

## Part2 Chapter 6:The Effect of Commodity Classifications on the Formulation of Export Unit Value Indices:A Comparison of Export Unit Value Indices based on SITC and HS

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# Chapter 6

## The Effect of Commodity Classifications on the Formulation of Export Unit Value Indices: A Comparison of Export Unit Value Indices based on SITC and HS

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### Abstract

The trade index project of the Institute of Developing Economies employs international trade statistics compiled by the UN to calculate unit values using value and quantity for individual product codes which have been rendered uniform for SITC revisions 1, 2, and 3, to enable the formulation of fixed-weight and chain-linked unit value and quantity indices for separate product categories. The project has also studied the characteristics and the problems of the fixed-weight and chain-linked unit value indices it formulates. This fiscal year, the project has formulated unit value indices and quantity indices based on HS product codes in order to examine the characteristics of unit value indices based on more detailed product classifications than SITC.

This paper compares the chain-linked indices formulated by Masato Kuroko this fiscal year based on HS for individual industry categories and countries with chain-linked indices based on SITC-R1 codes, in order to study how changes in the quality composition of the same products, which cannot be considered using unit value indices based on SITC-R1 codes, can be considered using unit value indices based on the more detailed HS product classifications.

### 1. Characteristics of the IDE UN COMTRADE-based Indices

The IDE's trade index project uses trade statistics based on SITC and HS drawn from the UN COMTRADE database as basic data for the formulation of trade price indices. However, the SITC has been revised three times since 1960, and the edition in use therefore differs depending on the period under consideration. The HS has also been revised twice since 1988.

When using trade data organized by product as long-term time series data, it is therefore necessary to achieve consistency between the different classification systems for the same products. In the UN COMTRADE data, the product classifications for different revisions have been standardized by conversion, making it possible to use continuous time series data from 1960 onwards irrespective of whether Rev. 1, 2 or 3 is employed.

In the following discussion, IDE export unit value indices are SITC-R1 indices for all periods and indices linking different classification standards from SITC-R2 to HS2002, as formulated by Masato Kuroko using COMTRADE data. These unit value indices cover 21 industry categories.

As for the shows product numbers for each classification standard, the approximately 1,300

products for SITC-R1 increases to approximately 1,800 for R2 and approximately 3,000 for R3, and the greater detail of classifications sees the number increase to approximately 5,000 for HS. Because of this, comparison of series based on SITC-R1 and series based on HS can be considered to enable clarification of the effect of changes in the composition of detailed level products which make up groups of products with identical uses on changes in unit values. To take one category of products with identical uses as one example, it is possible to analyze the effect of changes in the composition of passenger vehicle classified by displacement on changes in the average unit values of passenger vehicles.

The indices formulated by Masato Kuroko for use in comparisons are therefore chain-linked indices which are able to reflect time series changes in trade structure. The merit of chain-linked indices is that the weighting is not fixed in the base year or the comparison year, enabling changes in the export structure from the base year onwards to be reflected.

## **2. Formulation of Export Unit Value Indices by HS Classification**

This section will discuss changes in classification standards, products numbers, and coverage in the formulation of indices for unit value indices based on SITC and HS formulated for the US, Europe, and major Asia-Pacific countries including Japan.

### **2.1 Changes in Classification Standards in International Trade Statistics used in the Formulation of Indices**

The SITC has undergone four revisions since its original publication, with Rev. 1 in 1962 and Rev. 4 in 2007. The HS, originally developed by the Customs

Cooperation Council (now the World Customs Organization) in 1988, has undergone two revisions, in 1996 and 2002. The IDE uses the SITC revisions for periods in which the HS cannot be used, and uses HS series in place of the SITC for periods for which it can be used. In this way, by using the most detailed classification standard possible for product classifications, we are able to adjust the overestimation or underestimation of export unit value indices when comparing them with export price indices.

