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Analyzing alternatives to export price indexes

By David Mead

The International Price Program (IPP) at the U.S. Bureau of Labor Statistics (BLS) has produced a full set of export price indexes for merchandise goods since September 1983. Along with the import price indexes, which began a year earlier, the Office of Management and Budget designated the indexes as Principal Federal Economic Indicators. The export price indexes have a myriad of uses, but primary among them is to deflate the various trade statistics for the United States.

The export price indexes produced by the BLS are created by directly collecting a sample of export price data directly from exporting companies. However, collecting data from companies on a monthly basis is costly. The question is whether there any other data sources that could be used in place of BLS export price indexes. The two

most likely alternatives are to either use producer prices as a proxy for export prices or calculate detailed unit value indexes derived from trade dollar values and trade volumes. The latter is a less costly alternative than directly collecting export prices from respondents. In the end, both options proved to be inferior replacements for a number of reasons. This **Beyond** the **Numbers** article details the uses for the export price indexes and summarizes the problems with using proxies in place of the current indexes.

Uses for the export price indexes

BLS initially produced export and import price indexes as a more detailed replacement for the unit value indexes that the U.S. Census Bureau published from 1919 to 1989.[1] The export and import price indexes currently serve as deflators for the foreign sector components of the gross domestic product (GDP) produced by the Bureau of Economic Analysis (BEA) and the merchandise trade statistics that Census publishes.

GDP can be broken down into five major components using the following formula:

$$GDP = C + I + G + (X – M)$$

Where,

C = Personal Consumption Expenditures

I = Gross Domestic Investment

G = Government Consumption and Investment

X = Exports

M = Imports

The export price indexes produced by BLS deflate the export component of GDP to convert the data from nominal terms to real terms. In 2013, exports accounted for 12.9 percent of total real GDP, compared with the investment sector making up 16.3 percent and government spending, 18.4 percent. BEA converts nominal data into real terms to remove the inflation component and obtain an accurate measure of the U.S. economy.

For example, between 2009 and 2013, the export price indexes BEA uses to deflate the export component of GDP rose 12.0 percent, compared with just a 6.7-percent increase over the same period for the price index used to deflate overall GDP.[2] The nominal GDP results therefore overstated the value of exports because export price levels went up faster than the other components of GDP.

The other major government statistics deflated by the export price indexes are the merchandise trade statistics produced by the Census Bureau. These measures of exports and imports measure the U.S. balance of trade. Accurately measuring the trade balance was the main impetus behind expanding the BLS export and import price indexes from a quarterly to a monthly measure in the 1980s, when the United States began to run a trade deficit.[3]

Although creating a more accurate deflator was the primary reason BLS introduced the indexes, there was a secondary reason for producing a full set of export price indexes. By the mid-1980s, trade between countries was becoming more integrated, emphasizing the importance for the United States to compete in an increasingly global market. Export price indexes are used to compare U.S. export price movements with both the export prices from

