

B. DESCRIPTIONS OF INFORMATION COLLECTION EMPLOYING STATISTICAL METHODS

The following paragraphs summarize the primary features of the sampling and statistical methods used to collect data and produce estimates for the IPP Export and Import series. Additional technical details are provided in Chapter 15 of the BLS Handbook of Methods (http://www.bls.gov/opub/hom/homch15_a.htm) and the Sampling and Index Construction Concepts papers, which are internal BLS reports and are available upon request.

1. Universe and Sample Size

The target universe of the import and export price indexes consists of all goods and services sold by U.S. residents to foreign buyers (exports) and purchased from abroad by U.S. residents (imports). However, items for which it is difficult to obtain consistent time series for comparable products (such as works of art) are excluded, as are goods purchased specifically for military use.

The import and export price indexes are calculated from prices submitted on a monthly basis by sampled establishments that agree to participate in the IPP's Import/Export Price Index Survey at initiation. Thus, the IPP collects data from sampled establishments at initiation and during monthly repricing.

In the following, the unweighted response rates are presented for initiation and repricing.

The unweighted establishment quote response rate and frame error rate are equal to:

$$\text{Unweighted Response Rate} = \frac{\text{COOP}}{\text{COOP} + \text{REF}}$$

$$\text{Frame Error Rate} = \frac{\text{OOB} + \text{OOS}}{\text{OOB} + \text{OOS} + \text{COOP} + \text{REF}}$$

where:

COOP = the number cooperative quotes;
REF = the number of quotes coded as refusals;
OOS = the number of out-of-scope quotes; and
OOB = the number of out-of-business quotes

The unweighted establishment response rate and frame error rate are equal to:

$$\text{Unweighted Response Rate} = \frac{\text{COOP}}{\text{COOP} + \text{REF}}$$

$$\text{Frame Error Rate} = \frac{\text{OOB} + \text{OOS}}{\text{OOB} + \text{OOS} + \text{COOP} + \text{REF}}$$

where:

COOP = the number of establishments with at least one cooperative quote;

REF = the number of establishments with no cooperative quotes and at least one quote coded as a refusal;
 OOS = the number of establishments with no quotes coded as cooperative or as refusals and with at least one quote coded as out-of-scope; and
 OOB = the number of establishments with all quotes coded as out-of-business

EXPORTS

To meet the demanding requirements of the IPP in the environment of the constantly changing composition of international trade requires complex statistical procedures. The universe consists of the total set of export prices. The number of establishments exporting products or services from the United States in the universe is approximately 500,000. In 2012, the overall sample for ongoing repricing of exports for the IPP is approximately 2,200 exporters with 17,600 annual prices/responses . Approximately 8 quotation prices are sampled within each exporter with a resultant average of 4.525 prices collected from each responding exporter. There are approximately 150 product category strata¹ in the export sample design.

Export Response Rates at Initiation

The response rate achieved at the establishment-quote level during the last two export samples initiated was 63% excluding out-of-scope and out-of-business quotes. Approximately 31% of the sampled quotes are either out-of-scope or out-of-business.

The following table presents the unweighted establishment-quote response rates for exporters for IPP initiation.

Unweighted Response Rate at Establishment-Quote Level			
Outcome	X34	X35	Overall
Cooperative	64.3%	61.8%	63.1%
Refusal	35.7%	38.2%	36.9%

Frame Error Rate at Establishment-Quote Level			
Outcome	X34	X35	Overall
In-Scope	71.8%	66.0%	68.9%
OOB/OOS	28.2%	34.0%	31.1%

The next table presents the number of quotes from the 34th and 35th exporter samples by initiation outcome code. These numbers were used to calculate the unweighted response rates at the establishment-quote level.

Export Quote Counts				
Outcome	X34	X35	Overall	Percent

¹IPP uses the term "stratum" (pl. "strata") to refer to a grouping of one or more classification groups which are homogenous with respect to some characteristic and may experience similar price trends.

