods included in Group 3 (Ricardo goods)**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 041. Wheat, unmilled | x | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | m | 11.11 | 5.38 | 8.74 | 13.33 | 14.32 | 15.55 | 17.23 | 0.53 | 5.31 | 8.76 | 5.45 | 2.94 |
| 047. Meal or flour, non-wheat | x | 388.1 | 476.8 | 397.6 | 445 | 455.2 | 295 | 436.2 | 0.00 | 0.00 | 361.6 | 0.00 | 0.00 |
| | m | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 8.92 | 0.10 | 1.89 |
| 054. Vegetable, fresh & simply preserved | x | 0.57 | 0.85 | 0.78 | 2.12 | 2.80 | 2.14 | 3.57 | 5.88 | 4.02 | 2.06 | 7.31 | 3.13 |
| | m | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.13 | 0.22 | 0.06 |
| 261. Silk | x | 6.94 | 18.42 | 274.2 | 336.9 | 188.7 | 432.2 | 387.1 | 178.6 | 146.5 | 27.00 | 91.59 | 46.37 |
| | m | 0.00 | 0.00 | 0.00 | 0.00 | 0.49 | 0.07 | 0.14 | 2.31 | 0.00 | 0.12 | 2.64 | 3.41 |
| 263. Cotton | x | 0.02 | 0.00 | 0.00 | 0.16 | 0.19 | 0.56 | 0.27 | 0.49 | 0.04 | 0.02 | 0.03 | 0.12 |
| | m | 6.53 | 3.95 | 3.97 | 3.92 | 7.77 | 8.52 | 12.96 | 14.13 | 19.76 | 10.63 | 6.97 | 4.58 |
| 321. Coal, coke, briquettes | x | 0.77 | 0.51 | 2.25 | 0.69 | 0.23 | 0.83 | 0.34 | 0.79 | 2.72 | 6.95 | 8.86 | 4.99 |
| | m | 5.20 | 3.92 | 0.89 | 2.62 | 5.24 | 6.21 | 5.02 | 5.10 | 8.08 | 15.45 | 11.51 | 9.28 |
| 331. Crude petroleum | x | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | m | 2.12 | 0.72 | 0.22 | 0.73 | 1.05 | 0.65 | 0.92 | 1.09 | 3.96 | 2.27 | 1.06 | 2.57 |
| 421. Fixed vegetable oils | x | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | m | 3.76 | 2.74 | 2.48 | 1.10 | 1.65 | 2.63 | 5.20 | 3.39 | 2.80 | 2.80 | 2.38 | 5.68 |
| 681. Silver and Platinum | x | 9.50 | 9.30 | 13.55 | 16.26 | 8.40 | 14.37 | 15.25 | 8.63 | 4.06 | 3.73 | 1.14 | 0.84 |
| | m | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.04 | 0.31 | 0.25 | 0.21 | 0.03 | 0.03 | 0.03 |
| 685. Lead | x | 31.37 | 50.80 | 53.70 | 89.11 | 39.07 | 59.72 | 44.29 | 43.25 | 29.57 | 12.67 | 11.57 | 17.39 |
| | m | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.07 | 2.59 | 3.75 | 8.18 | 3.64 | 1.80 | 0.99 |
| 686. Zinc | x | 34.76 | 49.22 | 52.15 | 52.91 | 28.84 | 39.73 | 26.63 | 20.59 | 35.78 | 47.25 | 57.46 | 28.85 |
| | m | 0.00 | 0.01 | 0.00 | 0.02 | 2.66 | 0.37 | 0.51 | 1.25 | 0.16 | 0.10 | 0.06 | 0.21 |

Sources and note: same as those of Table 2.

6. See the table in previous footnote.

The shares of commodity groups relevant to the technological level also show that the most significant trend in North Korea's trade is the gradual decline of 'Ricardo goods' and gradual increase of 'Heckscher-Ohlin goods.' One can get detailed information by looking at the RCAs of major items included in Group 3, 4, and 5. According to Table 6, among the items included in Group 3 (Ricardo goods), North Korea has comparative advantages in SITC 047(meal or flour, non-wheat), 054(vegetables, fresh and simply preserved), 261(silk), 681(silver and platinum), 685(lead) and 686(zinc), and has comparative disadvantages in SITC 041(wheat, unmilled), 263(cotton), 321(coal, coke, briquettes), 331(crude petroleum) and 421(fixed vegetable oils). An interesting finding is that the gradual decline of comparative advantages in 'Ricardo goods' was mainly caused both by a decrease in exports of meal or flour (SITC 047) and raw materials (SITC 681 and 685), and by an increase in import values of solid and liquid fuel (SITC 331 and 321).

