Measuring Export Prices

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International Trade Administration, U.S. Department of Commerce

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Abstract: This article describes and compares the three most popular indices that are used to measure export prices—Wholesale Price Indices, unit value indices, and export price indices. It includes a brief discussion of the methodology used in constructing the different types of indices and the relative merits of each, as well as a review of the relevant literature. Two of these price measures, Wholesale Price Indices and unit value indices, are used to analyze the "pass-through" question. A proper measurement of the extent to which exporters pass-through the price effects of changes in exchange rates in the prices they charge their foreign customers is essential to an understanding of (1) export pricing behavior of individual industry sectors when exchange rates fluctuate and (2) the impact of exchange rate changes on a country's trade balance.

Biographies
The authors are all International Economists in the Office of Planning and Research, International Trade Administration, U.S. Department of Commerce.

Charles Dale specializes in studies of the effects of various macroeconomic variables on trade flows. He was formerly a Financial Economist in the Office of the Secretary of the Treasury.

Victor B. Bailey is the Information Officer in the Office of Planning and Research. He is one of the government's specialists in the collection and use of U.S. trade data.

Timothy M. Baxter has extensive experience in the design and construction of forecasting models. He was formerly employed by SRI International.

Elizabeth W. King analyzes petroleum pricing and U.S. trade with less-developed countries. She was formerly employed by the International Trade Commission.

The appropriate measurement of export prices is essential for understanding many important issues in international trade, such as the effects of devaluation or revaluation on a country's balance of trade. Furthermore, the accuracy of equations used in trade forecasting models also depends on the appropriate measurement of export prices. This article surveys the state of the art of the most widely used measures of export prices and demonstrates that even a simple comparison of price measures can provide useful insights into the pricing behavior of industry sectors following a currency devaluation.

EXPORT PRICE MEASURES

The three most popular types of export price measures are Wholesale Price Indices (now called Producer Price Indices), unit value indices, and export price indices. All three are continually being revised and improved.

Wholesale Price Indices (WPI's), compiled by the Bureau of Labor Statistics, are Laspeyres indices based on Standard Industrial Classification (SIC) codes. They measure
average changes in the prices charged (i.e., list prices) in primary markets by producers of goods in all stages of processing.

The monthly sample used for compiling WPI's includes 2800 commodities, and approximately 10,000 price quotations. The sample universe covers both domestically produced commodities and goods imported for sale in primary markets.

The Bureau of Labor Statistics changed the name of WPI's to Producer Price Indices in 1978 to reflect more accurately the nature of the data. Since the use of the term WPI is so widespread, and because there has been little initial difference in the way the indices are calculated (see Cormier and Early, 1976), we will continue to use the term WPI throughout this study.

Unit value indices (UVI's), compiled by the Bureau of the Census, are Fisher indices. The indices, covering several Schedule B commodity groups, are based on average values derived by dividing the aggregate FAS value of exports by the volume exported. The share of the goods covered within a category varies considerably among categories. For example, the prices for a particular category may be determined by 10% of the goods in that category, whereas the prices for another category may be determined by 80% of the goods. In the occasional instances that using the quantity reported on the export manifest results in an unreasonable unit value, shipping weight is substituted for quantity. Until recently, Census used regression analysis when computing UVI's from shipping weights. Use of this method has been discontinued, however, because it is unsatisfactory when weights vary substantially within a category.

Finally, early in the 1970s the Bureau of Labor Statistics began compiling export price indices (EPI's). These are Laspeyres indices constructed from survey data of transaction prices collected from exporters. The BLS uses a method similar to the pioneering methods of Lipsey (1963) and Kravis and Lipsey (1971, 1974, 1977, 1979). Since these indices are specifically designed to measure export transaction prices, they would, in principle, be the most satisfactory measures to use in international trade analysis. However, these indices do not yet have the breadth of coverage or the historical depth needed for many analytical purposes.