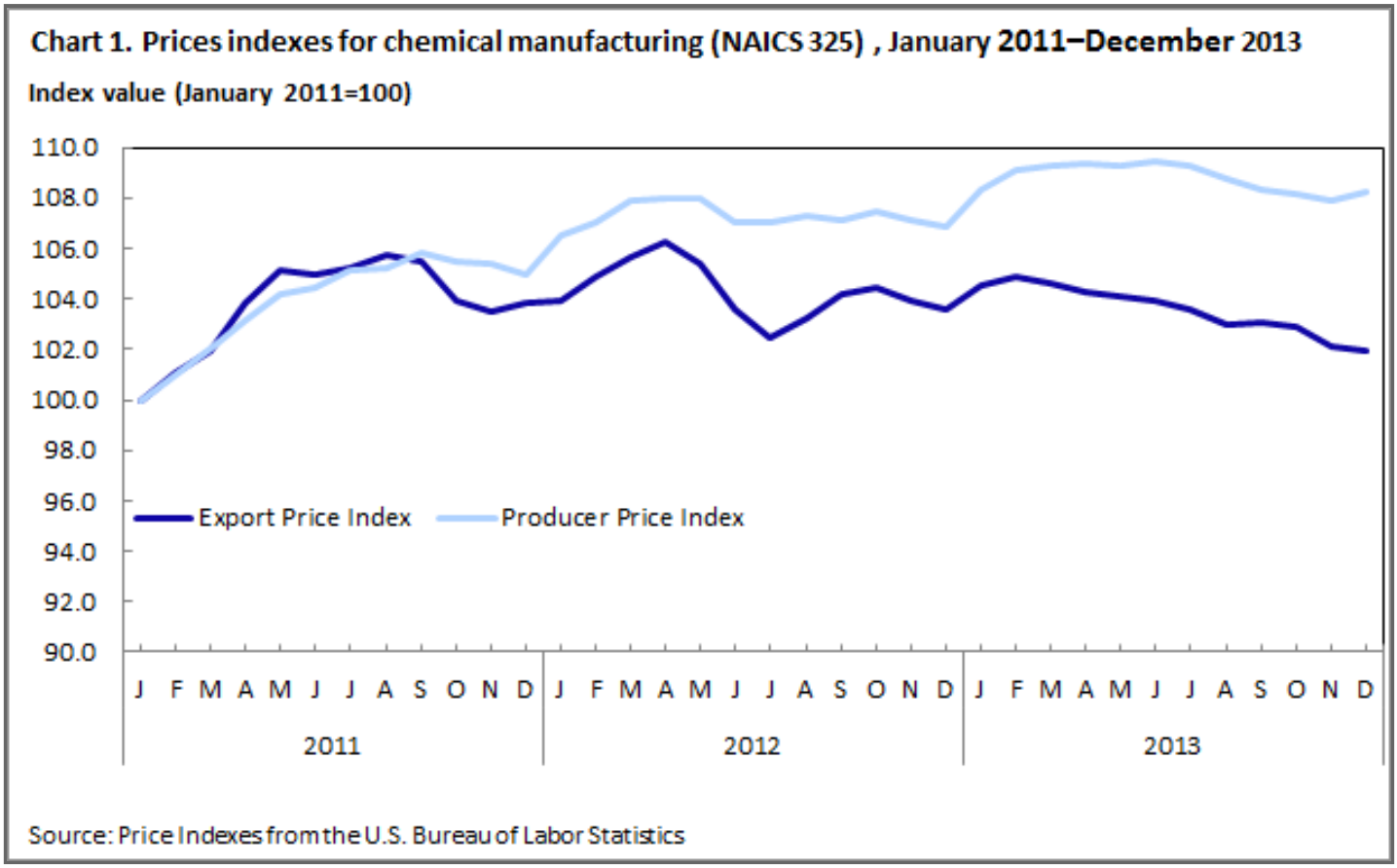
economic competitors and to the domestic price movements in those export markets. Looking at export prices as a measure of U.S. competitiveness has become even more important in the years subsequent to their creation.[4]

There are a number of other uses for the export price indexes. As measures of price movements, the export price indexes are also measures of inflation for different sectors of the economy. As such, potential uses might include forecasting future price trends, negotiating trade contracts, and processing cost-based accounting. Other uses include calculating contract escalation clauses, studying price elasticities, and analyzing the impact of foreign trade policies and movements in exchange rates.