**Table 7 RCAs for Major Goods included in Group 4 (Heckscher-Ohlin goods)**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551. Essential oil | x | 0.03 | 13.90 | 12.72 | 12.81 | 6.81 | 5.59 | 7.40 | 6.53 | 2.02 | 1.21 | 1.15 | 0.17 |
| and perfume | m | 0.00 | 0.15 | 0.17 | 0.01 | 0.09 | 0.21 | 0.20 | 0.24 | 0.21 | 0.12 | 0.33 | 0.06 |
| 629. Rubber | x | 0.02 | 0.01 | 0.20 | 2.20 | 1.74 | 2.75 | 0.40 | 0.41 | 0.64 | 0.29 | 0.20 | 2.94 |
| articles | m | 3.40 | 2.83 | 1.48 | 3.24 | 1.72 | 1.67 | 1.52 | 2.34 | 1.08 | 1.48 | 2.35 | 1.36 |
| 651. Textile yarn | x | 0.03 | 0.12 | 0.16 | 0.44 | 0.23 | 0.38 | 0.20 | 0.13 | 0.22 | 0.13 | 0.17 | 1.25 |
| and thread | m | 1.08 | 2.01 | 3.73 | 0.75 | 1.72 | 1.60 | 1.72 | 2.74 | 1.50 | 1.56 | 1.65 | 1.64 |
| 661. Cement, | x | 18.34 | 14.75 | 14.62 | 19.23 | 18.68 | 19.90 | 5.07 | 7.18 | 8.07 | 11.42 | 8.93 | 2.48 |
| building products | m | 0.04 | 0.01 | 0.13 | 0.06 | 0.00 | 0.05 | 0.10 | 0.12 | 0.40 | 0.26 | 1.79 | 0.54 |
| 666. Pottery | x | 10.61 | 7.74 | 6.24 | 6.20 | 2.18 | 2.61 | 5.74 | 4.50 | 5.59 | 1.50 | 1.21 | 0.17 |
| | m | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.02 | 0.03 | 0.29 | 0.01 | 0.04 | 0.04 | 0.11 |
| 672. Iron and steel, | x | 2.42 | 1.47 | 2.50 | 6.98 | 1.02 | 4.76 | 3.30 | 3.71 | 5.10 | 6.39 | 9.64 | 12.38 |
| primary forms | m | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.01 | 0.00 | 0.06 | 0.00 | 0.16 | 0.63 | 2.71 |
| 673. Iron and | x | 17.31 | 16.91 | 8.82 | 10.42 | 9.79 | 14.77 | 22.71 | 22.29 | 19.57 | 12.36 | 5.06 | 0.50 |
| steel shapes | m | 0.01 | 0.05 | 3.27 | 0.06 | 0.53 | 0.89 | 0.07 | 0.20 | 0.12 | 0.07 | 2.94 | 1.02 |
| 841. Clothing, | x | 4.24 | 3.03 | 1.53 | 1.78 | 1.80 | 2.12 | 5.69 | 4.84 | 6.07 | 7.42 | 8.72 | 3.55 |
| non-fur | m | 0.02 | 0.02 | 0.00 | 0.02 | 0.03 | 0.07 | 0.20 | 0.17 | 0.15 | 0.26 | 0.35 | 0.64 |

Sources and note: Same as those of Table 2.

Among the major items of Group 4 (Heckscher-Ohlin goods), North Korea appears to have comparative advantage in SITC 551[essential oil and perfume; especially SITC 5511(essential oils, resinoids)], 661(cement, building products), 666(pottery), 672(iron and steel, primary forms), 673(iron and steel shapes) and 841(clothing, non-fur), while it has comparative disadvantage in SITC 629(rubber articles) and 651(textile yarn and thread) as shown in Table 7. Aside from those items which appear to have conclusive trends, there are several items which play an important role in determining the RCA of Group 4 without any obvious trends: those are SITC 652, 654, 655, and 671. Thus, the gradual increase in the trade of 'Heckscher-Ohlin goods' was caused mainly by an increase in imports of textile yarn and fabric (SITC 652, 654 and 655) and pig iron (SITC 671 and 672) and by an increase in exports of iron and steel (SITC 672) and clothing (SITC 841).

**Table 8 RCAs for Major Goods included in Group 5 (Product-cycle goods)**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 561. Fertilizers, | x | 0.00 | 1.82 | 1.58 | 1.99 | 1.98 | 0.77 | 1.50 | 1.15 | 0.24 | 0.91 | 0.53 | 0.80 |
| manufactured | m | 0.00 | 0.80 | 1.42 | 0.66 | 0.58 | 0.00 | 0.63 | 0.74 | 0.48 | 0.79 | 0.84 | 0.27 |
| 711. Power machine, | x | 0.00 | 0.00 | 0.00 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.08 |
| non-electrical | m | 0.70 | 0.53 | 1.17 | 1.61 | 0.14 | 0.83 | 3.46 | 0.79 | 0.26 | 0.21 | 0.26 | 0.11 |
| 715. Metalworking | x | 3.77 | 5.93 | 5.00 | 2.43 | 0.58 | 0.99 | 0.45 | 0.02 | 0.53 | 2.78 | 2.06 | 0.10 |
| machinery | m | 12.38 | 17.03 | 9.24 | 20.46 | 3.20 | 6.44 | 3.69 | 7.74 | 8.76 | 1.68 | 0.71 | 2.84 |
| 717. Textile and | x | 0.02 | 0.00 | 0.03 | 0.02 | 0.05 | 0.07 | 0.16 | 0.25 | 0.05 | 0.12 | 0.25 | 0.43 |
| leather machinery | m | 3.22 | 7.74 | 5.49 | 0.32 | 1.01 | 1.01 | 0.91 | 3.56 | 2.97 | 2.71 | 8.24 | 1.17 |
| 718. Machines for | x | 0.00 | 0.01 | 0.00 | 0.07 | 0.37 | 0.01 | 0.03 | 0.30 | 0.01 | 0.06 | 0.02 | 0.05 |
| special industries | m | 2.20 | 1.24 | 4.67 | 4.42 | 0.74 | 1.77 | 2.27 | 4.91 | 2.30 | 0.95 | 1.30 | 0.55 |
| 722. Electric power | x | 0.24 | 0.20 | 0.32 | 0.11 | 0.28 | 0.09 | 0.16 | 0.18 | 0.20 | 0.42 | 0.22 | 0.25 |
| machine, switchgear | m | 9.46 | 5.79 | 2.14 | 1.49 | 0.91 | 0.84 | 0.64 | 0.75 | 0.60 | 0.50 | 0.36 | 0.46 |
| 864. Watches | x | 0.00 | 0.00 | 0.07 | 0.09 | 0.12 | 0.16 | 0.14 | 0.03 | 0.44 | 0.20 | 0.17 | 0.16 |
| and clocks | m | 1.46 | 1.39 | 1.04 | 2.08 | 1.19 | 1.46 | 2.29 | 1.56 | 1.15 | 0.47 | 0.39 | 2.25 |

Sources and note: Same as those of Table 2.

