

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 <https://www.bls.gov/opub/hom/pdf/mxp-19970820.pdf> 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 quote 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 of 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 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 2018, the overall sample for ongoing repricing of exports for the IPP is approximately 1750 exporters with 16,275 annual prices/responses. Approximately 9.3 quote prices are sampled within each exporter with a resultant average of 5.5 prices collected from each responding exporter. There are approximately 150 product category strata¹ 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.

Table 1

Unweighted Response Rate at Quote Level			
Outcome	X40	X41	Overall
Cooperative	58.1%	62.6%	60.1%
Refusal	41.9%	37.4%	39.9%

Table 1 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 60% 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).

Table 2

Export Quote Counts				
Outcome	X40	X41	Overall	Percent
Cooperative	3483	3039	6522	43.5%

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.

Refusal	2511	1816	4327	28.9%
OOB	108	113	221	1.5%
OOS	1885	2033	3918	26.1%
Grand Total	7987	7001	14988	100.0%

Table 2 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.

Table 3

Unweighted Response Rate at Establishment Level			
Outcome	X40	X41	Overall
Cooperative	71.0%	75.9%	73.3%
Refusal	29.0%	24.1%	26.7%

Unweighted establishment response rates at initiation are presented for the last two IPP export samples in Table 3. The overall initiation response rate for both samples (combined) is approximately 73% 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).

Table 4

Export Establishment Counts				
Outcome	X40	X41	Overall	Percent
Cooperative	715	678	1393	57.3%
Refusal	292	215	507	20.9%
OOB	21	23	44	1.8%
OOS	216	269	485	20.0%
Grand Total	1244	1185	2429	100.0%

Table 4 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 IPP continues data collection three months after data for the reference month was first published; therefore, the fourth publishing represents the final revision. Table 5 displays unweighted response rates at the time of final revision, for reference months January 2015 – December 2017.

Table 5

Export Response Rates for Repricing		
Reference Month	Response Rate	Usable Response Rate
201501	79%	77%
201502	80%	77%
201503	81%	79%
201504	80%	78%
201505	82%	80%
201506	82%	80%
201507	81%	79%
201508	82%	80%
201509	82%	80%
201510	80%	78%
201511	81%	79%
201512	82%	80%
201601	81%	79%
201602	82%	80%
201603	82%	80%
201604	80%	77%
201605	81%	80%
201606	80%	78%
201607	80%	77%
201608	81%	79%
201609	80%	78%
201610	82%	80%
201611	80%	78%
201612	80%	78%
201701	78%	77%
201702	79%	78%
201703	81%	79%
201704	80%	77%
201705	78%	77%
201706	80%	77%
201707	78%	76%
201708	78%	75%
201709	77%	74%
201710	78%	75%
201711	79%	77%
201712	76%	74%

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 2018, the overall sample for ongoing repricing of imports for the IPP is approximately 2700 importers with 24300 prices/responses. Approximately 9.0 quote prices are sampled within each importer with a resultant average of 5.325 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.

Table 6

Unweighted Response Rate at Quote Level			
Outcome	M40	M41	Overall
Cooperative	66.6%	66.8%	66.7%
Refusal	33.4%	33.2%	33.3%

Table 6 presents unweighted quote response rates at initiation during the last two import samples. The overall initiation response rate for both samples (combined) is approximately 67% 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 21% of the sampled quotes were either out-of-scope or out-of-business (as indicated in the following table).

Table 7

Import Quote Counts				
Outcome	M40	M41	Overall	Percent
Cooperative	6239	5684	11923	52.8%
Refusal	3134	2819	5953	26.3%
OOB	230	94	324	1.4%
OOS	2086	2320	4406	19.5%
Grand Total	11689	10917	22606	100.0%

Table 7 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.

Table 8

Unweighted Response Rate at Establishment
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Level			
Outcome	M40	M41	Overall
Cooperative	77.4%	78.9%	78.1%
Refusal	22.6%	21.1%	21.9%

Unweighted establishment response rates at initiation are presented for the last two IPP import samples in Table 8. 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 16% of the units sampled are either out-of-scope or out-of-business (as indicated in the following table).

Table 9

Import Establishment Counts				
Outcome	M37	M38	Overall	Percent
Cooperative	1131	1125	2256	65.7%
Refusal	330	301	631	18.4%
OOB	42	17	59	1.7%
OOS	199	290	489	14.2%
Grand Total	1702	1733	3435	100.0%

Table 9 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 IPP continues data collection three months after data for the reference month was first published; therefore, the fourth publishing represents the final revision. Table 10 displays unweighted response rates at the time of final revision, for reference months January 2015 – December 2017.

Table 10

Import Response Rates for Repricing		
Reference Month	Response Rate	Usable Response

U. S. Import and Export Price Indexes
1220-0025
September 2018

		Rate
201501	78%	77%
201502	78%	77%
201503	80%	79%
201504	78%	76%
201505	82%	80%
201506	81%	80%
201507	80%	78%
201508	81%	79%
201509	81%	79%
201510	81%	79%
201511	82%	80%
201512	82%	80%
201601	79%	77%
201602	80%	78%
201603	81%	79%
201604	80%	78%
201605	81%	79%
201606	81%	79%
201607	81%	79%
201608	81%	79%
201609	81%	79%
201610	82%	80%
201611	81%	80%
201612	81%	80%
201701	80%	78%
201702	81%	79%
201703	82%	80%
201704	79%	77%
201705	81%	79%
201706	79%	78%
201707	79%	76%
201708	80%	77%
201709	79%	76%
201710	78%	76%
201711	79%	76%
201712	77%	75%

2. Collection Procedures

a. Description of Sampling Methodology

U. S. Import and Export Price Indexes

1220-0025

September 2018

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

U. S. Import and Export Price Indexes

1220-0025

September 2018

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 by 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 et al., 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 and other factors, 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.

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

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

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

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

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

$$\dot{(STR_t)} (LTR_{t-1})$$

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 et al., 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.)

- 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 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 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.
- 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 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:

- o capping the burden for a respondent within a sample
- o enhancing the sampling refinement process so that Field Economists can prioritize items for collection if burden issues arise (with input from the National Office, if applicable); 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). However, the 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 Susan Fleck, Assistant Commissioner for International Prices, Office of Prices and Living Conditions, Bureau of Labor Statistics.

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