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:

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

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

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:

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

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

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 thoughtful 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 2015, the overall sample for ongoing repricing of exports for the IPP is approximately 1,950 exporters with 17,550 annual prices/responses. Approximately 9.0 quotation prices are sampled within each exporter with a resultant average of 4.826 prices collected from each responding exporter. There are approximately 150 product category strata[1] in the export sample design.

Export Response Rates at Initiation

This section summarizes IPP response rates at initiation for the last two export samples, at both the quote level and at the establishment level.

Unweighted Response Rate at Quote Level			
Outcome	**X37**	**X38**	**Overall**
Cooperative	63.7%	64.8%	64.3%
Refusal	36.3%	35.2%	35.7%

The table above presents unweighted quote response rates at initiation during the last two IPP export samples. The overall initiation response rate for both samples (combined) is approximately 64% excluding out-of-scope and out-of-business quotes. (Quotes considered out-of-scope or out-of-business are not included in the above table as the rates displayed simply indicate whether or not the IPP obtained cooperation.) Approximately 28% of the sampled quotes were either out-of-scope or out-of-business (as indicated in the following table).

[1] IPP 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.

Export Quote Counts				
Outcome	**X37**	**X38**	**Overall**	**Percent**
Cooperative	3474	3652	7126	46.6%
Refusal	1982	1980	3962	25.9%
OOB	118	164	282	1.8%
OOS	2145	1777	3922	25.7%
Grand Total	7719	7573	15292	100.0%

The Export Quote Counts table, above, displays the number of quotes from the last two IPP export samples by initiation outcome code. These numbers were used to calculate the unweighted response rates at the quote level.

Unweighted Response Rate at Establishment Level			
Outcome	**X37**	**X38**	**Overall**
Cooperative	79.0%	76.4%	77.7%
Refusal	21.0%	23.6%	22.3%

Unweighted establishment response rates at initiation are presented for the last two IPP export samples in the table above. The overall initiation response rate for both samples (combined) is approximately 78% excluding out-of-scope and out-of-business units. (Units considered out-of-scope or out-of-business are not included in the above table as the rates displayed simply indicate whether or not the IPP obtained cooperation.) Approximately 22% of the sampled units were either out-of-scope or out-of-business (as indicated in the following table).

Export Establishment Counts				
Outcome	**X37**	**X38**	**Overall**	**Percent**
Cooperative	773	744	1517	61.0%
Refusal	205	230	435	17.5%
OOB	22	30	52	2.1%
OOS	289	192	481	19.4%
Grand Total	1289	1196	2485	100.0%

The Export Establishment Counts table, above, displays the number of establishments from the last two IPP export samples by initiation outcome code. These numbers were used to calculate the unweighted response rates at the establishment level.

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. IPP repricing rates are calculated based on the unique items being repriced.

The following table displays unweighted response rates for the repricing stage from January 2012 – October 2014.

Export Response Rates for Repricing Stage				
Reference Period	1st Closing	2nd Closing	3rd Closing	4th Closing
201201	72%	74%	75%	75%
201202	75%	76%	77%	77%
201203	75%	77%	77%	77%
201204	76%	76%	76%	77%
201205	77%	78%	78%	78%
201206	74%	75%	75%	75%
201207	72%	73%	74%	74%
201208	75%	77%	77%	77%
201209	73%	75%	75%	75%
201210	72%	73%	75%	75%
201211	73%	74%	75%	75%
201212	73%	74%	75%	75%
201301	73%	74%	75%	75%
201302	74%	75%	76%	76%
201303	74%	75%	75%	76%
201304	74%	75%	77%	77%
201305	76%	78%	78%	78%
201306	75%	76%	76%	76%
201307	72%	73%	74%	74%
201308	74%	75%	75%	75%
201309	75%	77%	77%	78%
201310	71%	73%	74%	75%
201311	73%	75%	75%	75%
201312	72%	74%	74%	74%
201401	73%	74%	75%	75%
201402	73%	74%	75%	75%
201403	73%	75%	75%	75%
201404	72%	74%	74%	75%
201405	73%	75%	76%	76%
201406	74%	75%	75%	76%
201407	*	*	*	*
201408	*	*	*	*
201409	74%	75%	76%	76%
201410	75%	77%	78%	78%

* The IPP collected and published price indexes for 201407 and 201408. However, data are not available for this report due to system-related problems internal to the IPP.

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) closings when the index for these periods were computed and published. The 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 2015, the overall sample for ongoing repricing of imports for the IPP is approximately 3000 importers with 26400 prices/responses. Approximately 8.8 quotation prices are sampled within each importer with a resultant average of 5.113 prices collected from each responding importer. There are approximately 150 product category strata in the import sample design.

Import Response Rates at Initiation

This section summarizes IPP response rates at initiation for the last two import samples, at both the quote level and at the establishment level.

Unweighted Response Rate at Quote Level			
Outcome	**M37**	**M38**	**Overall**
Cooperative	66.1%	66.3%	66.2%
Refusal	33.9%	33.7%	33.8%

The table above presents unweighted quote response rates at initiation during the last two import samples. The overall initiation response rate for both samples (combined) is approximately 66% excluding out-of-scope and out-of-business quotes. (Quotes considered out-of-scope or out-of-business are not included in the above table as the rates displayed simply indicate whether or not the IPP obtained cooperation.) Approximately 23% of the sampled quotes were either out-of-scope or out-of-business (as indicated in the following table).