Table 8 shows that North Korea had a comparative advantage in SITC 561(fertilizers) during 1972-1984 and had comparative disadvantages in SITC 711(noneletrical power machine), 715(metalworking machinery), 717(textile and leather machinery), 718(machines for special industries), 722(electric power machines) and 864(watches and clocks). An interesting fact found from this table is that the RCAs of all the items in the table, except textile and leather machinery (SITC 717), are declining in terms of both exports and imports. This dual decline indicates that: (a) the trade in 'Product-cycle goods' decreased, relative to the rest of the world; and (b) North Korea especially needed textile and leather machinery. The latter fact, with the previous finding of increases in imports of textile yarn and fabric (SITC 652, 654 and 655) and in exports of clothing (SITC 841) from Table 7, leads us to conclude that North Korea chose clothing as a strategic export item. The latter fact can also be explained as a result of investment from Koreans in Japan which was initiated by the North Korean government's 'Joint Venture Program' to attract foreign investment.

## 2. North Korea's Trade with Non-Communist Countries

In evaluating North Korea's RCAs, there is some weakness in analyzing North Korea's trade with the world for the following reasons. More than half of North Korea's trade with the world included its trade with the communist bloc countries before 1991[7] when trade with the former Soviet Union dropped sharply. However, the terms of trade between North Korea and the communist countries was usually decided, not by economic considerations alone, but also largely by political factors. A considerable part of the data on China and some of data on the former Soviet Union are omitted. The omitted data are probably critical for analyzing North Korea's

7. The shares of North Korea's trade with non-communist countries in total value are as follows;

trade because these countries have been one of the most important trading partners for Pyongyang.

These weaknesses indicate that North Korea's trade patterns can be more accurately analyzed through the study of Pyongyang's trade with non-communist countries. The data on trade with non-communist countries is much more complete and the terms of trade are determined mainly by world prices, which reflect the comparative advantages of North Korean products. Thus, the use of only trade data with non-communist trading partners can be expected to provide more appropriate information on the North Korean economy. Thus, analyzing the RCAs of North Korea only with non-communist data does possess advantages in spite of the fact that the larger portion of North Korea's trade has been with communist countries.

The RCAs for trade with the non-communist countries only are defined as follows:

$$x_{ik.c} = \left(\sum_{n \in G_i} X_{nk.c} \Big/ \sum_{n=1}^{N} X_{nk.c}\right) \Big/ \left(\sum_{n \in G_i} \sum_{t=1}^{T.C} X_{nt} \Big/ \sum_{n=1}^{N} \sum_{t=1}^{T.C} X_{nt}\right), \tag{8}$$

$$m_{ik.c} = \left(\sum_{n \in G_i} M_{nk.c} \Big/ \sum_{n=1}^{N} M_{nk.c}\right) \Big/ \left(\sum_{n \in G_i} \sum_{t=1}^{T.C} M_{nt} \Big/ \sum_{n=1}^{N} \sum_{t=1}^{T.C} M_{nt}\right), \tag{9}$$

$$w_{ik.c} = x_{ik.c} / m_{ik.c}, \tag{10}$$

where $X_{nk.c}$ is the level of North Korea's exports of a commodity n to non-communist countries, $M_{nk.c}$ is the corresponding figure for imports by North Korea. Also T.C is the number of non-communist countries included in the analysis, N is the total number of commodities, and $G_i$ is the group i which contains commodities having a particular property which is defined in Table 1. The numerator in Equations (8) and (9) is the share of exports (imports) of the commodity group i to (from) non-communist countries in North Korea's total exports to (imports from) non-communist countries. The denominator is the share of non-communist countries' exports (imports) of the commodity group i in the total of the non-communist countries' exports (imports). In calculating the RCAs for non-communist countries, because the data for non-communist countries are not available, only the share of world's exports (and imports) of a commodity group in total exports (and imports) are used in place of those of non-communist countries' exports (and imports) on the assumption that the commodity composition of world trade is not significantly different from that of non-communist countries' trade.

**(i) Industry versus Consumers:** Comparing Table 2 with the world data, Table 9 with the data of non-communist countries reveals some differences. The RCAs of exports of industrial goods for consumers (Group 1) to non-communist countries are significantly lower than those to the world. This difference implies that North Korea's exports of industrial goods for consumers

| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | 15.0 | 10.5 | 22.2 | 35.9 | 56.1 | 43.6 | 35.2 | 34.3 | 41.7 | 41.7 | 44.4 | 47.4 |
| Exports | 19.1 | 19.0 | 18.7 | 25.4 | 34.4 | 38.7 | 35.4 | 42.2 | 45.1 | 41.9 | 42.7 | 37.7 |
| | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | |
| Imports | 44.3 | 47.3 | 42.0 | 31.0 | 27.0 | 29.6 | 26.2 | 25.5 | 37.2 | 47.7 | 44.8 | |
| Exports | 24.2 | 29.1 | 31.6 | 23.3 | 24.4 | 31.1 | 33.3 | 30.1 | 48.5 | 75.5 | 82.9 | |

(Group 1) were concentrated in the communist market, and can be explained by the Soviet request to meet its demand of Siberia consumers. As for industrial goods for production (Group 2), Table 7 shows that, even though the result is very inconclusive due to the high value of both x and m, if one pays more attention to the imports side than exports side, then one could say that North Korea has given a comparatively higher priority to industrial goods for production than for consumers.

