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**“Flying Geese” Paradigm: Review, Analytical Tool and Application**

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# “Flying Geese” Paradigm: Review, Analytical Tool and Application

## Abstract

The “flying geese” (FG) pattern is one of the well-recognized models to be strongly considered in explaining economic development in the East Asian region. This paper scrutinizes the flying geese (FG) pattern in East Asia. *Firstly*, the evolution of FG concept starting from the original Akamatsu’s concept to the modern one is briefly discussed. *Secondly*, this paper develops an analytical tool namely “products mapping” which is constructed by combining two fundamental variables derived from the FG concept i.e. comparative advantage and trade balance. *Thirdly*, this paper applies the analytical tool in the case of Japan and Indonesia.

*Keywords: Flying geese, Comparative advantage, Trade balance`*

*JEL classification: F10, F14, F17.*

## 1. Introduction

The mainstream theory in international economics (for an example Heckscher-Ohlin model<sup>1</sup>) imposes very strict assumptions that production of each commodity follows constant return to scale (CRS) and the markets for commodities and factors are perfect competitive ones. However, those assumptions are difficult to fulfill in the real world. Some new approaches relaxing several assumptions have emerged such as the imitation lag hypothesis (Posner, 1961), the flying geese paradigm (Akmatsu, 1961), the product cycle theory (Vernon, 1966), the Linder theory (1961), the gravity model (Tinbergen, 1962) the Krugman model (Krugman, 1979), and the reciprocal dumping model (Brander, 1981; Brander and Krugman, 1983), among others. The existence of

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<sup>1</sup> Heckscher-Ohlin model assumes two countries-two homogenous goods-two homogenous factors of production (2x2x2 model), identical technology, constant return to scale (CRS), different factor intensities, identical tastes and preferences (utility functions), perfect competition markets, perfect mobility of factors of production within country and perfect immobility between two countries, zero transportation costs, and no trade barriers or any policy restrictions.

widespread economies of scale may be obtainable from different sizes of plants. Market distortions, which are represented by tariff and non-tariff barriers, still exist widely. Starting from the 1960-s, the discourse about economies of scale and imperfect competition in the theory of international trade has taken much attention. Verdoorn (1960), Balassa (1963, 1966) and Grubel (1967), among others, examined the effects of tariff reductions on the pattern of specialization.

The “flying geese” (FG) pattern is one of the well-recognized models to be strongly considered in explaining economic development in the East Asian region. The model was firstly introduced by Kaname Akamatsu in the 1930s, as an analogous sequential development or catching-up process of manufacturing industries in developing countries (Kojima, 2000; Ozawa, 2001; Kwan, 2002; Kasahara, 2004). In Japanese, the FG paradigm is called the *ganko keitai* (a flock of flying geese). The paradigm tries to explain the phenomenon of industrial development in the catching-up economies. The FG concept was originally coined by Kaname Akamatsu in 1930s and he wrote his works in Japanese so that the concept was not so popular among non-Japanese scholars. After his publication in English during 1960s together with the popularity of product life cycle (PLC) by Raymond Vernon (1966), the FG paradigm has become popular one. Afterward, the FG concept has been greatly developed and modified by some Japanese scholars including Kojima and Ozawa who were Akamatsu’s students (Kasahara, 2004). It is sometime referred as the modern “multi-sequentialist” FG model.

This paper is addressed to review the concepts of the FG theorem and to derive an analytical tool which is suitable to analyze the FG pattern. It is argued that there two crucial variables in the FG paradigm i.e. comparative advantage and catch-up level. By

using two corresponding indicators i.e. Revealed Symmetric Comparative Advantage (RSCA) (Laursen, 1998) and Trade Balance Index (TBI) (Laffay, 1992), this paper construct a analytical tool namely “products mapping”. The analytical tool is then applied to analyze Japan as the lead goose and Indonesia as one of the follower geese. The rest of this paper is organized as follows. Part 2 describes the Akamatsu’s original model of flying geese. Part 3 discusses the modern multi-sequentialist concept. Part 4 shows some previous empirical findings. Part 5 exhibits the proposed analytical tool for the FG paradigm. The analytical tool is then applied to analyze the Indonesian export groups of products and the results are presented in Part 6. Finally, some conclusions are presented in Part 7.

