Call For Papers Submission: CRIW Conference: Big Data for 21st Century Economic Statistics

Measuring Import And Export Price Movements With Administrative Trade Data

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In the 1970s, the International Price Program (IPP) established a directly collected industry survey to measure price changes in U.S. imports and exports of goods. The directly collected information was a clear improvement over the unit value indexes calculated by the Census Bureau, and replaced the unit value indexes used to deflate merchandise trade in the early 1990s[i,ii]. However, today's international trade transaction database – ACE – provides a volume of administrative trade data that tracks over a quarter-trillion dollars of monthly goods shipments of exports and imports on a more timely basis and in accessible electronic format. The detailed data are being used to analyze the impact of trade on business relations and households. Kamal and Monarch (2017) analyze the reliability of the trade data in the context of U.S.-foreign supplier relations, and Monarch and Hottman (2018) use the foreign supplier ID to create an import price index in conjunction with profiles of consumers to map out the welfare impacts of import price changes[iii]. In the current budgetary climate with less resources, the IPP is seeking out alternative methods to collect data and calculate indexes. With a census of ACE (merchandise trade data), the IPP has a potentially excellent source of data to mine.

The purpose of this case study is to determine the viability of naturally occurring administrative trade data to improve or replace official import and export price index measures. The administrative data are presently used to draw the sampled establishments proportionally to their share of trade in each detailed product category. This case study will test the viability of directly using the administrative data to supplement or replace survey data. The study will also gauge the appropriate level of granularity, quality, and statistical viability these more current and numerous observations provide to price index quality compared to published indexes.

It is a valuable exercise to consider using the ACE administrative trade data. If using the ACE data as a direct data source improves granularity and coverage and also is feasible for publication, there is excellent potential for increasing the number of data products, primary among them being an imported intermediate input index. A similar index was previously envisioned by the IPP program to improve measures of productivity and economic growth[iv].

Although use of the data is promising, there are several challenges with integrating the data into official statistics that will be addressed in this study. Primary methodological issues to be addressed in the pilot are how to address substitution bias and quality adjustment, what the statistical implications are for blending sampled data with administrative data, and whether current values of trade could improve the index measurement methodology (e.g. by calculating a Fisher or Tornqvist index)[v]. Secondary issues are business and resource related; i.e., what changes would be needed in infrastructure and business processes to manage the volume and variety of data to be processed and what validations or revision policies may be needed to evaluate the veracity, consistency, and variability of the ACE data[vi]. Best practices will be developed to determine how and whether to integrate ACE data into present and future production of official import and export price indexes.

Pilot research will focus on a homogenous product category to create an export price index at a selected product classification level. For the two homogenous classifications in the BEA End Use Export product groups of Dairy & eggs

(Q00310) and Vegetables and juices (Q00330), there exist hundreds of companies trading 3.8 and 6.5 billion dollars, respectively, in 2016. While the use of unit values for a homogenous group of products is consistent with System of National Accounts methodology in some cases, this work will dig deep into the volume and variety of transactions in the administrative data to produce extremely detailed unit value measures[vii]. The lower level export price indexes calculated with the ACE data will be compared to existing published measures.

As a start, we will first create a nested set of Laspeyres export prices for unique items that share similar characteristics of company and business establishments within each 10-digit product category. An example of this price index is below. The indexes would be primarily grouped by detailed 10-digit Schedule B classifications. Let *R* be the Laspeyres index of *h*, a unique 10-digit product classification, and let the price *P* and quantity *Q* represent the average transaction price and quantity of each *h* traded by each unique company *c*, for each *v*, the vector of additional characteristics that further differentiate the product classification/company trade (e.g. state of origin, country of destination or others), and *m*, the month. Then, $P_{c,h,v,m}$ and $Q_{c,h,v,m}$ are respectively the average price and quantity of company *c's* products in *h* broken down into groups of unique product trade characteristics *v* in month *m*. Additional index formulas and index quality tests will be run against the trade data in an effort to determine an appropriate statistical approach.

$$R^{L}_{h,m} = \frac{\sum_{c=1}^{N_{h,v,m-1}} P_{c,h,v,m} Q_{c,h,v,m-1}}{\sum_{c=1}^{N_{h,v,m-1}} P_{c,h,v,m-1} Q_{c,h,v,m-1}}$$

Working through the different limitations that are present in administrative data such as the ACE, which are not designed for economic statistical measure like the production of price indexes, the BLS plans to develop methods to exploit these data. A hoped-for result is to improve the overall quality of the IPP's indexes and at the same time provide a valid alternative to function in a limited resources environment.

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[i] Alterman, William. 1991. *Price Trends in U.S. Trade, New Data, New Insights*, in International Economic Transactions. Edited by Peter Hooper and J. David Richardson. National Bureau of Economic Research, Studies in Income and Wealth. Volume 55. University of Chicago Press.

[ii] IPP started monthly publication for a limited number of indexes in 1989. In 1990 Census discontinued its publication of unit value indexes and started deflating merchandise trade with the directly collected import and export price indexes. By 1993 IPP published all indexes on a monthly basis.

[iii] Kamal, Fariha & Monarch, Ryan. 2017. *Identifying Foreign Suppliers in U.S. Import Data*. International Finance Discussion Paper. 2017. 1-36. (URL https://doi.org/10.17016/IFDP.2017.1142r) , and Hottman, Colin J. & Monarch, Ryan. 2018. *Estimating Unequal Gains across US Consumers with Supplier Trade Data*. Federal Reserve Issue Paper 1220. January 17, 2018. (URL: https://www.federalreserve.gov/econres/ifdp/files/ifdp1220.pdf)

[iv] Alterman, William. 2015. "Producing an Input Price Index." In Measuring Globalization: Better Trade Statistics for Better Policy - Volume 1. Biases to Price, Output, and Productivity Statistics from Trade, Susan N. Houseman and Michael Mandel, eds. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, pp. 331-358. https://doi.org/10.17848/9780880994903.vol1ch10.

[v] Fitzgerald, Jenny. 2017. *Assessing Product Downsizing, Upsizing, and Product Churn using Nielsen Scanner Data*, Presented at the 2017 Joint Statistical Meetings, Session on Measuring the Economy: Economic and Workforce Statistics, Government Statistics Section.

[vi] The ACE database provides an electronic interface that exporters and importers use to directly enter data on trade transactions. The trading party is expected to provide accurate data; data can be revised by the party up to one year later.

[vii] Silver, Mick. 2010. *The Wrongs and Rights of Unit Value Indices.* Review of Income and Wealth. June.