Cooperative	3915	3372	7287	43.5%
Refusal	2177	2087	4264	25.4%
OOB	191	184	375	2.2%
OOS	2202	2634	4836	28.9%
Grand Total	8485	8277	16762	100.0%

The initiation response rate at the establishment level during the last two export samples was 80% excluding out-of-scope and out-of-business units. Approximately 22% of the sampled units are either out-of-scope or out-of-business. In addition, approximately 10% of the exporters selected in a sample are lost each year due to going out-of-business, further refusal, or the changing nature of the export business.

The following table presents the unweighted establishment response rates for exporters for IPP initiation based on the last two export samples. The overall response rate is based on the combined responses from the 34th exporter sample (X34) and 35th exporter sample (X35).

Unweighted Response Rate at Establishment Level			
Outcome	X34	X35	Overall
Cooperative	81.1%	78.8%	80.0%
Refusal	18.9%	21.2%	20.0%

Frame Error Rate at Establishment Level			
Outcome	X34	X35	Overall
In-Scope	80.9%	74.4%	77.5%
OOB/OOS	19.1%	25.6%	22.5%

The next table presents the number of establishments from the 34th and 35th exporter samples by initiation outcome code. These numbers were used to calculate the unweighted export response rates at the establishment level.

Export Establishment Counts				
Outcome	X34	X35	Overall	Percent
Cooperative	864	823	1687	62.0%
Refusal	202	221	423	15.5%
OOB	35	37	72	2.7%
OOS	217	322	539	19.8%
Grand Total	1318	1403	2721	100.0%

Export Response Rates for Repricing

Once an establishment agrees to provide price data to the IPP at initiation, each unique item to be repriced for the establishment is loaded into the Repricing and Estimation portions of the IPP Unified Database. In most cases an item represents a single quote from one sample, but in some cases an item represents multiple quotes from a single sample, or one or more quotes

from more than one sample. Following is a table of IPP repricing rates are calculated based on the unique items being repriced. The unweighted response rates for the repricing stage are shown in the table below from January 2009 – October 2011.

Export Response Rates for Repricing Stage				
Reference Period	1st Closing	2nd Closing	3rd Closing	4th Closing
200901	69%	71%	72%	72%
200902	69%	71%	71%	72%
200903	73%	74%	75%	76%
200904	72%	75%	76%	76%
200905	75%	77%	77%	77%
200906	76%	78%	78%	78%
200907	73%	75%	76%	76%
200908	74%	75%	76%	76%
200909	74%	75%	76%	76%
200910	74%	76%	77%	77%
200911	74%	76%	76%	76%
200912	77%	78%	78%	79%
201001	73%	74%	75%	76%
201002	74%	76%	77%	77%
201003	76%	77%	78%	78%
201004	76%	77%	78%	78%
201005	77%	78%	79%	79%
201006	76%	77%	77%	77%
201007	74%	76%	77%	77%
201008	75%	77%	78%	78%
201009	75%	76%	77%	77%
201010	74%	76%	76%	76%
201011	75%	76%	76%	76%
201012	75%	76%	77%	77%
201101	75%	76%	77%	77%
201102	75%	76%	77%	77%
201103	74%	75%	75%	75%
201104	71%	73%	74%	74%
201105	74%	75%	75%	75%
201106	74%	75%	75%	75%
201107	71%	73%	74%	74%
201108	73%	74%	75%	75%
201109	74%	75%	75%	75%
201110	73%	74%	74%	75%

In the above table, the data for the 1st Closing shows the percentage of items for which repricing data had been returned as of the time the index for that reference period was first published. The data for the 2nd Closing shows the return rate for the following month—when the data for that period was published for the second time. The response rate for the second closing includes all of the responses from the first closing and all the responses received after the first closing and before the second closing. Data for the 3rd and 4th Closings show return rates for the

3rd and 4th (or final) times that the index for these periods were computed and published. IPP finalizes the indexes for each time period at the time of the 4th closing, so this is the final rate for the period.