## **2. The Akamatsu’s original model of flying geese**

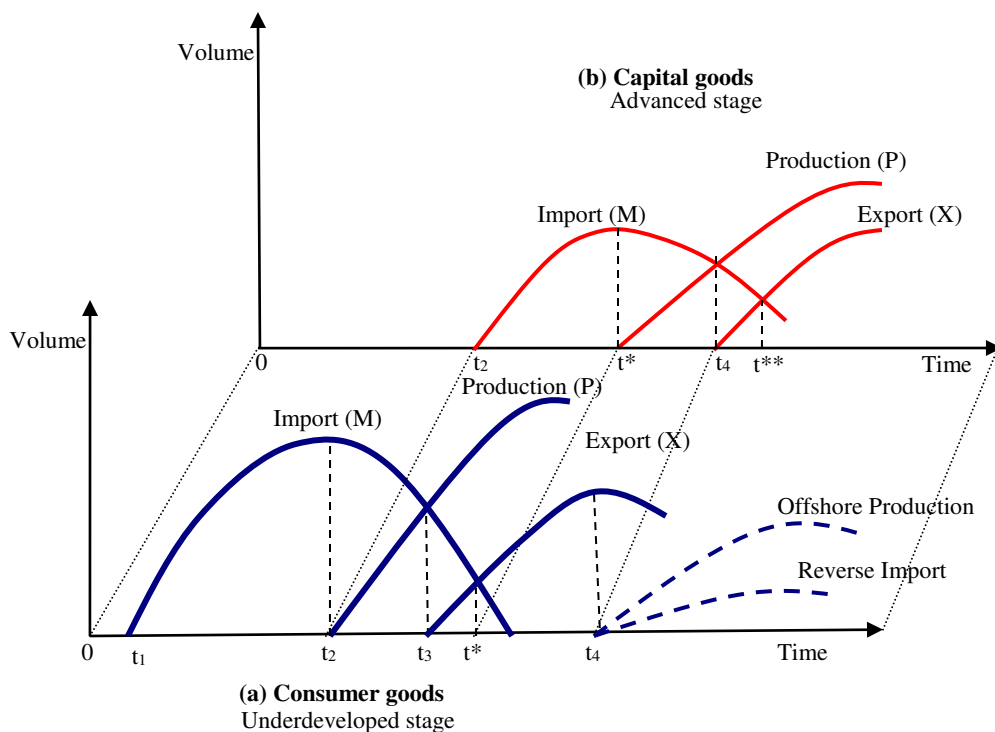
Akamatsu (1962) argued that the economic growth of developing countries must consider mutual interactions between developing countries and advanced countries. He mentioned seven historical stages of the economic growth in developing countries i.e. (a) the development of native (handicraft) industry, (b) the flow of manufactured goods from advanced countries, (c) the infiltration of capital and techniques for large-scale production of *primary* products, (d) the establishment modern industries including the industries processing raw materials, (e) the increased participation of native capital to run the industries processing native raw materials, (f) the native industries handling manufactured goods in general, and (g) the industrialization of the developing countries

becoming advanced. The essence of the FG model then might be given by directly citing the original Akamatsu's argument:

The wild-geese-flying pattern of industrial development denotes the development after the less-advanced country's economy enters into an international economic relationship with the advanced countries. This theory leaves out of consideration the period during which less-advanced countries are in the stage of a closed self-sufficient economy or during which there is no international trade of any significance with a neighboring country, since their economic structure are homogenous with each other. A sort of formula for the industrial development of less-advanced countries after they have opened trade ports and entered into large-scale trade relations with the advanced Western European countries is the hereby termed wild-geese-flying pattern of industrial development. (Akamatsu, 1962: p.11).

The basic pattern of development of industry is illustrated like the wild-geese-flying in orderly rank and forming an inverse V, just as airplane in shape. Figure 1 shows the Akamatsu's FG concept. Akamatsu mentioned four stages of the fundamental of FG pattern that was developed in the historical context of the Euro-American as leader and Asian as follower (Kasahara, 2004; Kojima, 2000). *First stage*: the industries might be classified into several categories. Manufactured consumer goods are imported from advanced countries (started from  $t_1$  in Panel a). Some products (*primary* products for example) are exported by less-advanced countries. In this stage, imported manufactured product may have a negative consequence on the native handicraft industry of the less-advanced countries due to the substitution effect.

When an underdeveloped nation first enters the international economy, the primary products, which are her specialties, are exported and industrial products for consumption are imported from advanced nations. [Because the later's more advanced factory products are superior in quality and cheaper in price.] (Akamatsu, 1961, pp. 206)



Source: Author's modification from Kojima (2000).

**Figure 1. The Akamatsu's Original FG Paradigm**

*Second stage:* the actual production of the imported manufactured goods (import-substitution strategy) exists (started from time  $t_2$  in Panel a). The import of consumer goods increases from time  $t_1$  to  $t_2$ . The domestic demand becomes large enough to reach the economies of scale. It is therefore possible for the domestic production to start (at  $t_2$  in Panel a). At the same time, the country must also import capital goods (started from  $t_2$  in Panel b). In the case of Japan, not only capital goods such as machinery but also raw materials must be imported (Akamatsu, 1962). In this stage, there will be competition between imported consumer goods and domestic production. By using infant industry arguments, the government sometimes must protect the domestic industry through subsidy, import tariff, etc.

In the process of recovering the domestic market, there will arise a struggle of economic nationalism in less-advanced countries. This presupposes the accumulation of capital and the technological adaptability of the people in those countries. Further, it calls for the government's protective policy to encourage and promote the consumer goods industries. (Akamatsu 1962 pp.13).

*Third stage:* the domestic consumer goods industry develops into the export industry (started from  $t_3$  in Panel a). At time  $t^*$ , trade in consumer goods is in the equilibrium or trade balance (Export=Import) and domestic production equals domestic demand (since domestic demand = domestic production – export + import). This stage implies a successful implementation of the catching-up process of the industry concerned along the sequential path import-production-export (M-P-E) which is the basic pattern of the FG model (Kojima, 2000)<sup>2</sup>. In addition, the industry metamorphoses from import-substitution industry toward export-led growth industry. The consumer goods industry is already homogenized with that of advanced countries. Therefore, the country has not been less-advanced country in these goods.

*Fourth stage:* the advanced status in consumer goods industry is further elevated. It is shown by the decrease of export in consumer goods (started from  $t_4$  in Panel a) meanwhile capital goods are started to be exported (started from  $t_4$  in Panel b). The decrease export in consumer goods happens due to the fact that consumer goods production is put in other less-developed countries (Offshore production depicted by broken line in panel a). In addition, it is possible that the reverse import exists.

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<sup>2</sup> This is why this research applies trade balance (net-importer or net-exporter) as one crucial variable in the analytical tool which is developed in part 3. By using trade balance, we can firmly assert the position of a specific country i.e. whether it lays in the period  $t_1t^*$  (net importer),  $t^*t_4$  (net exporter) or beyond as a net importer (due to the reverse import).