STUDIES OF EXPORT PRICE MEASURES

Concern about the quality of official price statistics led to a study by the Price Statistics Review Committee of the National Bureau of Economic Research (1961). The Committee's report, known as the "Stigler Report," concluded that price data on U.S. trade was woefully inadequate, but it recommended the use of UVI's as deflators. The report began a debate on the relative merits of WPI's and UVI's, the only export price measures then available.2

The Interagency Committee on Measurement of Real Output (1970), in a study known as the "Searle Report," recommended that preference be given to WPI's over UVI's as deflators. This recommendation was made since UVI's are essentially average values that can be greatly affected by changes in product mix.3 The WPI sampling procedure, on the other hand, has specific provisions that take into account changes in product mix and quality. The report also acknowledged that, in certain instances, WPI's would be unsuitable. In such cases, and under certain strict criteria, UVI's may be preferred.

Based on a comparison of WPI's and UVI's, Gordon (1971) recommended the use of UVI's as deflators for fixed capital goods, believing that the UVI's reflected transaction prices. Gordon argued that his comparison of the two price indices showed that the WPI's, which are based on sellers' list prices rather than buyers' transaction prices, were biased upward and were therefore unacceptable.

Poppin and Gillingham (1971), in a rejoinder, pointed out that many of the product categories used in Gordon's paper were broadly enough defined so as to make the product to product comparisons difficult. In this study, that, given the product quality differences, the UVI's used in Gordon were unsatisfactory as measures of trade. As a result, a comparison of UVI's and WPI's cannot show that it is the UVI's that are biased, nor can it show that the UVI's are valid deflators of capital goods.

In a subsequent paper, Gordon argued that UVI's were totally satisfactory as measures of trade, while acknowledging that mix problems would cause UVI's to be more volatile than the WPI's. Murphy (1971) made an attempt to derive UVI's for bilateral trade, finding that the WPI's were more satisfactory than the UVI's as deflators. The report began a debate on the relative merits of WPI's and UVI's, the only export price measures then available.2

The importance of having available data led to attempts for the construction of the indices. Kiehn (1966) offered early ideas for improving UVI's, and Etkin (1968) suggested UVI's for bilateral trade, while most significant improvement was the development, by Labor Statistics, of export price indices that are unbiased, nor can it show that the UVI's are valid deflators of capital goods.

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In a subsequent paper, Gordon (1973) concluded that neither WPI's nor UPI's were totally satisfactory as measures of export prices, while acknowledging that a product mix problem will cause UPI's to be a misleading measure of transaction prices. However, Gordon argued that in the event a particular UPI does represent a transaction price its comparison with a WPI can offer valuable insights into economic questions. Also he argued that notable deviations between the growth rates of UPI's that do reflect transaction prices and WPI's indicate that further research needs to be conducted to decide which index provides the best measure of export prices.

The importance of having accurate data available has led to attempts to improve the construction of the indices. For example, Kiehn (1966) offered early ideas on means of improving UPI's, and Etkin (1974) attempted to derive UPI's for bilateral trade. Perhaps the most significant improvement, however, has been the development, by the Bureau of Labor Statistics, of export price indices based on surveys of transaction prices.

Murphy and Perez-Lopez (1977) summarized the literature on UPI's. One of their conclusions was that an inverse relationship exists between the relative importance of each economic class of exports to total trade and the share of the value of exports in the category from which the particular UPI's are calculated. For example, the UPI's for crude foods were based on products comprising 90% of the value of exports in that category, whereas crude foods comprised only about 12% of U.S. exports. On the other hand, UPI's were calculated using products that covered only about 24% of the value of the finished manufactures category, which accounted for some 58% of total exports. This coverage raises the question whether UPI's accurately reflect the movement of the average unit values of some export categories, a broader perspective.
question quite distinct from whether UVI's represent actual transaction price movements.

Finally, it should be noted that both BLS and Census are constantly examining their price measures. BLS is upgrading its survey techniques, while Census is broadening its coverage of unit values. In the next section we will describe how measuring pass-through, a significant issue in international trade theory, critically depends on the availability of a suitable price measure.

