Chapter 4

Calculation of Trade Price Indices by Commodity and Characteristics of Results :

A Comparative Analysis of Taiwan, South Korea, the U.S. and Japan-

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1. Introduction

The globalization of economic activity is progressing rapidly and affecting every nation and region, driven by the liberalization of trade and investment and the continuing expansion and diffusion of the ITC revolution. In parallel with these developments, the dependence of national economies on import and export is rising yearly, and the speed with which local economic conditions impact internationally is also increasing. To attain a quantitative understanding of the trade- and investment-based interdependence of national and regional economies and conduct analyses of the changing factors within that interdependence necessitates above all else the construction of databases tailored to the purposes of specific analyses.

This paper examines problems in formulating trade price indices, measures which are indispensable to the analysis of trade and investment-based economic interdependence. It compares and examines the characteristics of trade unit value indices and trade price indices calculated as one measure of wholesale price. Specifically, it compares the nature and points at issue of the unit value indices calculated for product categories by Masato Kuroko of the Institute of Developing Economies with trade price indices published by various national and regional governments and central banks, conducting in addition a certain amount of international comparison.

2. Methods of Formulating Price Indices as Import and Export Deflators

Two indices, the import and export unit price indices and the import and export price indices, are generally calculated as import/export deflators by product or sector. The first of these is an index of unit price, found by dividing trade volume into customs-based trade value. If product categories are not sufficiently detailed, it is difficult to consider price changes occurring due to changes in the composition or quality of products generated by technological progress in this index. For this reason, if quality increases, there is a strong possibility that the unit price index will be higher than the true price (the price before changes in quality). By contrast, the other index targets the same brands, but is based on information regarding shipping price or contract price obtained directly from the importer, exporter or import and export supervisor at the point of manufacture. It is possible to take changes in a brand occurring as a result of changes in quality into account to some degree when this index is formulated. It goes without saying that this index is the more suitable as an import/export deflator which considers changes in

quality.

The Bank of Japan formulates and publishes import and export price indices on a monthly basis as part of its formulation of wholesale price indices. The Ministry of Finance applies the Fischer formula to customs data to formulate unit price indices for imports and exports, which are published on a monthly basis.

Import and export deflators formulated by category in other East Asian nations and the U.S. are as follows:

Indonesia:

The Central Bureau of Statistics formulates wholesale price indices. The latest price indices, with 1993 as the base year, represents price data for 327 products gathered from typical national enterprises. From among these products, export price indices target 46 products, and import price indices target 50 products.

The Philippines:

The National Statistics Office formulates trade price indices. Unit price indices are found from export value and export quantity using the seven-digit Philippine Standard Commodity Classification codes, and are then reduced to three- and one- and two-digit level indices. The latest indices take 1995 as the base year. (1972, 1975, 1985 and 1991 were adopted as base years prior to 1995).

Thailand:

The Bank of Thailand formulates indices based on customs data, with 1995 as the most recent base year. To reflect the large-scale changes in trade structure which occurred in the 1990s, the number of products used in the formulation of indices has been increased. The number of products used for export price statistics has been increased from 897 to 5,532, and the number used for import statistics from 671 to 5,791. Value coverage is 97.7% for exports and 90.9% for imports. To facilitate a grasp of the rapid changes to trade structure, indices are now compiled using a Fischer linked index formula rather than the former Laspeyres formula.

South Korea:

The Bank of Korea commenced publishing export price indices in 1976, with 1974 as the base year. The first revision following this made 1975 the base year, since when base years have been revised at five-year intervals. The current indices are formulated with 1995 as the base year. Contract price in currency of contract settlement is the basis of price data, rather than shipping price or customs price. Monthly average exchange rates are used to convert this to won prices. The product selection criteria specify products representing more than 1/2000 of total trade value; at present 223 products and 220 products are used to calculate import and export indices respectively.

Taiwan:

Statistics were initially formulated by the Bank of Taiwan and the Board of Foreign Trade of the Ministry of Economic Affairs, but this role was taken over by the Directorate-General of Budget, Accounting and Statistics (DGBAS) in 1978. The most recent indices, with 1996 as the base year, are based on data collected for between one and six brands of 219 export products and 217 import products. When the number of brands is factored in, this is equivalent to 466 export products and 510 import products. Importers and exporters report price data monthly by telephone or mail. Export indices are FOB value-based and import indices are CIF value-based,

and a Laspeyres formula is employed. Base years are revised every five years; base years to date have been 1981, 1986, 1991 and 1996.

The U.S.:

In the U.S., import and export value is calculated by the Bureau of Labor Statistics (BLS) of the Department of Labor. Presently published indices are weighted for 1995 and employ a modified Laspeyres formula. Price data for 20,000 products is reported by more than 6,000 enterprises across the nation. Criteria for evaluation of export prices differ between industries, but are either FAS factory shipping price or FOB transaction price. Information is published in three forms: HS, Department of Commerce end-use system and SITC.

