

Machinery and Equipment: Approach and Data Requirements

This chapter provides guidelines, specific instructions, and practical tools for implementing the price survey on machinery and equipment goods across different economies with divergent economic structures.

CATEGORIES OF MACHINERY AND EQUIPMENT ITEMS

In the International Comparison Program (ICP) classification, the category machinery and equipment is broken down into two groups: (1) metal products and equipment and (2) transport equipment. These groups are further disaggregated into eight basic headings. Economies are required to collect the prices of several specified items within most of these basic headings.

The five basic headings related to metal products and equipment are (1) fabricated metal products except machinery and equipment; (2) general-purpose machinery; (3) special-purpose machinery; (4) electrical and optical equipment; and (5) other manufactured goods not elsewhere classified (n.e.c.). The remaining three basic headings for transport equipment are (1) motor vehicles, trailers, and semitrailers; (2) other road transport; and (3) other transport equipment.

It is important to elaborate on the different products in each of the basic headings:

- Fabricated metal products, except machinery and equipment, include prefabricated buildings of metal; bridges, bridge sections, towers, and lattice masts of iron or steel; and reservoirs, tanks, vats, and similar containers of iron, steel, or aluminum for all materials.
- General-purpose machinery includes engines and turbines except aircraft, vehicle, and cycle engines; pumps and compressors; ovens other than bakery ovens; and furnaces, furnace burners, and incinerators.
- Special-purpose machinery is intended for specific industries such as agricultural and forestry metallurgy, mining, quarrying, and construction.
- Electrical and optical equipment includes word processing machines, printing machinery, computers and related equipment, electric motors, lighting equipment, and radio and television equipment.
- Other manufactured goods n.e.c. include office, shop, and hotel furniture.
- Motor vehicles, trailers, and semitrailers range from passenger cars, taxicabs, vans, buses, and coaches, to specialized parts and engines.

- Other road transport includes motorcycles, sidecars, scooters, bicycles, and invalid carriages, including their specialized parts and engines.
- Other products include computer software that a registered company expects to use in production for more than one year.

Structured product descriptions (SPDs) are developed for each equipment item. The technical characteristics that determine the performance of a machine or piece of equipment are very important in the product specifications.

SUMMARY OF PILOT STUDY

The 2011 round of the ICP began with a pilot study. It was the first in a number of steps that culminated in the launch of the main survey. The pilot study was based on an initial list of investment products drawn from the results of similar exercises in different parts of the world. The list comprised products and items that were divided into two main parts, generic and specified.

Prior to the pilot study, all items in the list were checked and determined to be current based on various sources. However, the availability of products could vary across economies—for example, new models could be introduced at different times in different economies.

The pilot study, carried out in nine economies, was a research exercise aimed at determining the availability of the products and items on the list. After the pilot study, the objective was to analyze the results and then prepare a global core list (GCL) that would reflect—as much possible—markets in all the participating economies.

PRODUCT LIST

The principal document of the price survey on machinery and equipment was the product list, which is described here. A summary of the list appears in table 11.1.

As indicated earlier, the list comprises eight different product groups called basic headings (1–8). Each basic heading is divided into products that are in turn split into generic and specified items. A *product* is a group of specific pieces of machinery or equipment. An *item* is a subdivision and a variation of a product (e.g., a particular make or model of a product). A *generic product or item* is one for which the specification gives a set of parameters that will define it but without a make or model. A *specific product or item* is one for which the specification includes the make and model.

The list is composed of 77 products and 177 items. Each item is assigned one Excel sheet that gives details, including the technical parameters. These are contained in the ICP Kit, which was distributed to participating economies.

Table 11.1 Product List, Machinery and Equipment, ICP 2011 Survey

Product group	Code	Basic heading	Products, total	Items		
				Generic	Specific	Total
1	150111.1	Fabricated metal products, except machinery and equipment	5	6	3	9
2	150112.1	General-purpose machinery	9	6	14	20
3	150113.1	Special-purpose machinery	24	17	33	50
4	150114.1	Electrical and optical equipment	25	15	41	56
5	150115.1	Other manufactured goods n.e.c.	4	3	5	8
6	150121.1	Motor vehicles, trailers, and semitrailers	5	4	13	17
7	150121.2	Other road transport	1	1	2	3
8	150311.1	Other products	4	0	14	14
Total			77	52	125	177

Source: ICP, <http://icp.worldbank.org/>.

OBJECTIVE OF THE PRICE SURVEY

The main objective of the survey is to find and price as many of the products and items on the list as possible. In addition, the number of identical and important items priced on the list is expected to be maximized. When products are not identical but are similar to the given specifications, they are to be priced and classified as equivalent.

WORKING METHODS

Definitions and Concepts in the Machinery and Equipment Goods Survey

What is meant by "specified" versus "unspecified"?

