APPENDIX A

EXPORT AND IMPORT PRICE INDEXES

Indexes Currently Published

Price indexes as such are not currently being prepared either for exports or imports.[1] The closest current approximations to export and import price indexes are the unit value indexes produced by the Bureau of Foreign Commerce. A unit value index differs from a price index in that it measures changes in the average value of imports or exports per physical unit regardless of whether the change in value is due to a change in price per se or to some other circumstance such as a change in the size or quality of the item being exported or imported. Our reasons for insisting on the necessity of prices rather than unit values in price indexes are given in Section III, 2. The Bureau of Foreign Commerce is, of course, aware of the distinction between prices and unit values and, within the limits of the resources that have been made available for work on the indexes, it has endeavored to minimize some of the larger distortions arising from the use of unit values and to limit the deviation of the indexes from the measurement of price changes.

Unit value indexes are calculated for each of five broad commodity categories of U.S. exports and imports—crude materials, crude foodstuffs, manufactured foodstuffs and beverages, semimanufactures, and finished manufactures—and for total exports and imports. The indexes are available annually from 1913, quarterly beginning with 1929, and monthly since July 1933. Special indexes are prepared for trade with the American Republics.

In recent years, items included in the indexes have accounted for 60 to 70 percent of the total value of imports for consumption and 40 to 45 percent of total domestic exports. Since the unit values are computed from the value and quantity figures compiled by the Bureau of the Census from data on export declarations and import entries filed at United States ports, it is not possible to include items for which the Census data contain only value figures rather than both values and quantities. With the expansion in the relative importance of finished manufactures in international trade, the proportions of exports and imports directly represented in the indexes have diminished This has been particularly true in the finished manufactures category, which has been of increasing importance in American trade. In 1957, for example, less than a fourth of finished manufactured imports (which accounted for one-third of total imports for con-

[1] A National Bureau study by Robert E. Lipsey currently in preparation will present indexes employing both prices and unit values for the period 1879 to 1923; it has been of great assistance in preparing this section.

sumption) and less than a fifth of finished manufactured exports (which accounted for 60 percent of the total) were covered in the unit value index calculations. These proportions in themselves would not necessarily represent a serious deficiency if the included items constituted an adequate sample for the category. However there is little ground for believing that the sample is representative of price movements for finished manufactured exports and imports; its deficiencies are especially marked in the machinery category. Weights for commodities whose unit values are unknown are generally assigned to other items selected in the same economic class.

The unit value indexes are constructed by Fisher's ideal formula; that is, each index figure represents the square root of the product of base-year weighted and given-year weighted indexes. The base period weights are taken from the preceding calendar year. The advantage of the use of the Fisher formula lies in the fact that the unit value, quantity, and aggregate value indexes are consistent; that is, the aggregate value index will equal the product of the unit value and quantity index. Because of the rapid change in the composition of exports and of imports, the weights are changed for each year's computation. The indexes for successive years are chained in order to derive a continuous series.

The indexes are produced in the International Economic Analysis Division of the Bureau of Foreign Commerce, using the equivalent of one professional and two clerical man-years. The staff is conscious of the desirability of making the unit value index approximate a price index as closely as possible, but it does not have sufficient resources to subject the data to the degree of professional scrutiny that is necessary to maintain high quality index numbers. Little attention can be given to continuous comparisons with external data such as the movements of domestic prices of commodities similar or identical to those included in the indexes.

Although there is a considerable diversity in the practice of other countries, most of them use a current-weighted unit value index, and in many cases this is derived by dividing a base-weighted quantity index into an aggregate value index. A number of countries employ fixed base weights, and a few follow the U.S. in using the Fisher index.

An abortive attempt to develop price indexes for exports and imports was made in the Bureau of Labor Statistics in 1946 and 1947. The project reached the point where exporters and importers were furnishing prices to the Bureau and some index numbers had been computed, when it was abandoned because of budgetary restrictions. The proposed BLS indexes were to be constructed with fixed weights, some of the early calculations for 1945 having been based on prewar trade patterns. Prices were to be collected for around 340 export commodities and 200 import commodities, either by personal visit or by mail collection. As with other BLS indexes, the prices were collected by specification, and an effort was made to take account of such variables affecting price as the size of the transaction, the port at which delivery was taken, the channel of trade discounts, and the like.