IMPORTS

To meet the demanding requirements of the IPP in the environment of the constantly changing composition of international trade requires complex statistical procedures. The universe consists of the total set of import prices. The number of establishments importing products or services into the United States is approximately 500,000. In 2012, the overall sample for ongoing repricing of imports for the IPP is approximately 3300 importers with 27,060 prices/responses. Approximately 8.2 quotation prices are sampled within each importer with a resultant average of 4.927 prices collected from each responding importer. There are approximately 150 product category strata in the import sample design.

Import Response Rates at Initiation

The response rate achieved at the establishment quote level during the last two import samples initiated was 67%. Approximately 25% of the sampled quotes are either out-of-scope or out-of-business. The following table presents the unweighted establishment-quote response rates at initiation.

Unweighted Response Rate at Establishment-Quote Level			
Outcome	M34	M35	Overall
Cooperative	68.6%	65.1%	66.9%
Refusal	31.4%	34.9%	33.1%

Frame Error Rate at Establishment-Quote Level			
Outcome	M34	M35	Overall
In-Scope	75.3%	74.1%	74.7%
OOB/OOS	24.7%	25.9%	25.3%

The next table gives the number of quotes from the 34th and 35th importer samples by initiation outcome code. These numbers were used to calculate the unweighted response rates at the establishment-quote level.

Import Quote Counts				
Outcome	M34	M35	Overall	Percent

Cooperative	6988	6225	13213	50.0%
Refusal	3204	3330	6534	24.7%
OOB	367	316	683	2.6%
OOS	2976	3016	5992	22.7%
Grand Total	13535	12887	26422	100.0%

The initiation response rate achieved at the establishment level during the last two import samples was 82%. Approximately 18% of the units sampled are either out-of-scope or out-of-business. In addition, approximately 10% of the importers selected in a sample are lost each year due to going out-of-business, further refusals, or the changing nature of the import business.

The following table gives the unweighted establishment response rates for importers for IPP initiation based on the last two import samples. The overall response rate is based on the combined responses from the 34th importer sample (M34) and 35th importer sample (M35).

Unweighted Response Rate at Establishment Level			
Outcome	M34	M35	Overall
Cooperative	84.5%	79.9%	82.2%
Refusal	15.5%	20.1%	17.8%

Frame Error Rate at Establishment Level			
Outcome	M34	M35	Overall
In-Scope	81.6%	80.7%	81.2%
OOB/OOS	18.4%	19.3%	18.8%

The next table presents the number of establishments from the 34th and 35th importer samples by initiation outcome code. These numbers were used to calculate the unweighted import response rates at the establishment level.

Import Establishment Counts				
Outcome	M34	M35	Overall	Percent
Cooperative	1394	1325	2719	66.7%
Refusal	256	333	589	14.5%
OOB	60	56	116	2.8%
OOS	311	341	652	16.0%
Grand Total	2021	2055	4076	100.0%

Import Response Rates for Repricing

Once an establishment agrees to provide price data to the IPP at initiation, each unique item to be repriced for the establishment is loaded into the Repricing and Estimation portions of the IPP Unified Database. In most cases, an item represents a single quote from one sample, but in some cases, an item represents multiple quotes from a single sample, or one or more quotes

from more than one sample. Following is a table of IPP repricing rates are calculated based on the unique items being repriced. The unweighted response rates for the repricing stage are shown in the table below from January 2009 – October 2011 for each closing.

Import Response Rates for Repricing Stage				
Reference Period	1st Closing	2nd Closing	3rd Closing	4th Closing
200901	66%	67%	68%	68%
200902	68%	69%	70%	70%
200903	70%	72%	73%	73%
200904	71%	72%	73%	73%
200905	73%	74%	74%	74%
200906	73%	74%	75%	75%
200907	71%	72%	73%	73%
200908	72%	74%	74%	74%
200909	72%	74%	74%	74%
200910	71%	72%	73%	73%
200911	72%	73%	74%	74%
200912	73%	74%	75%	75%
201001	70%	72%	73%	73%
201002	72%	74%	74%	74%
201003	75%	76%	76%	76%
201004	74%	75%	76%	76%
201005	75%	77%	77%	77%
201006	75%	76%	76%	76%
201007	71%	72%	73%	74%
201008	73%	74%	75%	75%
201009	73%	74%	75%	75%
201010	73%	75%	76%	76%
201011	73%	74%	75%	75%
201012	73%	74%	75%	75%
201101	70%	72%	73%	73%
201102	71%	73%	73%	73%
201103	71%	72%	73%	73%
201104	69%	71%	72%	72%
201105	70%	72%	72%	72%
201106	71%	73%	73%	74%
201107	71%	73%	74%	74%
201108	73%	75%	75%	76%
201109	74%	75%	76%	76%
201110	73%	74%	75%	75%