.....due to the high wages make the import of consumer goods from less-advanced countries more profitable. Thereupon, what had been imported from advanced countries in the early development stages of less-advanced countries are now, conversely, exported to advanced countries from the less advanced countries. ...The wild-geese-flying pattern sees its completion in the fourth stage, with respect to capital goods such as machinery, by going through the importation beginning from the second stage, the initiation of domestic production in third stage, and switch over to export in the fourth stage. Here, domestic industrialization is also achieved for the capital goods industry. (Akamatsu, 1962, pp.16)

The FG pattern does not only happen in the capital goods industry following the consumer goods industry but also in the progression from crude and simple goods to complex and refined goods. According to Akamatsu (1962), the products (industries) diversification is then classifiable into two patterns i.e. intra-industry and inter-industry cycles. The former is created by the emergence of new product groups within each industrial sector, i.e. from cotton to woolen to synthetic textiles, or from crude and simple goods to complex and refined goods. The latter exhibits the development of new industry, for example from textiles to steel to shipbuilding to auto to computer, or from consumer goods to capital goods. The latter also shows the level of development of any national economy (Kasahara, 2004). Either intra-industry or inter-industry cycle repeats the FG pattern (import-production-export) enhancing competitiveness and efficiency of an industry through the “rationalization” of production. Meanwhile, a diversification of production through inter-industry cycle upgrades the structure of industries and exports. As a result, the parallel progress and interaction between rationalization and diversification of production could stimulate national development (Kojima, 2000).

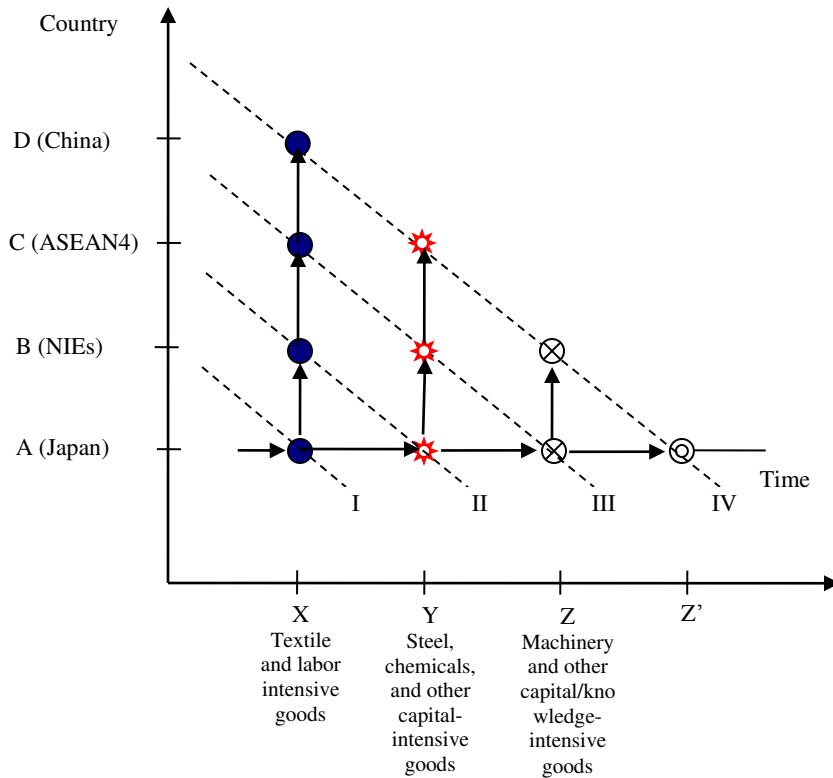
### **3. The modern “multi-sequentialist” concept**

The modern FG paradigm considers the sequential transformation of economic activities from industrialized countries to less industrialized countries through the increasing role of transnational corporations (TNCs: by sub-contracting, licensing agreement, joint venture, foreign direct investment, etc.) in parallel with the dynamic shifting in comparative advantage pattern. Ozawa (1991) stated three types of orderly sequencing of economic activities –“multi-sequentialist”- within and among a group of national economies (as summarized by Kasahara (2004)). Product-cycle sequencing of a particular product (or a product group) is the first type. The national economy tracks the trade framework of a product life cycle, comprising four stages: (a) import, (b) import-substituting production, (c) export and (d) finally once again import (reverse import). In Figure 1, it is depicted by panel (a). Consumer goods are firstly imported, and then domestically produced, exported and again imported (M-P-E-M). Industry-cycle sequencing of economic development is the second type. The continuing development of industries together with national economy’s changing factor and technological endowments affects a country’s comparative advantage. It also means that the country changes its production activities (and export), from the lower value-added, more labor-intensive and less capital-intensive industries, to the higher value-added, less labor-intensive and more capital-intensive industries. In Figure 1, it is shown by the shift from panel (a) consumer goods to panel (b) capital goods. The shift shows a signal of the structured and orderly process to generate self-sustaining and self-propelling forces along the dynamic path of comparative advantage. Inter-economy sequencing related to the

orderly transfer of industrial activities among national economies along the regional hierarchy is the third type. These industrial transfers will be done in those following economies that have attained the resources and technological capacities most appropriate to the transfers.