Looking at the period 1980-2005(6) for which the IDE has formulated indices, we find that HS can be used from 2000 onwards for all 26 countries for which indices are formulated, but from 1990, this figure is for only 13 countries, including Japan and Germany, countries which record high export figures. However, SITC-R3 series can be employed for some 3,000 products for the US and nine European countries. From 1980-1989, SITC-R2 series are used for 22 countries.

It may therefore be considered most appropriate when comparing SITC-R1 and HS series to limit the period for comparison to the period from 1995 onwards. This point should be borne in mind in the following discussion, in which the period from 1980 onwards is divided into the 1980s and the period following the 1980s.

### **2.2 Coverage of Products by Category (Export Value-based): Japan and The US**

As indicated above, the formulation of indices by category based on the HS offers the advantage of significantly increasing the number of products employed. At the same time, it is also important that the coverage rate for the numbers and values of the increased number of products is high for all categories. Here, it is necessary to examine the coverage of both SITC-R1 and HS for the US and Japan.

A comparison of the distribution of average values by category for Japan and the US for the period 1980-2005(6) is therefore as follows. For Japan, excepting a coverage of 60% for one category, the coverage for the HS series for the remaining 19 categories is 80% or higher. These figures are considerably higher than the figures for SITC-R1. In the case of the US, by contrast, for SITC there are seven categories for which the coverage is 80% or more, but for HS, there are only eight. For both HS and SITC-R1, there are seven categories for which coverage is less than 60%. While the US has two less categories for which coverage is between 40-50% and two more categories for which coverage is between 50-60%, it is clear that the coverage for the US is low in comparison to Japan.

### **3. Comparison of SITC-R1 Indices and HS Indices**

The comparison in this paper is limited to 1980 onwards. One reason for this is that SITC-R1 is the classification from 1962 to 1977-1978, and this makes it impossible to measure the effect of increasing the detail of classifications. Another reason is the fact that in the long-term time series from 1962 onwards, indices for some countries are discontinuous, making comparison difficult. From the 1980s, chain-linked indices for 20 industry categories can be used for almost all countries, making it possible to conduct comparisons.

However, indices based on HS can only be formulated for early-adopting countries from 1989, and for all remaining countries from 1995 onwards, and HS indices from 1980 onwards therefore contain series based on SITC-R2 and SITC-R3. Because of this, comparisons between countries have been divided into three time periods – 1980-1990, 1990-2000, and

2000-2005(6) – in order to study the effect of increasing the detail of product classifications.

In comparing two indices, the quality index has been defined using the following formula, and the annual average rate of change of this index has been employed.

$$\text{Quality index} = \text{SITC-R1 indices} / \text{HS indices}$$

#### **3.1 Comparison by Industrial Category and Country: 1990 Onwards**

Here, the rate of change of quality indices defined above SITC-R1 will be compared by industry category from 1990 onwards, a period in which the number of products by industry category increased 3-5-fold as compared to SITC-R1. 13 countries are compared, representing six Asian countries, the US, and six European countries. The results of the four machinery-related categories will be compared as follows.

There were two countries for which 1% or more positive change occurred in the machinery category, 10 in the electrical equipment and machinery category, six in the transport equipment category, and seven in the precision instruments category. Negative change of 1% or more was measured for four countries in the machinery category, one country in the electrical equipment and machinery category, three countries in the transport equipment category, and four countries in the precision instruments category. In the machinery-related categories, the increase in value due to the increase in quality was greatest in the electrical equipment and machinery.

#### **3.2 Comparison by Country and Industry Category (1): Japan and the US**

This section will discuss the quality changes for Japan

and the US when quality changes are measured for separate periods for whole world and for important regions.