**Table 9 RCAs for Industrial vs. Consumer Goods: Non-Communist Countries**

| Group | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Industrial | x | 0.13 | 0.21 | 0.31 | 0.63 | 0.90 | 0.54 | 1.90 | 0.97 | 0.46 | 0.66 | 2.20 | 2.61 |
| goods for | m | 0.44 | 0.16 | 0.28 | 0.18 | 0.15 | 0.16 | 0.37 | 0.32 | 0.28 | 0.32 | 0.46 | 0.52 |
| consumers | w | 0.30 | 1.36 | 1.12 | 3.41 | 5.93 | 3.38 | 5.13 | 3.07 | 1.62 | 2.04 | 4.73 | 5.03 |
| 2. Industrial | x | 1.42 | 1.59 | 1.63 | 1.91 | 1.20 | 2.18 | 1.54 | 1.17 | 1.16 | 1.26 | 1.12 | 0.83 |
| goods for | m | 1.29 | 1.09 | 1.42 | 1.68 | 0.91 | 1.33 | 1.00 | 1.21 | 0.97 | 0.83 | 1.08 | 0.77 |
| production | w | 1.10 | 1.46 | 1.15 | 1.13 | 1.31 | 1.64 | 1.53 | 0.97 | 1.20 | 1.52 | 1.03 | 1.08 |

Sources: The United Nations' diskettes of trade data, and various issues of the *Yearbook of International Trade Statistics of the UN and the Vneshniaia torgovlia SSSR* of the Soviet Union.

Table 10 and 11 provide detailed information on major items. As for the Group 1 (industrial goods for consumers), Table 10 shows that North Korea has comparative advantages in SITC 551(essential oil and perfume). Even though the share of SITC 841(clothing, non-fur) has taken up an overwhelming majority on the exports side, North Korea does not appear to have a conclusive comparative advantage in this item until the 1990s. On the imports side, even though soaps and cleaning products (SITC 554) have taken up a significant portion in its imports, North Korea does not appear to have a comparative disadvantage in those items.

**Table 10 RCAs for Major Goods in Group 1: Non-Communist Countries**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551. Essential oil | x | 0.08 | 0.44 | 3.37 | 2.84 | 4.36 | 0.32 | 2.48 | 6.16 | 3.53 | 1.13 | 1.78 | 0.20 |
| and perfume | m | 0.00 | 0.31 | 0.21 | 0.02 | 0.13 | 0.31 | 0.45 | 0.39 | 0.47 | 0.22 | 0.49 | 0.10 |
| 841. Clothing, | x | 0.20 | 0.10 | 0.25 | 0.64 | 1.48 | 0.87 | 2.84 | 0.40 | 0.42 | 1.00 | 3.58 | 4.04 |
| non-fur | m | 0.06 | 0.04 | 0.00 | 0.04 | 0.05 | 0.10 | 0.25 | 0.26 | 0.34 | 0.44 | 0.53 | 0.62 |

Sources: Same as those of Table 9.

Table 11 shows that, among the major items of Group 2 (industrial goods for production), North Korea has comparative advantages in SITC 661(cement, building product), 672(iron and steel, primary forms), 681(silver and platinum), 686(zinc), while it has comparative disadvantages in SITC 715(metalworking machinery), 717(textiles, leather machinery), 718(machinery for special industries), 719(nonelectric machines), 723(electric distributing machinery), 726(electro-medical X-ray equipment) and 729(electrical machinery). This means that North Korea has comparative advantages in less sophisticated industrial products such as raw materials (SITC 681 and 686) and its related manufactures (SITC 661 and 672) and disadvantages in modern machinery (SITC 715, 717, 718, 719, 723, 726 and 729).

**Table 11 RCAs for Major Goods in Group 2: Non-Communist Countries**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 661. Cement, | x | 1.12 | 4.21 | 14.4 | 17.8 | 23.9 | 27.3 | 4.3 | 2.25 | 3.93 | 0.35 | 8.00 | 0.82 |
| building product | m | 0.17 | 0.02 | 0.16 | 0.09 | 0.00 | 0.08 | 0.16 | 0.20 | 0.90 | 0.60 | 0.81 | 0.78 |
| 672. Iron and steel, | x | 7.95 | 4.46 | 4.65 | 11.0 | 1.56 | 7.87 | 8.59 | 9.55 | 14.2 | 16.6 | 17.3 | 2.64 |
| primary forms | m | 0.00 | 0.00 | 0.16 | 0.00 | 0.01 | 0.01 | 0.00 | 0.02 | 0.00 | 0.37 | 1.25 | 1.72 |
| 681. Silver and | x | 31.3 | 28.2 | 25.2 | 29.1 | 12.8 | 23.8 | 39.7 | 22.2 | 11.3 | 8.89 | 1.59 | 0.97 |
| Platinum | m | 0.02 | 0.00 | 0.00 | 0.06 | 0.01 | 0.06 | 0.48 | 0.41 | 0.47 | 0.06 | 0.06 | 0.04 |
| 686. Zinc | x | 58.5 | 117 | 79.5 | 94.6 | 44.1 | 65.7 | 69.3 | 51.6 | 99.5 | 106 | 102 | 30.4 |
| | m | 0.00 | 0.02 | 0.00 | 0.03 | 4.08 | 0.53 | 0.79 | 2.04 | 0.36 | 0.24 | 0.11 | 0.37 |
| 715. Metalworking | x | 0.23 | 0.32 | 0.13 | 0.18 | 0.06 | 0.04 | 0.09 | 0.01 | 0.01 | 0.13 | 1.40 | 0.11 |
| machinery | m | 13.9 | 1.25 | 2.65 | 26.7 | 1.1 | 6.05 | 3.87 | 4.26 | 1.23 | 1.84 | 0.98 | 4.81 |
| 717. Textile, leather | x | 0.07 | 0.00 | 0.06 | 0.04 | 0.08 | 0.11 | 0.42 | 0.63 | 0.13 | 0.34 | 0.46 | 0.49 |
| machinery | m | 12.1 | 15.4 | 6.33 | 0.37 | 1.43 | 0.94 | 0.97 | 0.82 | 1.74 | 1.88 | 2.92 | 1.49 |
| 718. Machinery for | x | 0.00 | 0.04 | 0.00 | 0.12 | 0.57 | 0.02 | 0.07 | 0.78 | 0.03 | 0.16 | 0.02 | 0.05 |
| special industries | m | 0.48 | 0.42 | 5.51 | 6.70 | 1.08 | 2.29 | 2.40 | 4.39 | 3.48 | 1.23 | 2.21 | 0.84 |
| 719. Nonelectric | x | 0.01 | 0.00 | 0.01 | 0.02 | 0.20 | 0.09 | 0.17 | 0.13 | 0.04 | 0.06 | 0.44 | 0.43 |
| machines | m | 1.54 | 2.82 | 4.01 | 1.72 | 1.67 | 1.84 | 1.42 | 1.86 | 1.71 | 1.83 | 1.48 | 1.24 |
| 723. Electric distri- | x | 0.00 | 0.37 | 0.09 | 0.43 | 6.05 | 0.68 | 0.43 | 0.40 | 0.56 | 0.10 | 0.06 | 0.20 |
| buting machinery | m | 1.98 | 3.26 | 2.74 | 1.84 | 3.86 | 1.56 | 0.93 | 2.48 | 1.65 | 0.93 | 0.58 | 0.38 |
| 726. Electro-medical | x | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.02 | 0.67 |
| X-ray equipment | m | 0.48 | 0.27 | 0.95 | 3.49 | 0.63 | 1.80 | 2.29 | 3.40 | 0.49 | 1.34 | 2.61 | 1.37 |
| 729. Electrical | x | 0.01 | 0.10 | 0.09 | 0.09 | 0.22 | 0.22 | 0.63 | 0.88 | 0.64 | 0.88 | 0.31 | 0.53 |
| machinery | m | 2.41 | 0.82 | 1.18 | 1.82 | 0.67 | 1.31 | 1.22 | 1.14 | 1.24 | 0.90 | 1.12 | 0.38 |