For the lead goose country, the phase of post-catch-up situation exists (time  $t^*$  in Figure 1 panel a). Exports of consumer goods keep on rising up to a peak at  $t_4$  and then decrease because such labor-intensive consumer goods are losing their comparative advantage due to wage increasing. Then, the production process of the labor-intensive consumer goods (including capital, superior technology, and managerial skill as a package) is transferred to another country, which has lower wage through foreign direct investment (FDI). As a result, the follower goose country can sell the products to domestic market or even export to other countries (including the lead goose country as reverse imports). Kojima (1995) called this FDI as “Pro-trade oriented type (PROT) of FDI”. He found that Japan’s FDI has been the Pro-Trade oriented investment. In this case, there is mutual relationship between the lead goose and follower geese as described by Kojima (2000):

FDI thus augments comparative advantages in both countries, resulting in an expanded basis for trade and a reinforce productivity growth. As long as this type of FDI is promoted, an FG stimulus of industrialization is transmitted sequentially from a lead goose to follower geese, bring about enlarged trade and co-prosperous economic growth. This is nothing else but the “FDI-led growth” of regional economies, which is a prime motive for building regional integration (p. 383)



Source: Kojima (2000)

**Figure 2. The Modern “Multi-sequentialist” FG Paradigm**

The modern “multi-sequentialist” FG paradigm is clearly presented in Figure 2. Kojima (2000) made two assumptions: (a) an economy’s industrial structure is diversified and upgraded in a sequence from industry X (textiles and other labor-intensive goods) to Y (steel, chemicals, and other capital-intensive goods), and further to Z (machinery and other capital/knowledge-intensive goods), this industrial shift happens horizontally over time, (b) the flying-geese pattern of industrialization is transmitted through Pro-trade type of FDI from economy, the lead goose (or Japan), to the follower geese B (or NIEs), C (or ASEAN 4) and D (or China) according to the order of industrialization stage or per capita income level. This geographical spread takes place vertically over time. The passages of time are indicated by broken lines I, II, III, and IV.

At period I, Japan has already achieved the catching-up process in X-industry, and there is no outward FDI yet. At period II, Japan has comparative advantage in Y-industry and invests in country B's X-industry. At period III, Japan upgrades its comparative advantage to industry Z, and invests in country B's Y-industry and country C's X-industry<sup>3</sup>. At period IV, the future progress of Japan's industrialization is yet unclear, but her investment has spread widely toward country B's Z industry, country C's Y-industry and country D's X-industry.

#### **4. Some previous empirical findings**

Kojima (2000) stated some empirical researches supporting the FG paradigm as follows. *First*, Tran (1992) examined the transfer of Japan's synthetic fiber industry serially to the NIEs, the ASEAN4, China and Vietnam, starting from downstream to upper stream. *Second*, Kosai and Tran (1994) found geographical extension of the FG pattern (industrialization<sup>4</sup> has spread through FDI in the sequence of Korea-Thailand-Malaysia-Indonesia during 1960-1990) and industry structural upgrading of the FG pattern (production has upgraded in the sequence of textiles-synthetic fibers-steel-office equipment in each country). *Third*, the APEC Economic Committee (1995) found that direct investment and trade are complementary. Kojima (1995) called such kind of FDI as pro-trade oriented type (PROT) investment. *Fourth*, Shinohara (1976, 1982) added

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<sup>3</sup> Dynamic comparative advantage becomes a crucial variable in the FG pattern. This is why this research uses comparative advantage as one crucial variable in the analytical tool, which is developed in part 3. By using a comparative advantage measurement, we can firmly assert the position of the country's comparative advantage in the international market for a specific product.

<sup>4</sup> Industrialization is measured by both a manufacturing/GDP ratio and a manufacturing share in total exports

another phase of the FG pattern, called the “boomerang effect”, which represents a reverse flow of imports from less advanced countries to the more advanced capital-exporting countries. The “boomerang effect” explains Japan’s declining share in the US export markets in the wake of rising exports of the Asian countries. Shinohara (1996) also found that there had been rapid increases in machinery trade (i.e. intra-industry horizontal trade) during the 1975 to 1992 period between (a) Japan and the Asian countries (NIEs, ASEAN4 and China), (b) the USA and the Asian countries and (c) the NIEs and the ASEAN4. *Fifth*, Watanabe (1997) found that the mutual FDI, mainly from the NIEs to the ASEAN and China, rose higher than FDI from Japan, the US and the EU. It was also accompanied by intra-regional trade.

Rana (1990) found some links between changes in the pattern of trade and economic development. He pointed out that the shifts in comparative advantage were significant from Japan to the NIEs and the ASEAN4 and from the NIEs to the ASEAN4. In addition, the shifts were “beneficial” in the sense that the gains increase export earnings and promoted economic development in these countries. Fukasaku (1992) examined the ability of the FG theory in explaining inter-industry trade as the mechanism for promoting growth across countries. By using trade data 1979-1988, Fukasaku found that the pattern of trade within Asia has gradually shifted away from inter-industry trade toward intra-industry trade. As far as the Asian economies become increasingly integrated and interdependent, the intra-industry trade has bigger opportunities to exist. Consequently, the doubt of the FG theory remaining applicable in the future might rise. Following technique used by Lutz (1987), Rana (1990) and Fukasaku (1992); Dowling and Cheang (2000) conducted a test on the existence of the FG pattern by using Revealed

Comparative Advantage (RCA) indices of all 22 industry groups for period of 1970-1995. They found that comparative advantage has shifted from Japan to the NIEs and the ASEAN4 during the period 1985 to 1995. In addition, Japanese FDI has been used to recycle comparative advantage and to tap the rich resources in the ASEAN4.