In the table above, the data for the 1st Closing shows the percentage of items for which repricing data had been returned as of the time the index for that reference period was first published. The data for the 2nd Closing shows the return rate in the following month – when the data for that period was published for the second time. The response rate for the second closing includes all of the responses from the first closing and all the responses received after the first closing and before the second closing. Data for the 3rd and 4th Closings show return rates for the 3rd and 4th times that the index for these

periods were computed and published. IPP finalizes the indexes for each time period at the time of the 4th closing, so this is the final rate for the period.

2. Collection Procedures

a. Description of Sampling Methodology

The import merchandise sampling frame is obtained from the U.S. Customs and Border Protection (USCBP). This frame contains information about all import transactions that were filed with the USCBP during the reference year. The frame information available for each transaction includes a company identifier (usually the Employer Identification Number), the detailed product category (Harmonized Tariff number) of the goods that are being shipped, and the corresponding dollar value of the shipped goods.

The export merchandise sampling frame is obtained from the U.S. Census Bureau for exports to the world except Canada. These exports are filed on an electronic computer system known as the Automated Export System (AES). . Since exporters trading with Canada no longer need to file export documentation, the IPP uses the Canadian import documents provided to the U.S. Census Bureau from the Canadian Customs Service. The constructed frame contains information about all export transactions that were filed during the reference year. The frame information available for each transaction includes a company identifier (usually the Employer Identification Number), the detailed product category (Harmonized Tariff number) of the goods that are being shipped, and the corresponding dollar value of the shipped goods.

The IPP divides both its import and export universes into two halves referred to as panels based on trade dollar value. The program samples one import panel and one export panel each year. Those samples are sent to the field offices for collection, so that both universes are fully re-sampled every two years. The sampled products are priced for approximately five years until the items are replaced by a newly drawn sample from the same panel. As a result, each published index is based upon the price changes of items from up to three different samples.

For exports, the two panels consist of the following major product groupings, as defined by the Harmonized System:

Export Product Panel A: Food and beverages
Minerals, chemicals, and rubber
Crude materials; related goods
Miscellaneous manufactures

Export Product Panel B: Machinery
Vehicles and transportation equipment

For imports, the two panels consist of the following major product groupings, as defined by the Harmonized System:

Import Product Panel A: Food and Beverages
Crude materials; related goods
Vehicles and transportation equipment
Miscellaneous manufactures

Import Product Panel B: Minerals, chemicals, and rubber Machinery

Each panel is sampled using a three stage sample design. The first stage selects establishments independently proportional to size (dollar value) within each broad product category (stratum) identified within the Harmonized classification system (HS).

The second stage selects detailed product categories (classification groups) within each establishment – stratum using a systematic probability proportional to size (PPS) design. The measure of size is the relative dollar value adjusted to ensure adequate coverage for all three published strata across all classification systems, and known non-response factors (total company burden and frequency of trade within each classification group). Each establishment - classification group (or sampling group) can be sampled multiple times and the number of times each sampling group is selected is then referred to as the number of quotes requested.

In the third and final stage, the Field Economist, with the cooperation of the company respondent, performs the selection of the actual items for use in the IPP indexes. Using the entry level classification groups selected in the second stage, a list of items is provided by the respondent to the Field Economist. Using a process called disaggregation, items are selected from this list with replacement to satisfy the number of item quotes requested for each entry level classification group.

b. Description of Estimation Methodology

The IPP uses the items that are initiated and repriced every month to compute its price indexes. These indexes are calculated using a modified Laspeyres index formula. The modification used by the IPP differs from the conventional Laspeyres index by using a chained index instead of a fixed-base index. Chaining involves multiplying an index (or long term ratio) by a short term ratio (STR). This is useful since the product mix available for calculating price indexes can differ over time (Bobbitt, 2007).