- A specified item is an item in the global core list for which all specifications are fully stated in the structured product description, including name, brand, model, and an extract of up to 12 of the most important elements of the item specifications sheet, usually provided by the manufacturer.
- An unspecified item will have the same specifications as an existing item (whether or not on the global core list) except for the brand or model name.

The ICP catalog for machinery and equipment goods contains samples of structured product descriptions for specified and unspecified items.

What are the differences among the concepts of comparability, equivalence, and identity for specified items?

- An item in the national or regional market is deemed *comparable* to a given specified item if it has the same (or very close) specifications as the specified item except for the make or model. The notion of close specifications is based on the judgments of machinery and equipment goods experts, building on their experience, but, more important, on the relevant manufacturers' marketing strategies. In general, in this industry a company would conduct research and development activities, design an item, produce a prototype, market it, start commercial production, and develop a marketing strategy aimed at

turning the item into profitable activities as soon as possible. Sometime later, a competitor would appear on the market, producing a close copy for a better (but perhaps not significantly different) price.

- An item is deemed *equivalent* to a specified item on the GCL when it has the same purpose, use, and usually a comparable physical appearance (but not necessarily), and when it meets well-known international standards and norms and has quality and specifications comparable to those of the specified item. The same company may have delocalized the production of one (or some) of its products to another area of the world and assigned an identical (or regional) model number to the product. It may even shift from an existing model to a newer equivalent one. These are usually the items most equivalent to a given set of specifications. A competitor may also provide a comparable item sold at better market conditions.
- Finally, an *identical* item meets and matches exactly the prescribed SPD specifications. It is also referred to as an "exact match."

The priced items should be recorded on the technical sheets in the ICP Kit. For generic items, products matching as closely as possible the given technical specifications should be selected and priced. For specific items, the exact product and model should be researched and priced. Also for specific items, an alternative method is to choose an equivalent (i.e., an item of the same make but a different model) if the exact make and model are not found. A different make and model may also be selected if it matches the particular specification.

Generic Items

The objective of referring to generic items in the machinery and equipment goods survey is to identify items that nearly match the given specification. Makes and models of generic products should be provided, and the technical parameters should be completed. The parameters are ranked according to their importance.

For most generic items, the technical specifications are based on a specific make and model.

If a particular item exactly matches the technical parameters given, it is classified as identical. If differences exist, then the item is classified as equivalent.

When a priced product matches both the make and model of a specific item, it is recorded as either generic or specific.

Because it is generally better to price well-known makes of products, the makes and models most commonly used for the specific type of product should be priced.

Specific Items

Items that match the exact make and model are classified as identical. In some instances, although the make and model are the same, differences may exist in the technical parameters (e.g., because of national rules and regulations). Therefore, such items are classified as equivalent. If the same make is identified but there is a difference in the model, the item is submitted as equivalent.

What Do Experts Say about These Concepts?

Expert views are an interesting introduction to understanding the specificities of machinery and equipment goods, but a common understanding is also needed of the concepts and terminologies used in the survey guidelines. This is crucial during data collection to identify comparable items and during data validation to map price quotations and related items to the right product in the list. What follows are some useful insights from global experts in the industry about these concepts:

- Some items have stable standard specifications and price structures across the world. One example is Apple products, whether hardware or software. To some extent, the prices of these types of items are easily predictable both geographically and over time.
- Some items are unique because they are designed to fit the need of the customer, but they should meet international standards in terms of selected characteristics such as size, components, and security features. Examples are fuel tanks and selected health- and security-related items. These customized

items usually show regional patterns in terms of both product identification and price formation.

- The comparability of some items requires meeting all the specifications, whereas carefully selected specifications will be enough to identify comparable items in participating ICP regions. Usually brand and model (even name) can contribute to identifying a specified item, but for unspecified items comparable products would have most of the key requirements in terms of specification.
- Equivalent items have the same specifications. Some of them have the same brand but are different models, while others have different brands. Because of close competition, major manufacturers of machinery would develop equivalent products and sell them at slightly different prices around the world. In the search for equivalent items, it is important to select brands within the same category. For example, although four manufacturers—Caterpillar, John Deere, Hitachi, and Kumatsu—may produce equivalent items, Caterpillar and John Deere products are closer to each other, on the one hand, and Hitachi and Kumatsu, on the other.

STANDARD METHOD FOR PRICING EQUIPMENT GOODS

The standard method for pricing equipment goods is similar to that followed for consumer goods and services; economies collect prices for identical or very similar products—sometimes referred to as specification pricing.

Pricing Rules

For consistency with national accounts, economies are required to provide prices for equipment goods that are consistent with the valuation of those goods as fixed capital assets in the national accounts. Thus the prices must include the import duties and other product taxes actually paid by the purchaser, the costs of transporting the asset to the place where it will be used, and any charges for installing the asset

so it will be ready for use in production. Deducted from the price are any of the discounts generally available to most producers.