Sources: Same as those of Table 9.

Even though the RCAs of Group 2 for non-communist countries are not evidently different from that of the whole world, a closer look shows that North Korea's imports of modern machinery relied more heavily on non-communist countries than on its communist allies. And it becomes more clear that, in North Korea's trade with non-communist countries, North Korea has put a high priority on industrial goods for investment (capital goods) when one accepts Watanabe and Kajiwara (1983)'s classification for capital goods.

**(ii) Technological Levels:** Table 12 illustrates that North Korea has a comparative advantage in the selected goods with a high natural resource content ('Ricardo goods'). North Korea's comparative advantage in 'Ricardo goods' appears to be more clear and more lasting in its trade with non-communist countries than in its trade with the whole world, even though the degree of comparative advantage has been decreasing since the mid-1970s. On the other hand, North Korea has had a comparative disadvantage in 'Product-cycle goods.' This disadvantage appears to be clearer and stronger than that of North Korea's trade with the world. The degree of comparative disadvantage on those goods with high technology (Product-cycle goods) declined, partly because North Korea was forced to curtail imports of 'Product-cycle goods' after 1978 due to its default problems. The portion of 'Heckscher-Ohlin goods' in total trade was increased,

especially during the latter half of the 1970s.[8] It is not clear whether North Korea had a comparative advantage in 'Heckscher-Ohlin goods' *vis a vis* non-communist countries because the RCAs in general are not significantly greater than 1.

Considering those results together, one might find that North Korea's stress upon exports has been steadily passed from 'Ricardo goods' to 'Heckscher-Ohlin goods' and 'Product-cycle goods.' In this context, one might conclude that North Korea has tried continuously to improve its technology and economic structure during 1970-1992, in spite of the severe foreign debt problem. Recognizing, however, that, until late 1980s, North Korea had a comparative advantage in 'Ricardo goods' and did not have a conclusive comparative advantage in 'Heckscher-Ohlin goods,' one cannot conclude that North Korea succeeded in improving its technology and economic structure during this period. Note that this conclusion is different from the conclusion of the trade with the world where North Korea seems to have, in some measure, succeeded in improving the structure of its economy. It is my view, however, that North Korea's trade with only the non-communist countries could provide more accurate information on North Korea's economy in the past, and will serve as a better indicator of the future perspective in the world without its communist allies.

**Table 12 RCAs by Technological Level: Non-Communist Countries**

| Group | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3. Ricardo goods | x | 2.07 | 2.28 | 1.97 | 1.38 | 1.01 | 1.22 | 1.18 | 1.41 | 1.62 | 1.48 | 1.61 | 0.63 |
| | m | 0.52 | 0.65 | 0.70 | 0.58 | 0.74 | 0.70 | 0.86 | 0.77 | 1.15 | 1.18 | 0.89 | 0.90 |
| | w | 4.00 | 3.50 | 2.80 | 2.38 | 1.37 | 1.74 | 1.37 | 1.83 | 1.41 | 1.25 | 1.82 | 0.70 |
| 4. Heckscher-Ohlin goods | x | 0.56 | 0.39 | 0.63 | 1.14 | 1.24 | 1.50 | 1.15 | 0.92 | 0.77 | 0.82 | 1.02 | 1.60 |
| | m | 0.55 | 0.99 | 1.08 | 0.67 | 0.91 | 1.06 | 0.97 | 1.00 | 0.90 | 0.80 | 1.10 | 1.11 |
| | w | 1.01 | 0.40 | 0.58 | 1.71 | 1.37 | 1.42 | 1.19 | 0.92 | 0.86 | 1.02 | 0.93 | 1.44 |
| 5. Product-cycle goods | x | 0.03 | 0.17 | 0.13 | 0.15 | 0.31 | 0.12 | 0.19 | 0.28 | 0.25 | 0.28 | 0.26 | 0.33 |
| | m | 2.18 | 1.46 | 1.39 | 2.39 | 1.01 | 1.04 | 1.06 | 1.26 | 1.07 | 0.91 | 0.86 | 0.93 |
| | w | 0.02 | 0.12 | 0.09 | 0.06 | 0.31 | 0.11 | 0.18 | 0.22 | 0.23 | 0.31 | 0.30 | 0.36 |

Sources: Same as those of Table 9.