Using producer prices as a proxy for export prices

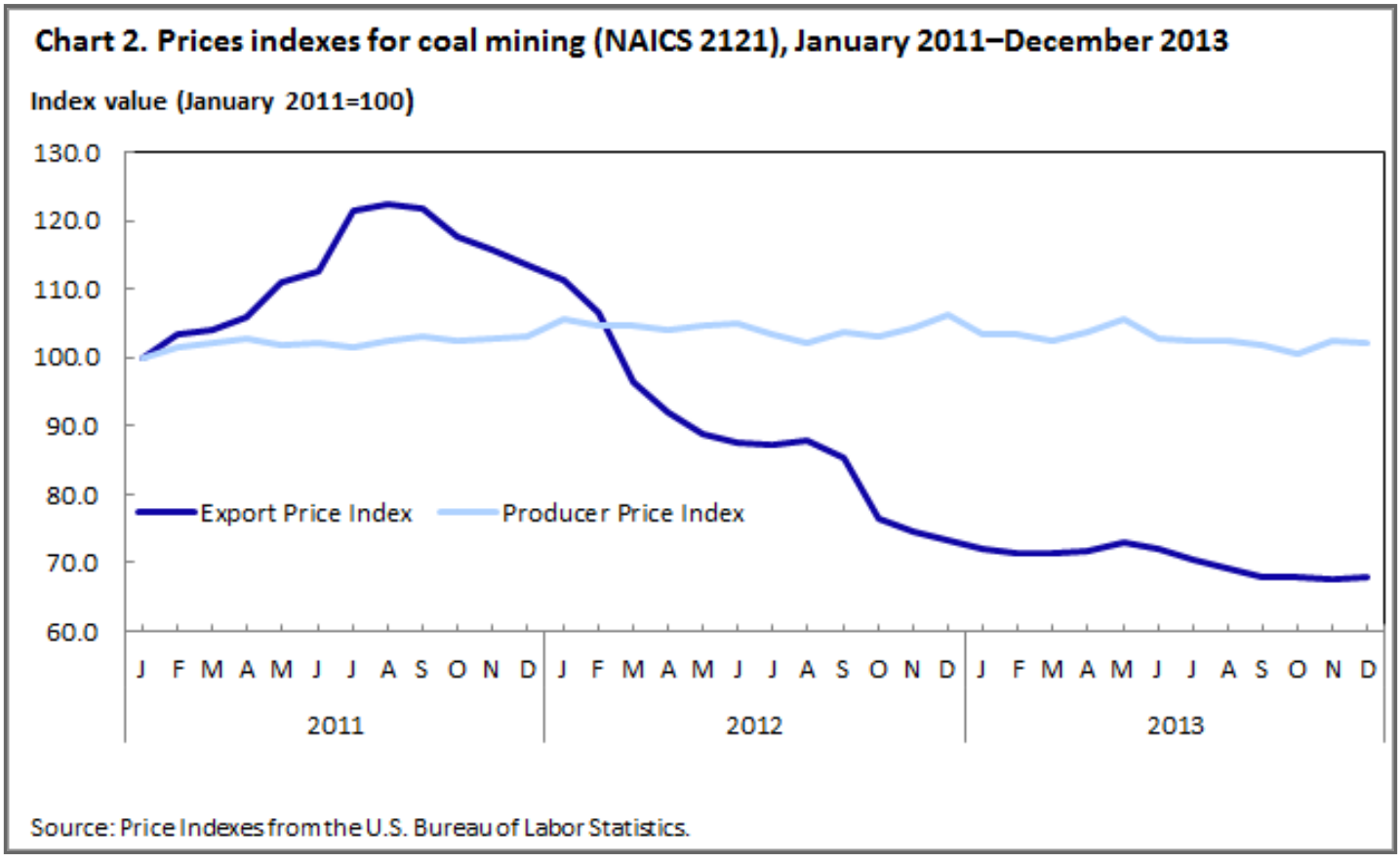
No organization outside BLS produces U.S. export price indexes. However, is there a substitute that can be used to proxy the export price indexes?[5] The obvious choice would be the producer price indexes also produced by the BLS. The majority of exports from the United States originate here and are in scope for the producer price indexes, which measure price movement for items produced in the United States.