The conventional Laspeyres index and the modified index are identical as long as the market basket of items does not change over time and each item provides a usable price in every period. In fact, due to non-response, the mix of items used in the index from one period to the next is often different. The benefits of chaining over a fixed base index include a better reflection of changing economic conditions, technological progress, and spending patterns, and a suitable means for handling items that are not traded every calculation month.

Below is the derivation of the modified fixed quantity Laspeyres formula used in the IPP.

$$\begin{aligned}
LTR_t &= \left(\frac{\sum p_{i,t} q_{i,0}}{\sum p_{i,0} q_{i,0}} \right) (100) \\
&= \left(\frac{\sum p_{i,0} q_{i,0} \left(\frac{p_{i,t}}{p_{i,0}} \right)}{\sum p_{i,0} q_{i,0}} \right) (100) \\
&= \left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0}} \right) (100) \\
&= \left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0} r_{i,t-1}} \right) \left(\frac{\sum w_{i,0} r_{i,t-1}}{\sum w_{i,0}} \right) (100) \\
&= \left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0} r_{i,t-1}} \right) (LTR_{t-1}) \\
&= (STR_t)(LTR_{t-1})
\end{aligned}$$

where:

$p_{i,t}$ = price of item i at time t

$q_{i,0}$ = quantity of item i in base period 0

$w_{i,0} = p_{i,0} q_{i,0}$ the total revenue in base period 0

$r_{i,t} = \frac{p_{i,t}}{p_{i,0}}$, or the long term relative of item i at time t

LTR_t = long - term ratio of a collection of items at time t

$$STR_t = \left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0} r_{i,t-1}} \right)$$

For each classification system, the IPP calculates its estimates of price change using an index aggregation structure (i.e. aggregation tree) with the following form (Powers, 2006):

Upper Level Strata

Lower Level Strata

Classification Groups

Weight Groups (i.e. Company-Index Classification Group)

Items

A stratum may have several middle-level-strata between itself and the classification group level or none. The number of middle-level-strata from the classification group to each stratum varies depending on which stratum the specific CG belongs. Similarly, the number of middle-step-strata from a stratum lower to an overall index varies. The following general formula is used until the desired aggregation level index is obtained.

Let $Child[h]$ to be the set of all strata or classification groups in the aggregation level directly below Stratum h in an aggregation tree. Let $STR_{h,t}$ be a short-term ratio of stratum, h , at time t :

$$STR_{h,t} = \frac{\sum_c w_c LTR_{c,t}}{\sum_c w_c LTR_{c,t-1}}$$

where:

$c \in stratum[h]$;

w_c =weight of child c ;

LTR_t =long-term ratio of child c at time t .

As mentioned previously, at any given time, the IPP has up to three samples of items being used to calculate each stratum's index estimate. Currently the IPP combines the data from these samples by 'pooling' the individual estimates.

Pooling refers to combining items from multiple samples at the lowest level of the index aggregation tree. These combined sample groups are referred to as a weight group. Different sampling groups can be selected for the same weight group across different samples, so it is possible that multiple items from different sampling groups can be used to calculate a single weight group index. This weight group level aggregation is done primarily so the Industry Analysts within IPP can perform analyses on the index information across samples.

3. Methods to Maximize Response Rates

Several techniques are used to ensure maintenance of adequate sample sizes for estimating IPP indexes. Initial sample sizes are sufficiently larger than desired sample sizes to allow for non-response (which includes out-of-business, out-of-scope, and refusal outcomes). An export analysis and an import analysis were conducted to identify the causes of out-of-scope non-response, which resulted in the methodology changes below. (For additional details, see the Out-of-Scope Export and Import Analysis reports which are internal BLS reports available upon request.)