For Japanese export products, eight categories of a total of 19 displayed positive quality change for the 1980s; from 1990 onwards, this figure increased to 17. In addition, if the period from 1990 onwards is divided into the 1990s and the 2000s, 13 categories display positive quality change for each period. Of these, four categories, mining, foodstuffs, leather products, and metal products, display a quality increase of 1% or higher for the 1990s, while eight categories, agricultural, forestry and fisheries products, mining, apparel, leather products, paper and pulp, ceramics, transport equipment, and precision instruments, display a quality increase of 1% or higher for the 2000s.

Looking at the 1990s, the greatest rate of increase in quality in the machinery category occurred in the US, in the electrical equipment and machinery category in the EU, in the transport equipment category for North America, and in the precision instruments category in the EU. For the 2000s, the greatest rate of quality increase occurred in the machinery and the precision instruments categories for North America, and in the electrical machinery and transport machinery categories for the EU. Asia recorded the second highest rate of increase in quality after North America in the machinery and precision instruments categories. Looking at the whole world, excepting electrical equipment and machinery, the rate of quality increase was higher for the 2000s than for the 1990s.

We will now look at the results for North American exports to the whole world.

For the 1980s, 10 industry categories out of 19 recorded positive quality changes for exports; this figure increased to 14 from 1990 onwards. From 1990 onwards five industry categories recorded positive quality increases of 1% or higher, as follows: mining,

leather products, petroleum and coal products, transport equipment, and precision instruments. If the period from 1990 onwards is divided into the 1990s and the 2000s, 10 categories and 8 categories record positive change, respectively. For the 1990s, three industry categories, rubber and plastics, petroleum and coal products, and transport equipment were measured as displaying a quality increase of 1% or higher; for the 2000s, 5 categories, mining, leather products, paper and pulp, electrical equipment and machinery, and precision instruments, displayed an increase of 1% or higher.

For North America in the 1990s, for the machinery-related categories, when changes in quality are compared by export market, the greatest rate of change of quality is recorded for Canada in the machinery category, for Asia in the electrical equipment and machinery category, for the EU in the transport equipment category, and for Japan in the precision instruments category. For the 2000s, the rate of increase is highest for machinery category in the EU and for transport equipment and precision instruments in Asia. There were negative quality changes in four industry categories for Japan as export market.

### **3.3 Comparison by Country and Industry Category (2): Asian Region**

Quality indices were calculated for 8 countries in the Asian region (excluding Japan) for 19 industry categories.

Looking first at quality changes for the 1990s and the 2000s when the period from 1990 onwards is divided into two, for the 1990s five countries including Singapore recorded positive changes in 10-14 industry categories, and for these (excluding South Korea), six-eight categories displayed an annual rate of change of 1% or higher.

For the 2000s, six countries and areas including Hong Kong record positive change in 10-16 categories, with change greater than 1% in 13 categories and 10 categories for Hong Kong and Singapore respectively. Next, we will examine the characteristics of these quality changes for each important category, for example the machinery-related categories.

Looking at results for the four machinery-related categories, we find that for machinery, for the 1990s, South Korea and four ASEAN nations displayed positive change, with the highest rate of increase recorded by Malaysia at 9.5%. For the 2000s, positive change was displayed only by China and Hong Kong, with the figure highest for Hong Kong at 2.2%.

Excluding the Philippines, for electrical equipment and machinery all countries displayed positive change from 1990 onwards. However, the rate of increase was higher for all countries in the 2000s than in the 1990s. The rate of increase in quality was particularly marked in the case of Thailand.

For transport equipment, Hong Kong displayed the highest rate of increase in the 1990s, at 1.25%. Other countries all displayed positive or negative change of 1% or below. In the 2000s, by contrast, seven countries displayed positive change, of which five displayed positive change of 1% or higher. Only Malaysia and Indonesia displayed negative change.

For precision instruments, Singapore and Malaysia displayed positive change of 2% or higher for both periods. Of the other countries, China, the Philippines, and Indonesia displayed negative change for both periods.

For the three machinery-related categories excluding machinery, the increase in quality was greater for the 2000s.