THE PASS-THROUGH ISSUE

One significant economic issue that arises under both fixed and floating exchange rate regimes is the question of when and how exchange rate changes affect trade balances. In this regard, the critical determinant is the pricing policies of individual firms. If firms resist altering their export prices to reflect exchange rate changes, they are said to absorb the differences. On the other hand, if they adjust their export prices immediately following major exchange rate changes, they are said to pass-through the exchange rate effects. The timing and extent of pass-through help determine the short-run effects that exchange rate changes will have on trade balances.

In this section we describe how two export price measures may be used to study the pass-through issue. We conclude that industrial sectors differ greatly in their pricing behavior, with some sectors exhibiting a great deal more pass-through than others.

To look for pass-through, we first divide total merchandise exports into the end-use categories devised by the Commerce Department's Bureau of Economic Analysis. These categories are: Foods, Feeds, and Beverages; Industrial Supplies and Materials; Capital Goods; Automotive Vehicles, Parts, and Engines; and Consumer Goods.

Two price indices are shown on Figure 1 and Table 1: Wholesale Price Indices and unit value indices. The WPI's are aggregates chosen to approximate each end-use category and thus are composites of tradable and nontradable goods. The UVI's are compiled by the Bureau of the Census specifically for these end-use categories. They are, however, subject to all the defects described earlier. Of course, the best price measure to use would be a survey-type index such as the Bureau of Labor Statistics' export price index. However, BLS currently is compiling indices primarily for highly disaggregated SITC categories, not aggregate end-use categories.

Figure 1 compares the movement of the two price indices during the period 1972-1979. The results reveal a striking difference in the pricing behavior of different industry sectors.

The most dramatic example, and the one that is easiest to interpret, is end-use group 3, Automotive Vehicles, Parts, and Engines. The divergence of the WPI and UVI since 1973 is very clear. Since relatively few subgroups comprise this end-use category, and the total value of automobile exports and the value of parts exports are very similar, the aggregation problems commonly experienced by UVI's are likely to be minor.

Before 1973, the price indices moved together, even through the Smithsonian agreement period of late 1971. During 1973, when the fixed exchange rate system ended, the WPI and UVI for automobiles began to diverge markedly, with the UVI increasing significantly faster. One possible explanation is this: If, after the 1973 dollar devaluation, U.S. auto exporters had maintained similar pricing schemes for cars and parts to be sold domestically and cars and parts to be exported, the WPI and UVI would have continued to move together. Possibly, the UVI began to increase more rapidly than the WPI because U.S. automakers did not pass through the exchange rate benefits to foreign customers, but instead raised the dollar prices of their exported cars. This, in turn, suggests that U.S. automakers were attempting to maximize profits by increasing prices, rather than trying to expand market share by taking advantage of the cheaper dollar. Although this is conjec-
composites of tradable and non-tradables. The UVI's are compiled by the Census specifically for export categories. They are, however, not the defects described earlier. Of the price measure to use would be an index such as the Bureau of Labor Statistics export price index. However, the UVI compiling indices primarily aggregated SITC categories, not the specific categories.

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Table 1. End-Use Category Price Indexes, 1972 = 1.0 (Not Seasonally Adjusted) continued

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Note: The WPI's for end-use group 0 through 4 are the Wholesale Price Indexes for All Foods, Industrial Commodities, Capital Equipment, Passenger Cars, and Finished Consumer Goods, respectively.
ture, such behavior is not improbable in oligopolistic industries.

Figure 1 reveals a similar pattern for end-use group 2, Capital Goods. The WPI and UVI moved together until the 1973 dollar devaluation, after which U.S. firms may have marked up the prices of their export goods relative to their products sold domestically.

The opposite situation is shown in end-use category 4, Consumer Goods. The WPI and UVI moved together fairly well through the 8 year period shown, although there were temporary divergences possibly due to currency fluctuations. This behavior is consistent with the theory that competitive pressures generally kept export prices in line with domestic prices.

Figure 1 also includes an intermediate case. Firms that chiefly manufactured goods in end-use group 1, Industrial Supplies and Materials, appear to have begun increasing their export prices relative to domestic prices in 1973. The closeness of the UVI and WPI indicates, however, that the markups in this industry were not as great as those in the auto industry.