## 5. The proposed analytical tool

This subpart explained the “products mapping” which is developed to examine the FG pattern. As mentioned in the FG concept, there are two crucial variables engaged in the FG pattern i.e. comparative advantage and export-import (trade balance)<sup>5</sup>. Therefore, the analytical tool is constructed by combining the two variables. Accordingly, two indicators are chosen i.e. Revealed Symmetric Comparative Advantage (RSCA) as the indicator of comparative advantage and Trade Balance Index (TBI) as the indicator of export-import activities. The RSCA index is formulated as (Laursen, 1998):

$$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1) \quad (1)$$

RCA is the “Revealed” Comparative Advantage (Balassa) Index by Balassa (1965), which is formulated as  $RCA_{ij} = (x_{ij} / x_{in}) / (x_{rj} / x_{rn})$ . Where  $x_{ij}$  symbolizes total exports of country  $i$  in group of products (SITC)  $j$ . Subscript  $r$  denotes all countries without country  $i$ , and subscript  $n$  refers all groups of products (SITC) except group of product  $j$ . By excluding the country and group of products under consideration, double

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<sup>5</sup> It is argued that production is represented well by both export and import. In the early stage of import substitution, domestic production is low, there is no export and import is still high. When economies scale is reached, domestic production becomes efficient and product has comparative advantage in international market, export will increase and import will decrease. Beyond time  $t^*$  (after the catching-up process) at Figure 1 (panel a) for example, domestic production and export increase meanwhile import decreases. See Balance *et al.* (1987) for a good discussion.

counting is avoided and the nature of trade, which is always a bilateral exchange of goods between two countries, is nicely represented (Wörz, 2005; Vollrath, 1991). The  $RSCA_{ij}$  index ranges from minus one to one (or  $-1 \leq RSCA_{ij} \leq 1$ ). The  $RSCA_{ij}$  greater than zero implies that country  $i$  has comparative advantage in group of products  $j$ . In contrast, the  $RSCA_{ij}$  less than zero imply that country  $i$  has comparative disadvantage in group of products  $j$ .

Trade Balance Index (TBI) (Lafay, 1992) is applied to analyze whether a country has specialization in export (as net-exporter) or import (as net-importer) for a specific group of products (SITC). TBI is simply formulated as follows:

$$TBI_{ij} = (x_{ij} - m_{ij}) / (x_{ij} + m_{ij}) \quad (2)$$

where  $TBI_{ij}$  denotes trade balance index of country  $i$  for group of products (SITC)  $j$ ;  $x_{ij}$  and  $m_{ij}$  represents exports and imports of group of products  $j$  by country  $i$ , respectively. This index ranges from minus one to one. Extremely, the TBI equals to minus one if a country only imports, in contrast, the TBI equals to one if a country only exports. Indeed, the index is not defined when a country neither exports nor imports. In this case, this paper put zero since it shows either potentially to be exported or imported. Any values within minus one and one implies that the country exports and imports good  $j$  simultaneously, “net-importer” (if the TBI negative) or “net-exporter” (if the TBI positive). By using the RSCA and TBI indexes, the “products mapping” is constructed<sup>6</sup>.

Products (SITC) can be categorized into four groups A, B, C and D as depicted in Figure

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<sup>6</sup> This preliminary analytical tool has been presented by the author in the 10th International Conference Society for Global Business & Economic Development (SGBED) “Creativity & Innovation: Imperative for Global Business and Development”, Kyoto, Japan August 8-11, 2007. The author would like to thank Dr. Xu Ming (China Textile University), Dr. Katsuo C. Yamazaki (Shizuoka Sangyo University) and all participants in the conference for the valuable comments.



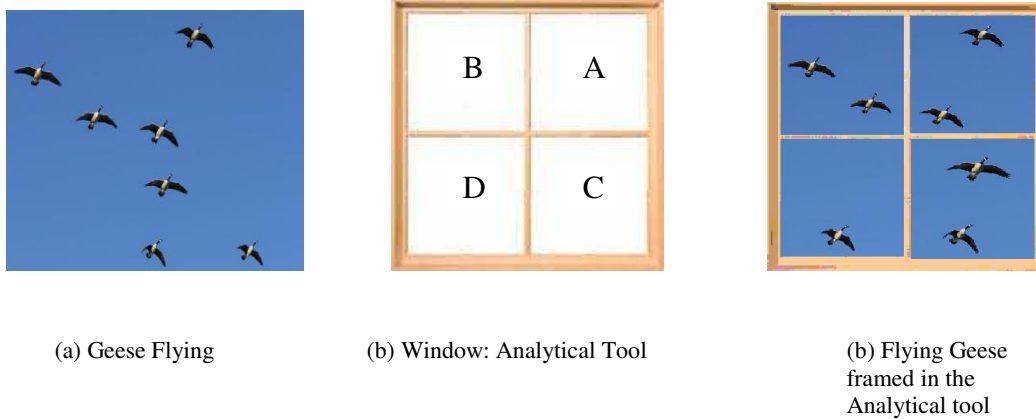
2. Group A consists of products which have both comparative advantage and export-specialization; Group B consists of products which have comparative advantage but no export-specialization; Group C consists of products which have export-specialization but no comparative advantage; and Group D consists of products which have neither comparative advantages nor export-specialization.

|   |          |  |  |
|---|----------|--|--|
| Revealed Symmetric Comparative Advantage Index (RSCA) | RSCA > 0 | <b>Group B:</b><br>Have Comparative Advantage<br>No Export-Specialization (net-importer)<br>(RSCA > 0 and TBI < 0) | <b>Group A:</b><br>Have Comparative Advantage<br>Have Export-Specialization (net-exporter)<br>(RSCA > 0 and TBI > 0) |
|   | RSCA < 0 | <b>Group D:</b><br>No Comparative Advantage<br>No Export-Specialization (net-importer)<br>(RSCA < 0 and TBI < 0)   | <b>Group C:</b><br>No Comparative Advantage<br>Have Export-Specialization (net-exporter)<br>(RSCA < 0 and TBI > 0)   |
|   |          | TBI < 0  | TBI > 0  |
|   |          | Trade Balance Index (TBI)  |  |

**Figure 3 Product Classifications**

The analytical tool, “products mapping” is used to examine the flying geese pattern. Figure 4 shows geese flying in panel (a), the analytical tool “product mapping” in panel (b) and geese flying framed in the analytical tool “product mapping” in panel (c). Imagine we are sitting in the room and there is a window (panel b) corresponding with the analytical tool Figure 3! There are geese flying outside. We are looking at the geese flying from the window (panel c). In this research, geese flying might be products (SITC), then the analytical tool is called “products mapping”. We can examine what products are the leading products based on their comparative advantage and the position of the country as a net-exporter or net-importer. The geese might be industries, then the analytical tool is called “industries mapping”. We can scrutinize what industries are the leading industries based on their comparative advantage and the position of the country as net-exporter or

net-importer. Additionally, the geese might also be countries, then the analytical tool is called “countries mapping”.