Looking at results for other categories, we find that positive change was displayed by China, Hong Kong, and Indonesia in the agricultural, forestry and

fisheries for both periods. The greatest rate of increase in quality was displayed by Malaysia in the former period and by Indonesia in the latter period. In the lumber and wood products category, China, Hong Kong, and Singapore displayed positive change for both periods, with the highest rate for China and Hong Kong at approximately 2.6% for the former period, and the highest rate for Singapore at 4.56% for the latter period. Finally, for the ceramics category, both Singapore and Thailand displayed positive change for both periods, with Singapore displaying the greatest increase for both periods. For the latter period, Hong Kong, Singapore, Thailand, and Indonesia displayed quality increase rates of 2% or higher.

### **3.4 Comparison by Country and Industry Category (3): The European Region**

First, we will consider the distribution of positive quality changes by industry category for the 1990s and the 2000s for 13 countries including Germany.

For the 1990s, 11 countries, excluding the UK and Denmark, displayed positive change in 10 industry categories or more. By contrast, only four countries – Germany, France, Italy, and Spain – displayed positive change in 10 industry categories or more for the 2000s.

For the 1990s, Germany, Belgium, and Norway displayed an increase in quality of 1% or higher in either 0 or 1 industry category, while the figure was 7-8 categories for Holland and Spain. For the 2000s, Denmark, Norway, and Finland recorded quality increases of 1% or higher in three industry categories or less, while the remaining countries recorded increases of 1% or higher in 4-6 categories.

Next, we will consider the change in quality indices for the four machinery-related categories.

Only three countries, Belgium, Sweden, and Finland, recorded positive change for machinery for the

1990s, and the change was 1% or less in each case. In the 2000s, the number of countries recording positive change increased to seven, with the highest rate recorded by the UK at 3.09%.

For electrical equipment and machinery, 11 countries, excluding the UK and Norway, all recorded positive change in quality, with Sweden recording the highest increase at 5.66%. For the 2000s, the number of countries recording positive change declines to seven, with Germany, Holland, and Belgium recording increases of 4% to more than 6%. Of the five countries which recorded positive change for both periods, the rate of increase of quality indices increased in the 2000s for Germany, Italy, Holland, and Belgium, but not for France.

For transport equipment, the number of countries recording positive change declines from 10 for the 1990s to seven for the 2000s. For the 1990s, four countries, the UK, Holland, Portugal, and Finland, recorded positive change of 1% or more. Four countries again recorded positive change of 1% or more in the 2000s, this time Italy, Spain, Portugal, and Austria. Portugal is conspicuous here, recording the highest rate of increase for both periods, at levels from 3 to more than 4%.

For precision instruments, five countries, Germany, Holland, Portugal, Sweden, and Norway, display positive change for the 1990s; of these, Holland and Portugal display change of 1% or higher. The number of countries displaying positive change increases to eight for the 2000s, with seven countries recording

positive change of 1% or higher, including Denmark at 10.29%.

Considering the machinery-related categories as a whole, the increase in quality was greater for the 2000s than for the 1990s.

#### 4 Concluding remarks

In the preceding discussion, we have compared export unit value indices formulated based on SITC-R1 and those based on HS for the period from 1980 onwards by industry category and country, in order to study the effect of differences in the digit level of product classifications on export unit value indices. Comparison of unit value indices based on SITC-R1 which incorporate the effect of increases in quality (more advanced functions, increased size, etc.) for the same products with indices based on HS, which are able to adjust the effect, has shown that the former indices tend to be overestimated for certain industry categories and certain countries.

Of course, the HS indices used here have been based on the UN 6-digit standard; if indices based on the 9-digit codes domestically used by reporting countries were available, it would have been possible to formulate indices closer to genuine price indices.

In relation to the interpretation of the results of this study, it will be necessary to engage in further study as to whether the cases in which negative change occurs in quality indices can be regarded simply as declines in the quality of the products.