Table 13, 14 and 15 show that the RCAs of major items through which one hopes to find some other useful information on North Korea's economy. In Table 13 for the Group 3 (Ricardo goods), North Korea appears to have comparative advantages in SITC 054(vegetables, fresh and simply preserved), 261(silk), 681(silver and platinum), 685(lead) and 686(zinc), while it has comparative disadvantages in SITC 041(wheat, unmilled), 263(cotton), and 421(fixed vegetable oils). The gradual decline of comparative advantage in 'Ricardo goods' was mainly caused by

8. The shares in total trade: non-communist countries

(unit: percent)

| Group | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3. Ricardo goods | 37.6 | 33.7 | 36.4 | 30.3 | 27.8 | 32.8 | 28.9 | 27.3 | 27.9 | 25.5 | 23.7 | 12.7 |
| 4. Heckscher-Ohlin goods | 16.8 | 25.2 | 25.9 | 24.0 | 32.8 | 33.0 | 30.8 | 27.5 | 28.4 | 26.8 | 35.2 | 49.6 |
| 5. Product-cycle goods | 21.8 | 20.2 | 19.3 | 27.8 | 12.1 | 11.5 | 15.1 | 20.9 | 18.3 | 16.6 | 15.4 | 15.4 |

a decrease in exports of raw materials (SITC 681 and 685). Being compared with the result from the world data, this result is different in such items as: SITC 047(meal or flour, non-wheat), in which North Korea has had an advantage in trade with the world; SITC 321 and 331(solid and liquid fuel), where North Korea has had disadvantages in the trade with the world. This difference indicates that North Korea's exports of non-wheat meal or flour and imports of solid and liquid fuel are concentrated on the communist countries. The imports of crude petroleum (SITC 331) were concentrated especially on the former Soviet Union and China until the early of the 1990s because of their offering friendly prices to North Korea.

**Table 13 RCAs for Major Goods in Group 3: Non-Communist Countries**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 041 Wheat, unmilled | x | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | m | 10.3 | 11.2 | 9.04 | 11.9 | 8.53 | 10.6 | 13.4 | 0.87 | 11.8 | 12 | 10.7 | 5.14 |
| 054 Vegetable, fresh | x | 0.04 | 1.25 | 0.77 | 2.63 | 4.04 | 2.7 | 7.71 | 12.8 | 10.1 | 5.45 | 13.3 | 3.62 |
| & simply preserved | m | 0.00 | 0.00 | 0.05 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 2.19 | 0.07 | 0.4 | 0.05 |
| 261. Silk | x | 22.8 | 55.9 | 502 | 602 | 289 | 713 | 1007 | 460 | 407 | 73.9 | 168 | 53.4 |
| | m | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.1 | 0.22 | 3.78 | 0.00 | 0.27 | 5.2 | 5.97 |
| 263. Cotton | x | 0.00 | 0.00 | 0.07 | 0.00 | 0.01 | 0.01 | 0.00 | 0.07 | 0.07 | 0.01 | 0.00 | 2.22 |
| | m | 3.19 | 1.31 | 3.11 | 2.91 | 8.81 | 8.54 | 11.4 | 15.2 | 25.5 | 4.2 | 3.65 | 0.26 |
| 421. Fixed | x | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| vegetable oils | m | 0.77 | 0.49 | 2.21 | 0.99 | 2.53 | 3.81 | 8.13 | 5.54 | 6.24 | 6.02 | 4.59 | 8 |
| 681. Silver and | x | 31.3 | 28.2 | 25.2 | 29.1 | 12.8 | 23.8 | 39.7 | 22.2 | 11.3 | 8.89 | 1.59 | 0.97 |
| Platinum | m | 0.02 | 0.00 | 0.00 | 0.06 | 0.01 | 0.06 | 0.48 | 0.41 | 0.47 | 0.06 | 0.06 | 0.04 |
| 685. Lead | x | 78.2 | 112 | 76.4 | 159 | 59.8 | 98 | 114 | 110 | 82.2 | 34.7 | 21.2 | 20.1 |
| | m | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.1 | 4.05 | 6.13 | 18.2 | 8.41 | 3.54 | 1.73 |
| 686. Zinc | x | 58.5 | 117 | 79.5 | 94.6 | 44.1 | 65.7 | 69.3 | 51.6 | 99.5 | 106 | 102 | 30.4 |
| | m | 0.00 | 0.02 | 0.00 | 0.03 | 4.08 | 0.53 | 0.79 | 2.04 | 0.36 | 0.24 | 0.11 | 0.37 |

Sources: Same as those of Table 9.

Since it is not clear whether or not North Korea has had a comparative advantage in 'Heckscher-Ohlin goods,' it will be helpful to look into the Group for understanding this inconclusiveness. Table 14 shows that North Korea has had comparative advantages in SITC 551(essential oil and perfume), 661(cement, building products), and 672(iron and steel, primary forms), while it has had comparative disadvantages in SITC 651(textile yarn and thread), 678(iron, steel tubes and pipe) and 691(metal structure and parts).

Inconclusive trends for Group 4 in North Korea's trade with non-communist countries are caused mainly by several items which are not shown on Table 14. Those are SITC 653(woven textiles, noncotton), 671(pig iron) and 732(road motor vehicle). Because those items have taken up important roles in Group 4 and their RCAs show inconclusive trends, they could contribute to the inconclusiveness of Group 4. The reason why they do not have conclusive trends are as follows: (1) SITC 671 (one of leading items in exports) and SITC 653 (one of leading items in imports) have high measures of RCAs in both the export and import sides; (2) SITC 732 (one of leading items in imports) has low measures of RCAs on the import side.