**Figure 4. Geese Flying and “Product Mapping”**

## **6. Case study of Japan and Indonesia**

This paper applies data on export and import published by the United Nations (UN) namely United Nations Commodity Trade Statistics Database (UN-COMTRADE). This research uses 3-digit SITC Revision 2 and focuses on 237 groups of products SITC. There are still two groups of products (SITC) which are not covered i.e. SITC 675 (Hoop and strip of iron or steel, hot-rolled or cold-rolled) and 911 (Postal packages not classified according to kind) due to the unavailability of data. Most empirical analysis focuses on the 3-digit level of trade statistics, which is closely related to the conventional definition of an industry as a set of producers competing in the production of the same set of commodities<sup>7</sup> (Grubel and Lloyd, 1975).

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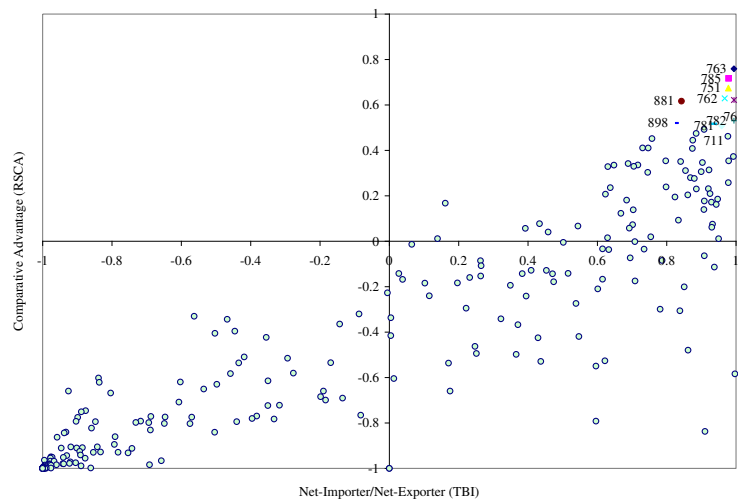
<sup>7</sup> For this reason also, the terms industries and products are interchangeable in this research.

Table 1 exhibits the products mapping based on comparative advantage and trade balance previously explained. The first column represents the figure of products mapping. The objective of representing these figures is to give general picture of exported products for each country i.e. the distribution of exported products laying in groups A, B, C or D. The second column represents top-ten products in Group A. These products are considered as the best ten products in term of their comparative advantage and trade balance. They are in the position of having comparative advantage in the international trade and the country in the position of having positive trade balance (or as net-exporter). The figures show positive relationship between comparative advantage and trade balance. The higher comparative advantage, the higher trade balance will be. In contrast, the lower comparative advantage, the lower trade balance will be.

**Table 1. Product Mapping: Japan and Indonesia**

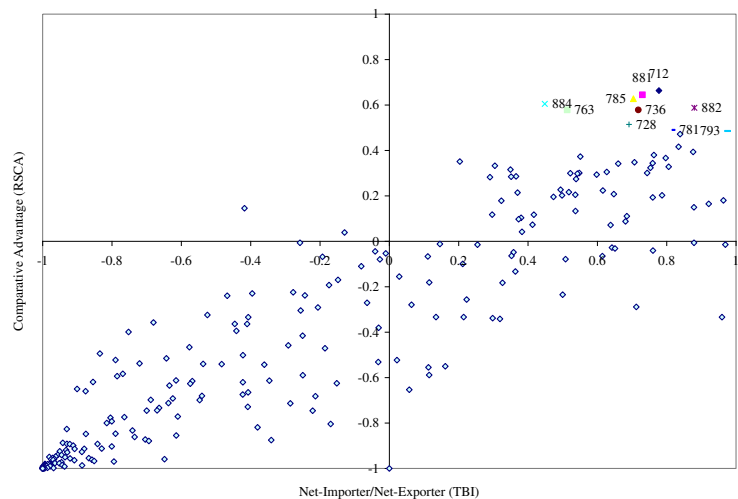
**Products Mapping**

**Top-Ten Products**



a.1. Japan 1985:

