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. Response Rates

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 sub-sections, the unweighted response rates are presented for initiation and re-pricing. The unweighted establishment response rate and universe error rate are equal to:

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

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

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.

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

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

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

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.

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 potential respondent universe consists of the total set of export prices. The estimated number of individuals and establishments exporting products or services from the United States in universe is approximately 580,000. In 2009, the overall sample for ongoing repricing of exports for the IPP is approximately 2,400 exporters with 16,320 annual prices\responses. Approximately 7 quotation prices are sampled within each exporter with a resultant average of 4.294 prices collected from each responding exporter. There are approximately 150 product category strata in the export sample design.

Export Response Rates at Initiation

The response rate achieved at the establishment level during the last two export samples initiated was 82% excluding out-of-scope and out-of-business units. Approximately 21% 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 refusals, 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 initiated. The overall response rate is based on the combined responses from the 32nd exporter sample (X32) and 33rd exporter sample (X33).

Unweighted Response Rate at Establishment Level			
	X32	X33	Overall
Cooperative	83.5%	80.2%	81.9%
Refusal	16.5%	19.8%	18.1%

Universe Error Rate at Establishment Level			
	X32	X33	Overall
In-Scope	80.3%	78.4%	79.4%
OOB/OOS	19.7%	21.6%	20.6%

The next table presents the number of establishments from the 32nd and 33rd 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	**X32**	**X33**	**Overall**
Cooperative	980	905	**1885**
Refusal	194	223	**417**
OOB	32	24	**56**
OOS	256	286	**542**
Sub-Total	1462	1438	**2900**

Pending	0	6	**6**
Grand Total	1462	1444	**2906**

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 30% 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.

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Unweighted Response Rate at Establishment-Quote Level			
	X32	X33	Overall
Cooperative	64.9%	59.7%	62.5%
Refusal	35.1%	40.3%	37.5%

Universe Error Rate at Establishment-Quote Level			
	X32	X33	Overall
In-Scope	70.8%	70.2%	70.5%
OOB/OOS	29.2%	29.8%	29.5%

The next table presents the number of quotes from the 32nd and 33rd 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	**X32**	**X33**	**Overall**
Cooperative	4262	3438	**7700**
Refusal	2308	2319	**4627**
OOB	189	121	**310**
OOS	2517	2328	**4845**
Sub-Total	9276	8206	**17482**

Pending	0	12	**12**
Grand Total	9276	8218	**17494**

<u>Export Response Rates for Repricing</u>:

Once an export 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. Most items represent a single quote from one sample, but some items represent multiple quotes from a single sample, or one or more quotes from more than one sample. While the IPP Unified Database provides the ability to link the sampled establishment-quote pairs to the unique items being repriced, 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 2006 – March 2009.

Export Response Rates for Repricing Stage				
Reference Period	1st Closing	2nd Closing	3rd Closing	4th Closing
200601	67%	70%	72%	73%
200602	70%	73%	74%	74%
200603	73%	75%	75%	75%
200604	70%	72%	73%	74%
200605	71%	74%	74%	75%
200606	72%	74%	75%	75%
200607	68%	72%	73%	73%
200608	71%	73%	74%	74%
200609	72%	74%	75%	75%
200610	70%	74%	75%	75%
200611	73%	75%	75%	75%
200612	73%	74%	75%	75%
200701	68%	71%	73%	73%
200702	72%	74%	75%	75%
200703	71%	72%	73%	73%
200704	68%	71%	72%	72%
200705	72%	74%	74%	75%
200706	71%	73%	74%	74%
200707	69%	72%	73%	73%
200708	72%	74%	74%	75%
200709	72%	73%	74%	74%
200710	69%	71%	72%	72%
200711	69%	71%	71%	72%
200712	68%	70%	71%	71%
200801	67%	72%	73%	74%
200802	71%	74%	75%	75%
200803	73%	75%	76%	76%
200804	72%	74%	75%	75%
200805	73%	75%	76%	76%
200806	74%	75%	76%	76%
200807	71%	74%	75%	75%
200808	73%	75%	76%	76%
200809	72%	73%	74%	74%
200810	71%	72%	73%	73%
200811	70%	71%	72%	72%
200812	70%	72%	72%	72%
200901	69%	71%	72%	72%
200902	69%	71%	71%	72%
200903	73%	74%	75%	76%

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 potential respondent universe consists of the total set of import prices. The estimated number of individuals and establishments importing products or services into the United States in universe is approximately 580,000. In 2009, the overall sample for ongoing repricing of imports for the IPP is approximately 3500 importers with 23,800 prices/responses. Approximately 7 quotation prices are sampled within each importer with a resultant average of 4.687 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 level during the last two import samples initiated was 85% excluding out-of-scope and out-of-business units. 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 initiated. The overall response rate is based on the combined responses from the 32nd importer sample (M32) and 33rd importer sample (M33).

Unweighted Response Rate at Establishment Level			
	M32	M33	Overall
Cooperative	85.9%	83.3%	84.6%
Refusal	14.1%	16.7%	15.4%

Universe Error Rate at Establishment Level			
	M32	M33	Overall
In-Scope	82.6%	81.1%	81.8%
OOB/OOS	17.4%	18.9%	18.2%

The next table presents the number of establishments from the 32nd and 33rd 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	**M32**	**M33**	**Overall**
Cooperative	1446	1406	**2852**
Refusal	237	282	**519**
OOB	63	47	**110**
OOS	292	346	**638**
Sub-Total	2038	2081	**4119**

Pending	0	1	**1**
Grand Total	2038	2082	**4120**

The response rate achieved at the establishment-quote level during the last two import samples initiated was 67% excluding out-of-scope and out-of-business quotes. 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 for importers for IPP initiation.