The Technical Problems

The fundamental problem of price index number construction—that of coping with a changing basket of goods—seldom appears in so exacerbated a form as in the case of price indexes for exports and imports. The patterns of consumption and production change but slowly compared to the rapid shifts that may occur in the commodity composition of imports and exports. These changes are sometimes so great that substantial differences in the measurement of price change are obtained according to whether the change is calculated with the weights of one year or another. For example, in an NBER study [2] currently under way, indexes of price change between 1879 and 1923 for 22 major classes of exports and imports yielded changes from 20 to 40 percent higher on one set of weights than on another, with the distribution of the percentage excesses as follows:

Percent excess	Number of indexes	
	Export	Import
0 to 4.9	2	1
5 to 9.9	6	1
10 to 14.9	6	1
15 to 19.9	0	7
20 to 24.9	0	8
25 to 34.9	5	3
35 to 44.9	3	1
Total	22	22

The illustration is extreme in that it involves two points in time nearly a half century apart. For shorter periods the differences produced by alternative weighting systems are likely to be much smaller though not always negligible. In the three years 1956–58, for example, there were three instances in which the ratio of the Paasche to the Laspeyres monthly index of imports for the five economic classes exceeded approximately 102.5 percent. These were all in the crude foods category. In the export indexes, there were 24 such cases (out of a total of 180), the maximum divergence among these being about 9 percent. All of these cases occurred in the economic classes of crude and manufactured foods and crude materials. These classes include the commodities most obviously subject to sharp seasonal changes in volume of trade. Most of the export cases (16) occurred in one year—1956. The crude-foods class seems to be especially subject to recurring divergences in the monthly index. Of the two indexes for total trade, that for exports showed one instance of a divergence of over 2.5 percent in the three-year period—a difference of about 4 percent—in December 1956. The index for total imports showed no such divergence.

Nevertheless, the extent of the changes in the commodity composition in trade and the consequent dependence of the measures of price change upon the method employed have led some to question whether meaningful export-import price indexes can be prepared. The Committee recognizes the difficulties involved, but feels that the demand for such indexes is so great that in the absence of officially prepared

[2] Robert E. Lipsey, "United States Foreign Trade Indexes, 1879–1923", in manuscript.

indexes even less satisfactory ad hoc indexes would be concocted both in government offices and in business firms. In these circumstances it is best to have official indexes that are as good as they can be, taking into account the resources that can reasonably be expected to be made available for their construction.

It is clear, however, that the degree of variation in trade patterns makes frequent weight revision necessary. The system presently employed by the Department of Commerce of computing indexes between pairs of years and linking the results in a chain index thus has much to recommend it.

Another aspect of the export-import price program that distinguishes it from others is that these prices are commonly published side by side with quantum and value indexes of exports and imports. For this reason, there is a somewhat stronger case than usual for the use of an index formula that meets the factor reversal test (i.e., that satisfies the condition that the price index times the quantity index should equal the value index). A number of countries meet this need by using current weights for the unit value series and base weights for the quantum series; a few countries carry out the same idea but reverse the weighting systems for the unit value and quantum indexes. Sweden, New Zealand, Ireland, and a few others, like the United States, satisfy the factor reversal test by using the "ideal" index (i.e., the geometric mean of base-weighted and current-weighted index numbers) for both the unit value and the quantum series. This is not an unreasonable compromise, particularly if both the base and the current-weighted index numbers (which must in any case be produced as intermediate products) are made available to interested persons.

Although the technical methods employed by the Bureau of Foreign Commerce to convert the quantities and average values derived from foreign trade data into quantity and average value index numbers appear to be sound and well suited to the nature of the special problems encountered in this statistical area, serious questions must be raised concerning the nature of the raw materials—that is, the average values and the quantities—to which these methods are applied. Unless changes in average values correspond closely to changes in prices, the changes in value will not be correctly factored into price and quantity components and the analytical utility of the indexes will be impaired.