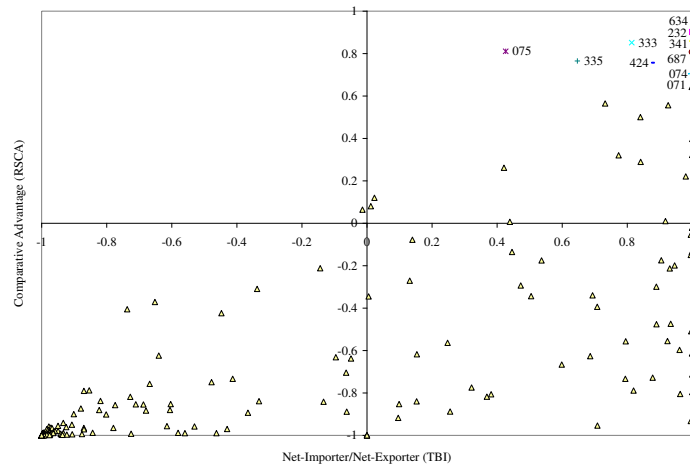
| SITC | Commodity Description                                     |
|------|---|
| 763  | Gramophones, dictating machines and other sound recorders |
| 785  | Cycles, scooters, motorized or not; invalid carriages     |
| 751  | Office machines   |
| 762  | Radio-broadcast receivers                                 |
| 761  | Television receivers                                      |
| 881  | Photographic apparatus and equipment, nes                 |
| 782  | Lorries and special purposes motor vehicles               |
| 898  | Musical instruments, parts and accessories thereof        |
| 711  | Steam boilers and auxiliary plant; and parts thereof, nes |
| 781  | Passenger motor vehicles (excluding buses)                |



a.2. Japan 2005:

| SITC | Commodity Description   |
|------|---|
| 712  | Steam engines, turbines   |
| 881  | Photographic apparatus and equipment, nes                         |
| 785  | Cycles, scooters, motorized or not; invalid carriages             |
| 884  | Optical goods nes   |
| 882  | Photographic and cinematographic supplies                         |
| 736  | Metalworking machine-tools, parts and accessories thereof, nes    |
| 763  | Gramophones, dictating machines and other sound recorders         |
| 728  | Other machinery, equipment, for specialized industries; parts nes |
| 781  | Passenger motor vehicles (excluding buses)                        |
| 793  | Ships, boats and floating structures                              |

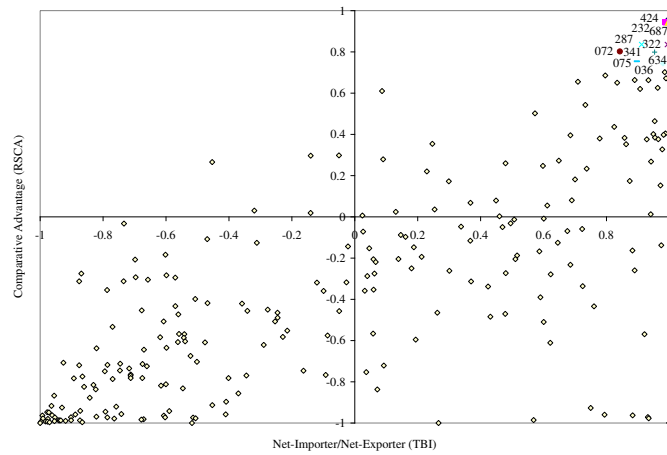
## Products Mapping



## Top-Ten Products

Indonesia 1985:

| SITC | Commodity Description                                       |
|------|---|
| 634  | Veneers, plywood, improved" wood and other wood worked nes" |
| 232  | Natural rubber latex; rubber and gums                       |
| 341  | Gas, natural and manufactured                               |
| 333  | Crude petroleum and oils obtained from bituminous minerals  |
| 075  | Spices  |
| 687  | Tin   |
| 335  | Residual petroleum products, nes and related materials      |
| 424  | Other fixed vegetable oils, fluid or solid, crude, refined  |
| 074  | Tea and mate  |
| 071  | Coffee and coffee substitutes                               |



## Indonesia 2005:

| SITC | Commodity Description   |
|------|---|
| 424  | Other fixed vegetable oils, fluid or solid, crude, refined    |
| 687  | Tin   |
| 232  | Natural rubber latex; rubber and gums                         |
| 287  | Ores and concentrates of base metals, nes                     |
| 322  | Coal, lignite and peat  |
| 072  | Cocoa   |
| 634  | Veneers, plywood, improved" wood and other wood worked nes"   |
| 341  | Gas, natural and manufactured                                 |
| 075  | Spices  |
| 036  | Crustaceans and molluscs, fresh, chilled, frozen, salted, etc |

## 7. Conclusions

This paper examines the FG pattern in the East Asia region. *First*, the evolution of FG concept starting from the original Akamatsu's one to the modern one is briefly described. There are two crucial variables in the FG model i.e. comparative advantage and trade balance (export-import). Industries will be transmitted from the lead-goose country to the follower-geese countries based on their comparative advantage. The successful catching process for a specific industry in specific country is reflected by the country's trade balance. *Second*, from the FG concept, this research develops an analytical tool namely the "products mapping" which is constructed by combining the two crucial variables. This paper uses the Revealed Symmetric Comparative Advantage (RSCA) index as the indicator of comparative advantage and the Trade Balance Index (TBI) as the indicator of export-import (implicitly also domestic production) activities. Then, the analytical tool is applied to examine empirically the Indonesian exports.

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Appendix: Products Mapping of Indonesia's Exports (1979-2005)