**Table 14 RCAs for Major Goods in Group 4: Non-Communist Countries**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551. Essential oil | x | 0.08 | 0.44 | 3.37 | 2.84 | 4.36 | 0.32 | 2.48 | 6.16 | 3.53 | 1.13 | 1.78 | 0.20 |
| and perfume | m | 0.00 | 0.31 | 0.21 | 0.02 | 0.13 | 0.31 | 0.45 | 0.39 | 0.47 | 0.22 | 0.49 | 0.10 |
| 651. Textile yarn | x | 0.09 | 0.36 | 0.29 | 0.79 | 0.35 | 0.63 | 0.66 | 0.34 | 0.62 | 0.36 | 0.31 | 1.38 |
| and thread | m | 2.64 | 3.45 | 4.41 | 0.73 | 2.16 | 2.04 | 2.33 | 1.92 | 2.24 | 1.36 | 2.95 | 2.49 |
| 661. Cement, | x | 1.12 | 4.21 | 14.4 | 17.8 | 23.9 | 27.3 | 4.30 | 2.25 | 3.93 | 0.35 | 8.00 | 0.82 |
| building products | m | 0.17 | 0.02 | 0.16 | 0.09 | 0.00 | 0.08 | 0.16 | 0.20 | 0.90 | 0.60 | 0.81 | 0.78 |
| 672. Iron and steel, | x | 7.95 | 4.46 | 4.65 | 11.0 | 1.56 | 7.87 | 8.59 | 9.55 | 14.2 | 16.6 | 17.3 | 2.64 |
| primary forms | m | 0.00 | 0.00 | 0.16 | 0.00 | 0.01 | 0.01 | 0.00 | 0.02 | 0.00 | 0.37 | 1.25 | 1.72 |
| 678. Iron, steel | x | 0.03 | 0.09 | 0.02 | 0.33 | 0.63 | 2.66 | 0.77 | 0.46 | 0.60 | 0.33 | 0.18 | 0.41 |
| tubes and pipe | m | 0.18 | 2.93 | 3.78 | 0.93 | 1.23 | 4.18 | 2.55 | 3.05 | 0.61 | 0.44 | 1.13 | 0.87 |
| 691. Metal structure | x | 0.00 | 0.29 | 0.29 | 0.91 | 5.04 | 3.54 | 3.03 | 0.61 | 0.63 | 0.05 | 0.06 | 0.16 |
| and parts | m | 0.06 | 0.17 | 3.43 | 4.43 | 1.95 | 3.01 | 1.17 | 3.81 | 2.20 | 1.48 | 1.93 | 0.67 |

Sources: same as those of Table 9.

As for the Group 5 (Product-cycle goods), Table 15 shows that North Korea has a comparative advantage in SITC 561(fertilizers), while it has comparative disadvantages in SITC 512(organic chemicals), 581(plastic materials), 715(metalworking machinery), 717(textile and leather machinery), 718(machines for special industries), 722(electric power machine), 723(electric distributing machinery), 726(electro-medical X-ray equipment), and 729(electrical machinery). Compared with the results from the world data, one realizes that, in the trade with non-communist countries, North Korea has comparative disadvantages in machinery (capital goods) with more items. This difference indicates that North Korea has heavily depended on non-communist countries for importing capital goods.

As shown in its trade with the world, the RCAs for major import items of Group 5 appear to have declined except SITC 717 and 726. This decline can be explained by a serious deficiency faced by North Korea in foreign currency. Considering this deficiency, one can easily recognize the importance of importing SITC 717 and 726. The importance of SITC 717 can be understood in the same way as commented in the analysis of the RCAs for North Korea's trade with the world.[9]

**Table 15 RCAs for Major Goods in Group 5: Non-Communist Countries**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 512. Organic | x | 0.00 | 0.02 | 0.02 | 0.06 | 0.09 | 0.02 | 0.05 | 0.20 | 0.12 | 0.06 | 0.15 | 0.42 |
| chemicals | m | 0.75 | 1.15 | 0.49 | 1.01 | 1.86 | 1.60 | 2.19 | 2.69 | 3.35 | 0.94 | 1.13 | 2.17 |
| 561. Fertilizers, | x | 0.00 | 1.85 | 2.03 | 1.79 | 2.34 | 0.58 | 2.15 | 0.94 | 0.00 | 0.03 | 0.42 | 0.21 |
| manufactured | m | 0.00 | 0.00 | 0.34 | 1.03 | 0.90 | 0.00 | 0.11 | 0.00 | 0.08 | 0.86 | 0.00 | 0.00 |
| 581. Plastic | x | 0.00 | 0.64 | 0.15 | 0.25 | 0.27 | 0.37 | 0.25 | 0.88 | 0.78 | 0.60 | 0.28 | 0.68 |
| materials | m | 2.78 | 1.99 | 0.75 | 2.75 | 3.80 | 0.93 | 1.32 | 1.20 | 1.14 | 2.59 | 0.79 | 1.04 |