Import Quote Counts				
Outcome	**M37**	**M38**	**Overall**	**Percent**
Cooperative	6145	6296	12441	51.3%
Refusal	3157	3197	6354	26.2%
OOB	109	254	363	1.5%
OOS	2779	2312	5091	21.0%
Grand Total	12190	12059	24249	100.0%

The Import Quote Counts table, above, displays the number of quotes from the last two IPP import samples by initiation outcome code. These numbers were used to calculate the unweighted response rates at the quote level.

Unweighted Response Rate at Establishment Level			
Outcome	**M37**	**M38**	**Overall**
Cooperative	79.1%	78.9%	79.0%
Refusal	20.9%	21.1%	21.0%

Unweighted establishment response rates at initiation are presented for the last two IPP import samples in the table above. The overall initiation response rate for both samples (combined) is approximately 79% excluding out-of-scope and out-of-business units. (Units considered out-of-scope or out-of-business are not included in the above table as the rates displayed simply indicate whether or not the IPP obtained cooperation.) Approximately 17% of the units sampled are either out-of-scope or out-of-business (as indicated in the following table).

Import Establishment Counts				
Outcome	**M37**	**M38**	**Overall**	**Percent**
Cooperative	1256	1194	2450	65.8%
Refusal	331	320	651	17.5%
OOB	22	46	68	1.8%
OOS	317	239	556	14.9%
Grand Total	1926	1799	3725	100.0%

The Import Establishment Counts table, above, displays the number of establishments from the last two IPP import samples by initiation outcome code. These numbers were used to calculate the unweighted response rates at the establishment level.

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. IPP repricing rates are calculated based on the unique items being repriced.

The following table displays unweighted response rates for the repricing stage from January 2012 – October 2014.

Import Response Rates for Repricing Stage				
Reference Period	1st Closing	2nd Closing	3rd Closing	4th Closing
201201	73%	74%	75%	76%
201202	75%	76%	76%	76%
201203	75%	76%	77%	77%
201204	74%	75%	76%	76%
201205	76%	77%	77%	77%
201206	75%	76%	76%	76%
201207	73%	75%	76%	76%
201208	75%	77%	77%	77%
201209	75%	76%	77%	77%
201210	72%	73%	74%	75%
201211	74%	75%	76%	76%
201212	74%	75%	75%	75%
201301	75%	76%	77%	77%
201302	75%	76%	76%	77%
201303	75%	76%	77%	77%
201304	75%	76%	77%	77%
201305	76%	77%	77%	78%
201306	76%	77%	77%	78%
201307	74%	76%	76%	77%
201308	77%	78%	78%	78%
201309	76%	78%	78%	78%
201310	73%	74%	75%	75%
201311	74%	75%	75%	76%
201312	72%	73%	73%	73%
201401	73%	74%	74%	74%
201402	73%	74%	75%	75%
201403	74%	75%	75%	75%
201404	74%	75%	76%	76%
201405	74%	76%	76%	78%
201406	76%	77%	78%	78%
201407	*	*	*	*
201408	*	*	*	*
201409	75%	77%	77%	77%
201410	75%	76%	77%	77%

* The IPP collected and published price indexes for 201407 and 201408. However, data are not available for this report due to system-related problems internal to the IPP.

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 closings when the index for these periods were computed and published. The 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 using a systematic probability proportional to size (PPS) design. The measure of size is the relative dollar value adjusted to ensure adequate coverage across all classification systems, and known nonresponse 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 can be 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 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. However, due to nonresponse, 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.

$$LTR_t = \left(\frac{\sum p_{i,t} q_{i,0}}{\sum p_{i,0} q_{i,0}}\right)(100)$$

$$¿\left(\frac{\sum p_{i,0} q_{i,0}\left(\frac{p_{i,t}}{p_{i,0}}\right)}{\sum p_{i,0} q_{i,0}}\right)(100)$$

$$¿\left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0}}\right)(100)$$

$$¿\left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0} r_{i,t-1}}\right)\left(\frac{\sum w_{i,0} r_{i,t-1}}{\sum w_{i,0}}\right)(100)$$

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

$$¿\left(STR_t\right)\left(LTR_{t-1}\right)$$

where:

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

$q_{i,o}$ = 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 or none, between itself and the classification group level. 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_c = 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 nonresponse (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 nonresponse, 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.)

- 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.

- For exports, the IPP 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.

- The Program has 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.

- 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.

- In 2011, the IPP began a pilot study to examine 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. Following the implementation of these changes into production (in 2012), the IPP observed a decline in out-of-scope rates at both the quote level and at the establishment level.

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:

- capping the burden for a respondent within a sample

- enhancing the sampling refinement process so that Industry Analysts have more freedom to reduce the burden for a respondent when needed; and

- 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, the IPP has no testing related to reducing respondent burden scheduled for the foreseeable future.

The Program is planning to implement changes to its checklists, which are currently being revised and undergoing internal testing within BLS. A nonsubstantive change will be submitted when these checklists are ready for use.

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 Jim Thomas, (acting) Assistant Commissioner for International Prices, Office of Prices and Living Conditions, Bureau of Labor Statistics.

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