| No  | SITC | Commodity Description   | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----|------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 181 | 749  | Non-electric parts and accessories of machinery, nes                | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 182 | 751  | Office machines   | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | D    | D    | C    | C    | C    | D    | C    | C    | C    | C    |
| 183 | 752  | Automatic data processing machines and units thereof                | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | D    | C    | C    | C    | D    | C    | C    | C    | D    | C    | C    | C    |
| 184 | 759  | Parts, nes of land accessories for machines of headings 751 or 752  | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    |
| 185 | 761  | Television receivers  | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    |
| 186 | 762  | Radio-broadcast receivers   | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    |
| 187 | 763  | Gramophones, dictating machines and other sound recorders           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    |
| 188 | 764  | Telecommunication equipment, nes; parts and accessories, nes        | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | D    |
| 189 | 771  | Electric power machinery, and parts thereof, nes                    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | A    | A    | A    |
| 190 | 772  | Electrical apparatus for making and breaking electrical circuits    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    |
| 191 | 773  | Equipment for distribution of electricity                           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | A    | C    | C    | A    |
| 192 | 774  | Electro-medical and radiological equipment                          | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    |
| 193 | 775  | Household type equipment, nes                                       | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | D    | D    | D    | D    | C    | C    | C    | C    | D    | D    | D    |
| 194 | 776  | Thermionic, microelectronic, transistor, valves, etc                | C    | C    | D    | C    | D    | C    | C    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    |
| 195 | 778  | Electrical machinery and apparatus, nes                             | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | D    | C    | C    | C    | C    | C    |
| 196 | 761  | Passenger motor vehicles (excluding taxis)                          | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 197 | 762  | Limous and special purpose motor vehicles                           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 198 | 763  | Road motor vehicles, nes  | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | D    | D    | D    | D    | D    |
| 199 | 764  | Motor vehicle parts and accessories, nes                            | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 200 | 765  | Cycles, scooters, motorized or not, tricycle carriages              | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | B    | B    | B    | B    | B    | B    | B    | B    | A    | B    | D    | B    | B    |
| 201 | 766  | Trailers, and other vehicles, not motorized, nes                    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | D    | D    | D    | D    | D    | C    | C    | C    |
| 202 | 791  | Railway vehicles and associated equipment                           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 203 | 792  | Aircraft and associated equipment, and parts thereof, nes           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 204 | 793  | Ships, boats and floating structures                                | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | D    | D    | D    | D    | D    | D    |
| 205 | 812  | Sanitary, plumbing, heating, lighting fixtures and fittings, nes    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | D    | D    | D    | D    | C    | C    | C    | C    | C    | D    |
| 206 | 821  | Furniture and parts thereof   | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | C    | A    | A    | A    | A    | A    | A    |
| 207 | 831  | Travel goods, handbags etc, of leather, plastics, textile, others   | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | A    | C    | A    | C    | C    |
| 208 | 842  | Men's and boys' outerwear, textile fabrics not knitted or crocheted | C    | C    | C    | C    | C    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    |
| 209 | 843  | Women, girls, infants outerwear, textile, not knitted or crocheted  | C    | C    | C    | C    | C    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    |
| 210 | 844  | Undergarments of textile fabrics, not knitted or crocheted          | D    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    |
| 211 | 845  | Outerwear knitted or crocheted, not elastic nor rubberized          | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | C    | A    | A    | A    | A    | A    | A    | A    |
| 212 | 846  | Undergarments, knitted or crocheted                                 | D    | D    | C    | C    | C    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    |
| 213 | 847  | Clothing accessories, of textile fabrics, nes                       | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | A    | A    | A    | A    | C    | C    | A    | A    | A    | A    | A    | A    | A    |
| 214 | 848  | Articles of apparel, clothing accessories, non-textile, headgear    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    |
| 215 | 851  | Footwear  | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    |
| 216 | 871  | Optical instruments and apparatus                                   | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 217 | 872  | Medical instruments and apparatus, nes                              | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 218 | 873  | Meters and counters, nes  | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | D    | D    | C    |
| 219 | 874  | Measuring, checking, analysis, controlling instruments, nes, parts  | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 220 | 881  | Photographic apparatus and equipment, nes                           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | A    | A    | A    | A    | C    | A    | A    | C    | C    | C    | C    | C    | C    | C    |
| 221 | 882  | Photographic and cinematographic supplies                           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 222 | 883  | Cinematograph film, exposed and developed                           | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 223 | 884  | Optical goods nes   | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | D    | C    | C    | C    | C    | C    | C    |
| 224 | 885  | Watches and clocks  | D    | D    | D    | D    | D    | D    | C    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | D    | D    | D    | D    | D    |
| 225 | 892  | Printed matter  | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 226 | 893  | Articles, nes of plastic materials                                  | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    |
| 227 | 894  | Baby carriages, toys, games and sporting goods                      | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    |
| 228 | 895  | Office and stationary supplies, nes                                 | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    |
| 229 | 896  | Works of art, collectors' pieces and antiques                       | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | D    | C    | D    | D    | D    | D    | C    | D    | C    | C    | C    | C    | C    |
| 230 | 897  | Gold, silver ware, jewelry and articles of precious materials, nes  | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | A    | A    | C    | C    | C    | A    | A    | A    | A    | A    | A    | C    | C    | C    | C    | C    | C    |
| 231 | 899  | Musical instruments, parts and accessories thereof                  | C    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | A    |
| 232 | 899  | Other miscellaneous manufactured articles, nes                      | D    | D    | D    | D    | D    | D    | D    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    | C    |
| 233 | 931  | Special transactions, commodity not classified according to class   | C    | C    | C    | C    | C    | C    | C    | D    | C    | D    | D    | D    | D    | D    | D    | D    | D    | D    | A    | A    | C    | C    | C    | C    | C    | C    | C    |
| 234 | 941  | Animals, live, nes, (including zoo animals, pets, insects, etc)     | C    | C    | D    | D    | D    | D    | C    | A    | D    | D    | A    | C    | C    | C    | C    | A    | A    | D    | C    | A    | C    | C    | C    | C    | C    | C    | C    |
| 235 | 951  | Armoured fighting vehicles, war firearms, ammunition, parts, nes    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 236 | 961  | Coin (other than gold coin), not being legal tender                 | D    | C    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    | D    |
| 237 | 971  | Gold, non-monetary (including gold ore and concentrates)            | D    | D    | D    | D    | D    | D    | C    | A    | A    | A    | A    | A    | A    | C    | C    | C    | C    | C    | C    | C    | A    | A    | A    | A    | A    | A    | C    |