The average values are derived from the Census Bureau's foreign trade statistics by dividing quantities into values. The classifications in the foreign trade statistics are rarely fine enough to ensure that homogeneous qualities of a product will be reported from one period to another. Consequently, changes in average value usually represent the result of an unknown combination of price change and variation in product mix. In some instances, the change in the nature of the product within a given classification may be quite substantial. For example, all nonmilitary passenger cars and chassis are placed in a single export category regardless of their size or value. Shifts in the composition of exports among various sizes of cars will therefore produce a different average value even though there has been no change in the price of any type of car. Furthermore, owing largely to the increasingly common requirements abroad that vehicles assembled locally must include a certain proportion of components of local origin, there has been a growing tendency to export "knocked-down" vehicles

for assembly abroad with more and more components missing; indeed, in some cases what is reported as a vehicle unit in the export declaration may contain as little as 15 to 20 percent by value of a complete vehicle. The Bureau of Foreign Commerce has tried to cope with some of the more serious problems of this type of subclassifying exports by destination according to the importance of the local product mixes. However, the extent to which the problems posed by the foreign trade classifications can be circumvented are limited both by staff and by the inherent nature of the data.

It is not surprising to find, therefore, that comparisons between price relatives from the BLS wholesale price index and unit value relatives from the export-import indexes uniformly reveal greater temporal variability in the latter. In some cases, however, the relative stability of wholesale prices may reflect at least in part deficiencies in the BLS system of relying upon prices reported by sellers (see Section V, 2).

In addition, it may be expected that price data for domestic transactions which refer to dates of sale contracts would display differences in the timing of changes from price data derived from foreign trade statistics since the latter are recorded as of dates of shipment across national boundaries.

Finally, unit values derived from Census import statistics may differ from prices for the same goods collected from domestic sources because the Census data are valued at the foreign port of origin. This means that changes in the source of supply may produce changes in the landed price in the United States which, owing to differences in transportation costs, may diverge from the changes in f.o.b. foreign port values. If the focus of analysis is to be on competition for the American market, it would be preferable to try to make the import price index reflect changes in the cost of foreign goods at American points of entry. (We shall return to this point subsequently.)

How important are these divergences between price relatives and unit value relatives? Since nearly 200 unit value relatives enter each index, may not the upgrading in size and quality within some foreign trade classifications be offset by downgrading in others so that the indexes of export and import unit values may not differ much from indexes of export and import prices? These questions can be answered only for the period 1913–23 for which NBER export and import price indexes have been prepared. The author of the NBER study, which has already been cited, presents comparisons between the Commerce and the NBER indexes for six pairs of years for total exports, total imports, and for each of the five major classes of exports and imports for which indexes are published by the Bureau of Foreign Commerce. The frequency distributions of the ratio of the Commerce to the NBER indexes for these six comparisons are as follows:

Ratio	Total index		5 major commerce classes	
	Exports	Imports	Exports	Imports
90.0 to 94.9	0	0	1	2
95.0 to 99.9	1	2	12	10
100.0 to 104.9	5	4	14	14
105.0 to 109.9	0	0	1	3
110.0 to 114.9	0	0	2	1
Total	6	6	30	30

The agreement between the Commerce and the NBER indexes is good. Commerce's unit value indexes for total imports and total exports fell within 5 percent of NBER's price indexes, and the same was true in a high proportion of the cases for the indexes relating to the major classes.

There is no way of knowing what a similar comparison for a more recent period would show if it could be made. In view of the rise in the importance of finished manufactures in United States trade and in view of the growing deficiencies in the Commerce indexes in this area, it is not unlikely that less favorable results would be obtained. At best, moreover, the inference is that the Commerce indexes provide good approximations to price indexes for total exports and total imports and that the margins of error become wider as the commodity class to which the index numbers refer becomes narrower (compare the distributions for the totals and for the major classes). Even on this optimistic conclusion, the Bureau of Foreign Commerce should be encouraged to continue its present practices with respect to the selection of unit value and quantity data only if emphasis in the uses of the indexes is to be placed on overall price changes in exports and imports. However, an understanding of changes in our trade position requires a knowledge of the relative price changes at home and abroad for particular categories of goods. In recent years, for example, changes in the relative prices of automobiles, oil, coal, and steel have been more relevant than export or import prices as a whole. Thus, it would be useful to have indexes for certain important commodity classifications designed for direct comparison with those of other countries that play an important role in the trade of particular items. Depending upon the usage followed by other countries, these subindexes might be based on the standard international trade classification as the United Nations Statistical Commission has recommended, or upon the Brussels nomenclature which has recently been employed extensively on the European continent. England and Japan have taken some steps toward the use of the standard international trade classification and if other major trading countries were to do likewise, it would be easier to analyze the role of relative price changes in competition for trade in third markets. The Commerce Department currently provides the United Nations with an export unit value index for inclusion in the world unit value index for exports of manufactured goods, and it might be useful to make this public.