The law of one price states that identical items sold in different countries should be the same price when expressed in the same currency. A simple method to examine how well the law of one price holds up in reality is to compare the export price indexes with the producer price indexes where possible. Both programs use multiple classification systems, but the North American Industry Classification System (NAICS) is the only one used for both the export and producer price indexes.[6] For purposes of comparison, the author rebased the indexes so that January 2011 equals 100, and then compared the two sets of indexes for 2011, 2012, and 2013. BLS publishes both an export price index and a producer price index for 72 industries at the 3–5 digit classification level. Only 18 of the 72 indexes were relatively close over the 2011–2013 period. An example in which indexes differed is in the chemicals industry as shown in chart 1.



Even though the price indexes trended in the same direction most months, over the 3-year period, export chemicals prices only increased 2.0 percent, compared with an 8.2-percent advance in producer chemical prices over the same period. Using producer prices as a proxy for export prices would have resulted in over deflating chemical prices and underestimating the value of chemical exports.

Why do producer prices differ from export prices? There are several economic reasons why the law of one price fails.[7] The product mix even at disaggregated levels can differ between domestic consumption versus exports. A good example is the coal industry, for which the United States consumes approximately 90 percent of the coal produced, made up mostly of thermal coal used for electricity generation. In contrast, approximately 77 percent by dollar value of U.S. coal production for exports is metallurgical or coking coal used for the production of iron and steel.[8] As seen in chart 2, the export and producer price indexes diverge dramatically.



A second reason that export and domestic prices can trend differently is that companies do not necessarily use the same price strategies when selling in foreign markets. Reasons include facing different competition selling in foreign markets, varying transportation costs depending on the cost of shipping and tariffs and other barriers to trade. Another factor is exchange rate changes, which can affect the U.S. dollar price of exports if sellers absorb some of the exchange rate fluctuation. Companies might also set different prices in markets where they are trying to gain market share.

Finally, although most U.S. exports are produced in the United States, some exports are not. Instead, those items first are imported into the United States and then reexported. Any exports not produced in the United States would not be included in the PPI sample, yet they would be in the sample of export items. The communications equipment and manufacturing industry is an example where the majority of exports originate outside the United States.

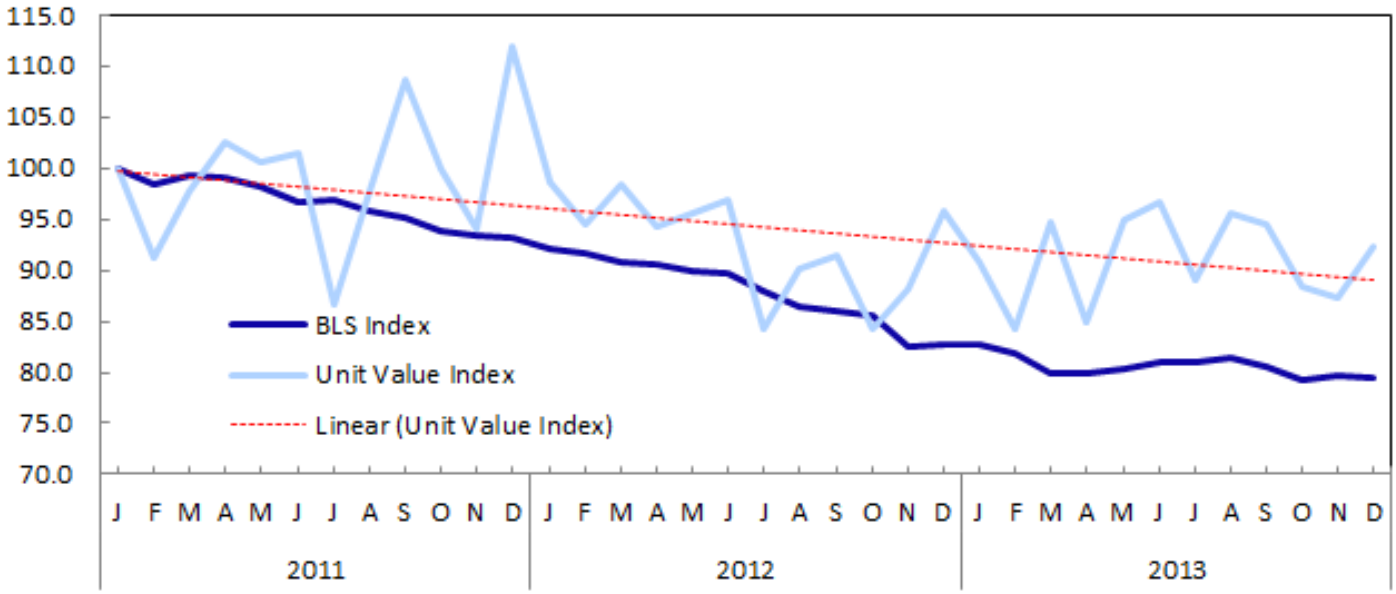
Deriving detailed unit value Export Price Indexes