9. North Korea might choose clothing as a strategic export item.

**Table 15 (Continued)**

| SITC code | Type | 1970 | 1972 | 1974 | 1976 | 1978 | 1980 | 1982 | 1984 | 1986 | 1988 | 1990 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 715. Metalworking | x | 0.23 | 0.32 | 0.13 | 0.18 | 0.06 | 0.04 | 0.09 | 0.01 | 0.01 | 0.13 | 1.40 | 0.11 |
| machinery | m | 13.9 | 1.25 | 2.65 | 26.7 | 1.10 | 6.05 | 3.87 | 4.26 | 1.23 | 1.84 | 0.98 | 4.81 |
| 717. Textile and | x | 0.07 | 0.00 | 0.06 | 0.04 | 0.08 | 0.11 | 0.42 | 0.63 | 0.13 | 0.34 | 0.46 | 0.49 |
| leather machinery | m | 12.1 | 15.4 | 6.33 | 0.37 | 1.43 | 0.94 | 0.97 | 0.82 | 1.74 | 1.88 | 2.92 | 1.49 |
| 718. Machines for | x | 0.00 | 0.04 | 0.00 | 0.12 | 0.57 | 0.02 | 0.07 | 0.78 | 0.03 | 0.16 | 0.02 | 0.05 |
| special industries | m | 0.48 | 0.42 | 5.51 | 6.70 | 1.08 | 2.29 | 2.40 | 4.39 | 3.48 | 1.23 | 2.21 | 0.84 |
| 722. Electric power | x | 0.01 | 0.01 | 0.03 | 0.08 | 0.35 | 0.06 | 0.23 | 0.48 | 0.55 | 0.26 | 0.14 | 0.26 |
| machine, switchgear | m | 3.00 | 0.87 | 2.11 | 2.05 | 1.07 | 0.74 | 0.83 | 0.93 | 1.03 | 0.90 | 0.61 | 0.78 |
| 723. Electric distri- | x | 0.00 | 0.37 | 0.09 | 0.43 | 6.05 | 0.68 | 0.43 | 0.40 | 0.56 | 0.10 | 0.06 | 0.20 |
| buting machinery | m | 1.98 | 3.26 | 2.74 | 1.84 | 3.86 | 1.56 | 0.93 | 2.48 | 1.65 | 0.93 | 0.58 | 0.38 |
| 726. Electro-medical | x | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.02 | 0.67 |
| X-ray equipment | m | 0.48 | 0.27 | 0.95 | 3.49 | 0.63 | 1.80 | 2.29 | 3.40 | 0.49 | 1.34 | 2.61 | 1.37 |
| 729. electrical | x | 0.01 | 0.10 | 0.09 | 0.09 | 0.22 | 0.22 | 0.63 | 0.88 | 0.64 | 0.88 | 0.31 | 0.53 |
| machinery | m | 2.41 | 0.82 | 1.18 | 1.82 | 0.67 | 1.31 | 1.22 | 1.14 | 1.24 | 0.90 | 1.12 | 0.38 |

Sources: Same as those of Table 9.

**Table 16 Summary of the RCAs for Major Goods in North Korea's Trade**

| Trade with the world | | Trade with non-communist countries | |
|---|---|---|---|
| Comparative advantage | Comparative disadvantage | Comparative advantage | Comparative disadvantage |
| Animal products (SITC 031, 032, 292). | Fuels (SITC 321,331). | Animal products (SITC 031, 032, 292). | Machinery (SITC 715, 717, 718, 719, 723, 726, 729, 731). |
| Raw materials (SITC 276, 681, 685, 686). | Machinery (SITC 715, 717 718, 719, 723 726, 731, 864). | Raw materials (SITC 276, 681, 685, 686). | Chemicals (SITC 512, 581, 599). |
| Labor-intensive products (SITC 661, 663, 666, 841, 851). | | | Capital-intensive products (SITC 651, 678, 691). |

Note: The classification of commodity is basically adopted from Leamer (1984).

## V. Summary

According to the literature on international trade, the trade patterns of a country reflect the process of development. In the poorest and least technologically developed countries, 'Ricardo goods,' which use natural resources intensively in production, play a major role in net exports. Then, as the ability to implement industrial technology rises, net exports begin to reflect a shift toward 'Heckscher-Ohlin goods,' the goods using relatively more standard technology. Finally, when a country becomes advanced, net exports reflect the implementation of advanced technologies - 'Product-cycle goods.'

The empirical results of the RCAs for North Korean trade with the whole world show that North Korea has achieved success in improving the economic structures from 'Ricardo goods'

to 'Heckscher-Ohlin goods' (see Table 5). Also, one can find a decrease in the RCAs for imports of capital goods especially after 1986 (see Table 2 and 4). This decline can be explained by two ways: (1) the foreign debt problem restricted the imports of capital goods; (2) Pyongyang decided to concentrate its energy on the 'Heckscher-Ohlin goods' rather than 'Product-cycle goods.'

Looking into the results of the RCAs for North Korean trade with non-communist countries, one could not find any clear sign of North Korea's success in improving its economic structure (see Table 12). Other findings are that North Korea's exports of consumer goods is concentrated on the communist market and its imports of production goods is concentrated on the non-communist sources (see Table 9 and 11). These concentrations can be explained by the low quality (competition) of the consumers goods produced in North Korea and high quality of the production goods produced by the Western countries.

Considering the results of both trade with non-communist countries only and with the whole world, one can draw the conclusion that: (1) North Korea has tried to improve its economic structure; (2) its key group has been changed from the goods using natural resources intensively in production to the goods using relatively standard technology; (3) for the foreseeable future, it seems that it will be difficult for North Korea to enter the more advanced stage, where the goods using advanced technology are taking a significant portion in the trade.

Reviewing the RCAs for major items, one can obtain several findings. Table 16 summarizes these findings: (1) North Korea appears to have comparative advantages in animal products and raw materials and have a disadvantage in machinery in general; (2) North Korea's comparative advantage in labor-intensive products and disadvantage in fuel is shown only in its trade with the world; (3) North Korea's disadvantage in chemicals and capital-intensive products appears only in its trade with the non-communist countries. What these findings mean is that the nature of North Korea's trade is different between that with the world and that with non-communist countries. In other words, North Korea exports labor-intensive products to, and imports fuels from, mainly the communist countries, while it imports chemicals and capital-intensive products mainly from the non-communist countries.

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