It would also be desirable to calculate and publish the indexes of total exports and imports for more narrowly defined geographical areas. There is great interest, for example, in the changes that occur in the terms of trade with underdeveloped countries.

The selection of the appropriate geographical and temporal terms of reference for the price indexes poses problems because of the differences between prices in the country of origin and the country of destination and differences between prices at the time of sale (contract) and at the time of shipment from the port of origin or delivery to the port of destination. If the main purpose of the price indexes is to serve as deflators for data on the value of foreign trade so as to produce quantum indexes of trade, the overriding consideration is to make the geographical reference and the timing of the price indexes consistent with those of the value data. Thus prices would be those

prevailing at ports of export, the domestic port in the case of exports and the foreign port in the case of imports, and as of the time of contract. Linking contract prices with actual times of the departure of exports from and of the arrival of imports at American ports creates obvious difficulties for any scheme of price collection relying upon sources external to the foreign trade statistics. On the other hand, current rather than past contract prices and domestic rather than foreign prices are relevant to the analysis of competitive conditions in a particular market. This conjures up the possibility of whole congeries of export and import price indexes, an export price index for each destination and an import price index for each source of supply. While we recognize that for various purposes we would desire differently defined indexes, we suspect that the differences will not be so great as to warrant the calculation of more than one index number of export prices and one index number of import prices. We are of the opinion that it would be best to make their geographical and temporal terms of reference consistent with those of the foreign trade value series. Even for some of the purposes for which other terms of reference would be preferable, information on quantity and value as well as price changes is useful or necessary, and something is gained in having all three on a consistent basis.

If the current indexes are to have greater utility, steps must be taken to exercise more extensive surveillance over the unit values that are derived from Census trade data. The minimum changes that should be made in the data collection procedures are (1) the institution of systematic comparisons with domestic price movements as revealed by BLS and other sources and with appropriate foreign export or import price series, and (2) the substitution, where appropriate, of price changes as revealed by these external sources for Census unit values. Substantial improvement along these lines would be possible with only a modest addition to the professional staff of the group responsible for the indexes. The BFC staff's proposals for mechanization of the computations by taking advantage of the Bureau of the Census electronic computing equipment should be adopted, and if adopted, the staff would be somewhat freer to carry on the policing of the Census figures that is necessary, though the need for additional staff would not be obviated.

It would, in addition, be highly desirable to do some specification pricing in the field, particularly in the finished manufactures area. Much of this pricing might be experimental, especially in the early stages, with the purpose of determining to what extent unit value data from Census statistics and price data from the Wholesale Price Index were satisfactory for export and import price indexes. In the long run, therefore, the indexes would be based upon a variety of sources chosen in accordance with criteria of validity and cost.

The byproducts of this work could be of benefit to the Wholesale Price Index. The total transactions information of the BFC data can provide a useful external check to some of the wholesale price series, since they include discounts and premiums which the latter series often does not detect. The same may be said of the information that would be obtained from field visits to exporters and importers made primarily for the foreign trade indexes.

For this and other reasons, the export-import index work should be brought into closer association with other price index activities, either through closer interagency cooperation or through the transfer of responsibility from an operating to a statistical agency. The latter suggestion is not made in a spirit of criticism of the manner in which the Bureau of Foreign Commerce staff has discharged its responsibilities. There is every indication that the resources available to it have been used intelligently and with great professional skill. But the available resources are inadequate to the magnitude and importance of the task, and it may be desirable to place this work in an administrative setting in which it is a major assignment rather than an incidental byproduct.