3 A Comparison of Export Unit Price Indices and Export Price Indices – Japan

Both the Bank of Japan's import and export price indices (part of its wholesale price indices) and the MOF's trade price indices can be used as deflators for Japan's imports and exports. The MOF indices are based on unit price indices obtained by dividing customs-declared trade value by trade volume. To statistically determine the correlative relationship between changes in both indices for exports, the following simple regression was performed for categories judged to be comparable:

$$\log(PEiBOJ) = a + b\log(PXiMOF) + cTrnd + AR(1)$$

where *PEiBOJ*: BOJ export price indices by category, *PXiMOF*: MOF trade price indices by category (export), *Trnd*: time trend (calendar year), and *AR*(1): the first-order autoregression generated by the Cochran-Orcutt procedure.

Parameters of trend variables show the rate of change of price indices per year, and demonstrate that there is a drop of 1.26% in the yearly rate for general indices. When we consider that the BOJ indices take into account changes in quality, it becomes apparent that calculation in the yearly rate of the MOF (unit price) indices is too high by 1.26%. In the same way, trend coefficients by category have fallen 0.7% in textile products, 3.1% in chemical products, 0.9% in metal products, and 5.3% in electrical equipment, and there is a strong possibility that in each case the MOF indices have been calculated too high.

4 A Review of the Export Unit Price Indices by IO Category Published by the Institute of Developing Economies

Here, we look at export unit price indices calculated by Masato Kuroko of the IDE for twenty sectors of the IO table by country and region. We focus on the foodstuffs, textiles, primary metals and machinery sectors in Taiwan, South Korea, Japan and the U.S., and compare the IDE indices with those calculated by the statistics bureaus of the governments and central banks of each country and region. To enable comparison, the regression formula shown below is used to calculate parameters; these parameters and coefficients of determination are used to evaluate the characteristics of the unit price indices.

$$\log(PEij) = a + b\log(PXij) + cTrnd + d(Trnd \cdot Trnd)$$

where *PEij*: price indices published by country *i*, *PXij*: unit price indices calculated by the IDE. *Trnd*: time trend, *i*: exporting country, and *j*: *j* sector ($j = 8, 9, 16, 17, 18$).

We will now summarize the results of calculations for these countries and regions.

Taiwan

Taiwan has published export trade price indices using classifications corresponding to two-digit manufacturing industry classifications since 1981. The results of calculations are shown in the table 1-1.

The square of trend is significant in the general indices column, because of the tendency for the rate of decline to increase with trend. Unit price index parameters are positive, but of little significance. Looking by category, indices for food and textiles have a positive correlation, and coefficients of determination for both sectors are comparatively high, between 0.7 and 0.8. General machinery and electronic machinery show a negative correlation, and trends for these indices have reversed. Unit price parameters for transport equipment are positive, while time trend coefficients are negative. However, the positive trends for the food and textiles sectors are statistically significant and show a decline in quality. This is related to the accuracy of unit price indices and requires further examination.

South Korea

Regression of the indices calculated by category by the Bank of South Korea generates a coefficient of determination of 0.967 in the general indices. Correlation is high, but the coefficient of the unit price index is well below one in table 1-2. By category, if transportation equipment is excepted, the correlation of indices is distributed between 0.66 and 0.97. Price parameters are positive and many are statistically significant. Size is below 0.5 if food and basic metals are excluded, and the range of variation is higher in unit price indices than in price indices. Time trend coefficients for general indices and the food and machinery sectors are negative, suggesting the need for quality to be reflected in unit price indices. Correlation in the transportation equipment sector was almost zero, because of the fact that while there was an 8.6% drop in yearly rate for unit price indices, the Bank of South Korea did not show trend in its indices calculated by category.

Japan

Correlation between indices is higher for Japan than for Taiwan or South Korea, and price parameters are distributed between 0.79 and 1.05, because in this case MOF export unit price indices and unit price indices calculated by the IDE have been compared. Because both unit price indices are calculated using a Fischer formula, a coefficient of determination of 1 should generate a price parameter of 1 and a trend of zero. The reason that some results deviate from this is that product categories were inconsistent, and there were differences between the selection criteria for the series and in the weights applied to the calculation of indices.

The U.S.

For the U.S., Department of Labor BLS export price indices for various categories in the machinery sector were regressed. As can be seen from Table 1-4, among the general indices only trend is significant, and the coefficient of unit price index is zero. One reason for these results is the extreme amplitude of changes in the unit price index. Coefficients of unit price indices for categories in the machinery sector, with the exception of automobiles, are distributed between 0.1 and 0.26, and are statistically significant. Trend results show that computer equipment and office machines have reached a yearly rate of –6.4%, while sound recording and electrical machinery have reversed their initial positive results and reached –1.8% and –4.2%, respectively in 2000. In the case of automobiles there is zero connection with unit

price indices, and BLS index trends are highly visible.

5. Conclusion

The significance of manufacturing industries to the expansion of international trade and the increasing weight of high-tech products (characterized by significant changes in the factors generally considered to relate to product quality - performance, functions, etc.) in economic development and competitiveness increases the difficulty of calculating trade price indices which reflect changes in quality. On the other hand, these factors make such indices increasingly necessary to grasping substantive changes in trade. How, and to what extent, changes in quality should be considered in trade unit price indices, will be a significant issue in future analyses of international trade structures.