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Unweighted Response Rate at Establishment-Quote Level			
	M32	M33	Overall
Cooperative	69.1%	65.2%	67.2%
Refusal	30.9%	34.8%	32.8%

Universe Error Rate at Establishment-Quote Level			
	M32	M33	Overall
In-Scope	76.7%	73.8%	75.3%
OOB/OOS	23.3%	26.2%	24.7%

The next table gives the number of quotes from the 32nd and 33rd 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	**M32**	**M33**	**Overall**
Cooperative	7087	6352	**13439**
Refusal	3175	3385	**6560**
OOB	364	263	**627**
OOS	2749	3198	**5947**
Sub-Total	13375	13198	**26573**

Pending	0	2	**2**
Grand Total	13375	13200	**26575**

Import Response Rates for Repricing:

Once an import 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. Most items represent a single quote from one sample, but some items represent multiple quotes from a single sample, or one or more quotes from more than one sample. While the IPP Unified Database provides the ability to link the sampled establishment-quote pairs to the unique items being repriced, 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 2006 – March 2009 for each closing.

Import Response Rates for Repricing Stage				
Reference Period	1st Closing	2nd Closing	3rd Closing	4th Closing
200601	66%	68%	70%	70%
200602	67%	70%	71%	72%
200603	68%	71%	72%	72%
200604	65%	68%	70%	70%
200605	67%	70%	70%	71%
200606	69%	71%	72%	72%
200607	67%	70%	71%	72%
200608	69%	72%	73%	74%
200609	70%	72%	73%	73%
200610	68%	71%	72%	72%
200611	70%	72%	73%	73%
200612	68%	71%	71%	72%
200701	65%	68%	70%	70%
200702	67%	70%	71%	71%
200703	69%	70%	71%	71%
200704	65%	69%	70%	70%
200705	68%	71%	72%	72%
200706	70%	72%	72%	73%
200707	66%	69%	70%	71%
200708	70%	72%	72%	73%
200709	68%	70%	71%	71%
200710	67%	70%	71%	71%
200711	68%	71%	71%	73%
200712	67%	70%	72%	72%
200801	65%	70%	71%	72%
200802	70%	72%	73%	73%
200803	71%	73%	74%	74%
200804	69%	72%	73%	73%
200805	72%	73%	74%	75%
200806	72%	73%	74%	74%
200807	69%	71%	72%	73%
200808	71%	73%	74%	74%

Import Response Rates for Repricing Stage				
Reference Period	1st Closing	2nd Closing	3rd Closing	4th Closing
200809	71%	73%	73%	73%
200810	70%	72%	72%	72%
200811	70%	71%	72%	72%
200812	69%	71%	71%	71%
200901	66%	67%	68%	68%
200902	68%	69%	70%	70%
200903	70%	72%	73%	73%

In the 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 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 (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.

2a. 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 Canadian Customs Service for exports to Canada and from the U.S. Census Bureau for exports to the rest of the world. The constructed frame contains information about all export transactions that were filed during the reference year. Exports to countries other than Canada 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 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 Area A: Food and beverages
Minerals, chemicals, and rubber
Crude materials; related goods
Miscellaneous manufactures

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

Import Product Area 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.

2b. Description of Estimation Methodology

From Bobbitt (2007), the IPP uses the items that are initiated and re-priced 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.

These two methods produce identical results 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

$q_{i,o}$ = 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:

Upper Level Strata

Lower Level Strata

Classification Groups

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

A stratum may have several strata between itself and the classification group level or none at all. From Powers (2006), the strata indices of the middle steps between the classification group and the stratum must be considered. The number of middle steps from the classification group to each stratum varies depending on which stratum the specific CG belongs. Similarly, there may be several strata between the stratum lower indices and the overall indices for all exports and all imports. Thus, the number of strata indices from a stratum lower to an overall index also varies.

Let *Child*[*h*] to be the set of all strata or classification groups 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.

This general formula is used until the desired aggregation level index is obtained.

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. Sample Size

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, that is, out-of-business, out-of-scope, and refusal. An export analysis and an import analysis were conducted to identify the causes of non-response and out-of-scope response, which resulted in a few of the following methodology changes. 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 has started to receive name and address information for each export shipment from a company and is revising its matching process for determining the correct name and address of each sampled unit. IPP is also determining the feasibility of 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 are being examined for aid in identifying out-of-scope trade.

To improve the response rate of respondents, the IPP is devising strategies to reduce respondent burden while increasing or at least maintaining their level of participation. The strategies which the IPP has implemented or is considering include capping the burden for a respondent within a sample, a refinement process that gives Industry Analysts more freedom to reduce the burden for a respondent when needed, and potentially repricing current items for a longer period of time rather than initiating new items.

4. Respondent Burden

The Program has recently implemented several changes to reduce respondent burden (discussed under number 3 in section A) 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. Responsibility of Statistical Methods

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.

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