- o A paneling approach was implemented whereby a new sample is introduced each year across half the product categories, re-establishing the distribution of the sample and incorporating changes in the distribution of exports/imports. Frequency of trade of exporters/importers in products is measured from the sampling frame and incorporated in the sample design to reduce the out-of-scope rate.
- o For exports, the IPP now receives name and address information for each export shipment from a company and has revised its matching process for determining the correct name and address of each sampled unit.
- o IPP has also recently implemented linking the Employer Identification Number (EIN) to additional data sources and using the linked information for identifying

- the correct name, address, and other pertinent information of each sampled unit.
- o Additionally, other variables on the sampling frame were examined for aid in identifying out-of-scope trade. As a result of this analysis, the IPP now screens (from its sampling frame) transactions that contain values for these variables that identify out-of-scope shipments.
- o The IPP is currently conducting a Pilot study to determine the productivity of allowing initiation of a sampled product area to occur at a broader (six-digit Harmonized) level when the original initiation at the more detailed ten-digit Harmonized level resulted in an out-of-scope situation. The results of this study will be completed in 2012.

To improve the response rate of respondents, the IPP has devised strategies to reduce respondent burden while increasing or at least maintaining their level of participation. The strategies which the IPP has implemented include the following:

- o capping the burden for a respondent within a sample
- o enhancing the sampling refinement process so that Industry Analysts have more freedom to reduce the burden for a respondent when needed; and
- o repricing current items for a longer period of time rather than initiating new items.

4. Testing Procedures and Plans

The Program has implemented several changes to reduce respondent burden (discussed under number 3 in parts A and B of the Supporting Statement) and has identified proposals which upon implementation, may further reduce burden. However, IPP has no testing related to reducing respondent burden scheduled for the foreseeable future.

5. Statistical Contacts

The responsibility for the statistical aspects of the International Price Program as well as collection and processing of price information, resides with William Alterman, Assistant Commissioner for International Prices, Office of Prices and Living Conditions, Bureau of Labor Statistics.

References

Bobbitt, P.A., Paben, S.P., Cho, M.J., Himelein, J.A., Chen, T-C., and Ernst, L.R.(2007). Application of the Bootstrap Method in the International Price Program. 2007 Proceedings of the American Statistical Association, Survey Research Methods Section [CD-ROM], 2910-2917

Bobbitt, P. A, Cho, M. J. and Eddy, R. M.(2005). Comparing Weighting Methods in the International Price Program. 2005 Proceedings of the American Statistical Association, Government Statistics Section [CD-ROM], 1006-1014

Chen, T-C., Bobbitt, P.A., Himelein, J.A., Paben, S.P., Cho, M.J., and Ernst, L.R.(2007). Variance Estimation for International Price Program Indexes. 2007 Proceedings of the American Statistical Association, Survey Research Methods Section [CD-ROM], 1427-1434

Cho, M. J. and Eltinge, J. L.(2008). Evaluation of Error Components in a Simulation Based Evaluation of a Survey Procedure. 2008 Proceedings of the American Statistical Association [CD-ROM], 352-359

Cho, M. J., Chen, T-C, Bobbitt, P.A., Himelein, J.A., Paben, S.P., Ernst, L.R., and Eltinge, J. L.(2007). Comparison of Simulation Methods Using Historical Data in the U.S. International Price Program. 2007 Proceedings of the American Statistical Association, Third International Conference on Establishment Surveys [CD-ROM], 248-255

Fitzgerald, Jenny(2009). Assessing Nonresponse Bias in the International Price Program's (IPP) Import and Export Price Index Surveys. 2009 Proceedings of the American Statistical Association, Survey Research Methods Section [CD-ROM], 2070-2082

Kravis, Irving B. and Lipsey, Robert E. (1971). Price Competitiveness in World Trade.

Powers, R., Eltinge, J. L. and Cho, M. J.(2006). Evaluations of the Detectability and Inferential Impact of Nonresponse Bias in Establishment Surveys. 2006 Proceedings of the American Statistical Association, Survey Research Methods Section [CD-ROM], 3577-3583