A second potential proxy for the export price indexes is detailed unit value indexes calculated from the nominal trade figures produced by the Census Bureau. Unit value indexes divide trade dollar values by trade volumes to calculate the average price. Census produced unit value indexes up until 1989, but those indexes were calculated at a high level of aggregation. One issue with unit value indexes was the difficulty in separating price changes from changes to the item mix. As the diversity of the product mix increases, this issue is exacerbated. In addition, those indexes only covered about 46 percent of the total value of exports.

Census now calculates trade value and volume statistics at a much finer detail—the 10-digit level of aggregation in the Harmonized Classification system.[9] Five-digit BEA end-use indexes can be derived using the value and volume data from Census at the 10-digit harmonized level. The mapping structure and weights used by BLS to aggregate the 10-digit harmonized indexes to the 5-digit BEA end-use indexes can then be used to aggregate those indexes up to the 5-digit BEA end-use level.

The question is how close these indexes match the BLS indexes derived from directly collected price data. Looking at the computer industry in particular, can reveal some discrepancies between the unit value indexes and the directly collected price data. Chart 3 shows the published export price index for computers compared to with the unit value index, calculated using the trade value and volume numbers, which are collected by the Census Bureau.

Chart 3. Prices indexes for computers (BEA End Use 21300), January 2011–December 2013



Source: The U.S. Bureau of Labor Statistics and the U.S. Bureau of the Census.

An issue with unit value indexes is there is no way to separate price changes from changes in the mix of items. BLS indexes hold the sample of products fixed when comparing prices from one month to the next. For computers, the unit value indexes were considerably more volatile than the published BLS indexes. Over the 3-year period from 2011 to 2013, monthly percent changes for the unit value indexes ranged from a 14.7-percent decline to a 19.0-percent increase, compared with BLS indexes, which never recorded a change larger than 2.5 percent. Even at a detailed level of aggregation, the unit value indexes proved too diverse in the product mix. For example, one of the 10-digit classification groups was portable, digital automatic processing machines, weighing not more than 10 kilograms and consisting of a central processing unit, keyboard, and display. Although that might sound detailed, in reality, the classification includes every tablet computer on the market as well as most laptops. If the percentage of computers exported switches from primarily tablets one month to mostly laptops the next, the unit value index might increase significantly even if prices remain constant.

Unit value indexes also do not allow for making adjustments for quality changes, meaning not only does the product mix vary from month to month, the individual items themselves vary. This problem also shows up in the computer example. Computers are a high-tech good in which quality improvements are frequent. To illustrate, chart 3 includes a trend line for the unit value indexes that takes the volatility out of the month-to-month index changes, allowing for a better comparison to the BLS export price index. Both indexes fell over the 3-year period, but the BLS index declined at a greater rate. From the beginning of 2011 to the end of 2013, the BLS export price index for computers decreased 20.5 percent: almost twice the decrease seen in the trend line for the unit value index. The upward bias in the unit value index would have led to underestimating the value of export computers at an increasing rate over time.