Finally, Figure 1 shows end-use category 0, Foods, Feeds, and Beverages. Here again the WPI and UVI diverge sharply in 1973. The two indices moved up together before 1973 reflecting the general commodity inflation that occurred in that period. The indices began moving back in line at the end of 1979—this development is not surprising since agricultural markets are generally highly competitive.

The huge differences in the behavior of prices for the various end-use categories have implications for both theory and policy. At the theoretical level, the graphs indicate that whether or not a depreciating currency will improve the trade balance, and if so how long it will take, is difficult to measure because of different pricing strategies among sectors. At the policy level, strategies to increase exports can only be devised if policymakers have a clear understanding of how individual sectors price exports.

Of course, we emphasize that our discussion of Table 1 is conjecture. Nonetheless, it is remarkable just how illustrative a few simple comparisons may be when the nature of the data being used is understood. As the Bureau of Labor Statistics and the Bureau of the Census improve their price measures, it should be possible to reach more definitive conclusions about the nature of pass-through in various industrial sectors.

CONCLUSIONS

This article has examined three price measures to reach the following conclusions: (1) The best measure of export prices would be the Bureau of Labor Statistics’ export price index, which is constructed using data from surveys of exporters’ transaction prices. This BLS index is, however, not yet adequate in either its commodity or historical coverage; (2) Of the two remaining price measures, Wholesale Price Indices are usually, but not always, superior to unit value indices. The composition and behavior of the individual export categories being measured must be carefully examined to be certain that WPI’s are preferable to UVI’s; (3) To measure pass-through, i.e., the extent to which firms alter their export prices to reflect exchange rate changes, requires analyzing the export price indices of separate industry groups, as opposed to just examining aggregate export price indices. The evidence in this study indicates that some sectors, such as autos, may have been holding up their export prices after the dollar devaluation, while other sectors, such as consumer goods, may have passed on the effectively lower prices to their prospective customers.

The measurement of export price movements in general, and the analysis of issues such as pass-through in particular, require the construction of accurate price indices. Both the Bureau of Labor Statistics, which produces EPi’s and WPI’s, and the Bureau of the Census, which constructs UVI’s, are actively working to raise the quality of these measures. Such improvements are vital to economists’ efforts to understand the theory of international trade.

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NOTES

1. These are only the most recent improvements. Hooper (1976) devised price indices for tradable goods. However, they do not include all price measures and are not necessarily those of any of the U.S. Department.


4. The seminal article on Branson (1972). Also see Magee (1973) and Mi

5. For a discussion of variations see Dale et al. (1975), and Bureau of I

6. There are two other categories: Special C: Goods), and Reexports. These categories are adequate public data or s

7. The Commerce Depa...
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NOTES
1. These are only the most widely used price measures. Hooper (1976) derived his own UVI's for his work. More recently, Goldstein and Officer (1979) devised new price indices for tradable and nontradable goods. However, they concluded that their price measures behave very similarly to more conventional measures.

2. For a representative sample of studies in which the choice of price indices may have had a profound effect on the results see Ahluwalia and Hernandez-Cata (1975), Grossman (1980), Isard (1977), Summers (1973), Suomela (1978), and U.S. Bureau of Labor Statistics (1971).


4. The seminal article on pass-through is Branson (1972). Also see related articles by Magee (1973) and Miles (1979).

5. For a discussion of various trade classifications see Dale et. al. (1981), Kwack (1975), and Bureau of International Economic Policy and Research (1978).

6. There are two other end-use export categories: Special Category (Military Goods), and Reexports and Miscellaneous. These categories either do not have adequate public data or behave too erratically to be useful for our purposes.

7. The Commerce Department's International Trade Administration (ITA) is currently experimenting with a "price proxy," which is a composite of disaggregated wholesale prices weighted by the share of exports of each commodity. In some cases, the ITA price proxy more closely follows movements in the WPI, in other instances it tracks better with the UVI. The price proxy is, therefore, an area of continuing research within ITA.

8. For example, one alternative explanation for divergences in the indices might be business-cycle considerations. Both 1973 and 1978 were years of fairly intensive capacity utilization worldwide, which may have had an abnormal effect on the various price indices. This type of situation could cause short-run abnormal pricing behavior.

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