Although unit value indexes proved to be a weak proxy for export prices due to the complexity of the industry, unit value index might work better for more homogenous, low-tech industries. Even though the results were not as extreme, low-tech product areas such as coal and soybeans proved too diverse to serve as good proxies for the export price indexes published by BLS.

Further studies

Export price indexes are used in numerous ways to measure and compare international price change. Over the next year, articles that are more detailed dealing with this subject will appear in the BLS *Monthly Labor Review*. One article will focus on how the BEA uses export and import price indexes to deflate the foreign sector of national accounts. Additional articles will present more results from research comparing the export price indexes to the producer price indexes and detailed unit value indexes.

This **Beyond** the **Numbers** article was prepared by David Mead, Economist in the Division of Producer Prices and Price Indexes, Office of Prices and Living Conditions, Email: mead.david@bls.gov, Telephone:(202) 691-7101.

RELATED ARTICLES

More BLS articles and information on export price indexes are available at the following links:

Forty Years of the BLS Export and Import Price Indexes: trends and competition

Are producer prices good proxies for export prices?

Using Disaggregated data to dissect the U.S. trade deficit

NOTES

[1] William Alterman, Edwin Bennion, and Sharon Royales, International Price Program, “Forty Years of the BLS Export and Import Price Indexes: trends and competition,” *Beyond the Numbers,* vol. 2, no. 24 (U.S. Bureau of Labor Statistics, December 2013), https://www.bls.gov/opub/btn/volume-2/forty-years-of-the-bls-export-and-import-price-indexes.htm.

[2] The export price indexes BEA uses to deflate the export component of GDP varies slightly from the BLS export price index because the BEA does not use the export price indexes for a small set of industries including most services.

[3] William Alterman, Edwin Bennion, and Sharon Royales, International Price Program, "Forty Years of the BLS Export and Import Price Indexes: trends and competition," *Beyond the Numbers,* vol. 2, no. 24 (U.S. Bureau of Labor Statistics, December 2013), https://www.bls.gov/opub/btn/volume-2/forty-years-of-the-bls-export-and-import-price-indexes.htm.

[4] The BLS is currently researching two enhancements to the overall set of export price indexes that would provide further insight to U.S. competitiveness. Export price indexes based on the country or region those exports are going to would allow for a direct comparison of the price movement of U.S. exports compared to price levels in the respective countries or regions. A second enhancement would measure export prices based on the currency of the location the exports go to rather than U.S. dollar terms.

[5] Both BEA and Census produce export price indexes as part of the implicit price indexes used to deflate the nominal trade numbers. However, those indexes are directly derived from the export price indexes produced by BLS.

[6] In reality, because PPIs do not use the BEA end-use classification, the indexes would have to be manipulated before using them to deflate the trade statistics.

[7] In addition to the economic differences discussed in this article, there are also a number of methodological and scope reasons that export price indexes and producer price indexes differ. For more detail on those factors, see Alterman, William, "Are Producer Prices Good Proxies for Export Prices," *Monthly Labor Review* (U.S. Bureau of Labor Statistics, October 1997), https://www.bls.gov/opub/mlr/1997/10/art3full.pdf.

[8] Yemi Assefa, Helen McCulley, Myron Murray, and Sharon Royales, International Price Program, "Coal: A key player in expanded U.S. energy exports", *Beyond the Numbers*, vol. 2, no. 3 (U.S. Bureau of Labor Statistics, February 2013), https://www.bls.gov/opub/btn/volume-2/coal-a-key-player-in-expanded-us-energy-exports.htm.

[9] The Customs Cooperation Council developed the Harmonized Classification system in the late 1980s to create an international classification system. The BLS publishes export price indexes aggregated using the Harmonized Classification System.

SUGGESTED CITATION

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