The following rules are to be observed in reporting prices for equipment goods:

- *Transport costs.* When the prices of equipment goods do not include transport costs, these costs should be estimated by economies. They would determine the average distance over which the items are transported from the factory where they are made or, for imports, the port of entry.
- *Installation costs.* Costs are usually associated with the installation of fixed equipment, and these costs are included in the gross fixed capital formation (GFCF) in national accounts. Installation charges include not only those paid by the purchaser for physical installation of an item at a factory or other site, but also any charges for testing or calibrating the equipment. In the case of transport equipment, there are usually no installation costs.
- *Product taxes.* The price should include only nondeductible product taxes. Economies that levy a value added tax (VAT) normally allow purchasers to deduct the full amount of the tax on capital goods. Sales and other product taxes, and sometimes import duties, may also be fully or partially deductible on capital goods.
- *Discounts.* The price should refer to the purchase of a single item so that it is not affected by discounts that may be available for large orders. The price of the single item should be reported after deducting any discount that is customarily available to most purchasers and that is available for most of the year.

The national average prices are required. Country experts should follow two guidelines in deciding how these prices are to be collected. First, in some small economies it may be sufficient to collect prices in only a single location such as the capital city or the largest industrial or commercial town. Second, in larger economies that have several centers of significant industrial and commercial activity, prices will have to be collected in several of these centers in order to calculate a national average price.

The prices reported should be the average prices for the reference year—that is, they should be the average of the prices collected at regular intervals throughout the year. However, experience shows that if all economies price equipment goods during the same period, there is no need to collect prices throughout the year. Price collection at midyear was recommended for ICP 2011.

Second-Hand Items

A significant proportion of the GFCF in equipment goods in some economies consists of imports of second-hand goods, some of which may have been reconditioned. Second-hand goods comparable for pricing purposes are difficult to find. Substantial quality adjustments may be necessary to make the prices comparable, and such quality adjustments are presently not feasible. Thus in ICP 2005, price collection was confined to new equipment goods. The prices of second-hand equipment goods were not used even when those goods were actually more representative than new goods. Second-hand goods were also omitted from pricing in ICP 2011.

Sources of Price Information

The prices of equipment goods can be obtained directly from producers, importers, or distributors, or from their catalogs. Prices are collected by the method or combination of methods that economies deem the most convenient such as personal visit, telephone, letter, or Internet. However, the prices have to be adjusted to conform to the valuation principles in terms of taking into account transport charges, installation costs, product taxes, and discounts.

The sources most often used for collecting price information are the following:

- *National statistical office.* Those who compile a producer price or an import price index are likely to be the most familiar with the types of goods being compared for these basic headings. For some items such as automobiles and computers, the comparisons used for household consumption are

also relevant to equipment, although the prices collected for the household consumption expenditure have to be adjusted by subtracting the value added taxes and other product taxes that are payable by households but usually can be deducted by enterprises.

- *Dealers within the economy.* Equipment distributors and dealers know which models are available, their detailed characteristics, and their prices. When prices are obtained from dealers, economies have to ensure that all product taxes and installation charges are included.

Government departments purchase transport and other equipment on a regular basis. Such purchases are often centralized under a public works or central supply department. They may buy directly from manufacturers, but often they also use local dealers and distributors.

- *Internet.* The specialized websites of equipment goods manufacturers are very useful. They often also provide the names and contact information for dealers and distributors. However, the price information obtained from websites has to be adjusted to conform to the valuation principles just outlined for taking into account transport charges, installation costs, product taxes, and discounts.

PRICING GUIDELINES

Prices reported by economies are required to be (1) purchasers' prices (without the VAT), (2) national average prices, and (3) prices observed during the survey data collection period.

Purchasers' prices should include trade margins, transport and delivery costs, assembly and installation costs, and general discounts. The VAT should not be included. However, other nondeductible taxes are to be included in the purchasers' prices. They may be special national taxes on certain equipment (e.g., for environmental reasons or to protect national producers of equipment goods).

National average prices should reflect the national average and not just certain locations or suppliers.

Finally, the reported prices should be the ones observed during the survey period. No adjustments to the annual average prices are required.

In addition to the list prices of items, other relevant components of the cost should be considered such as additional delivery and installation costs. These components will be added to the list price of items. Similarly, there may be applicable discounts that should be taken off the list price. These aspects are taken into account in the ICP Kit.

Additional aspects to be considered include the following:

- *Used equipment.* All the products specified for this survey are for new items. In some economies, however, a significant proportion of investment equipment consists of imports of second-hand goods, some of which may have been reconditioned. Experimental pricing of second-hand equipment goods shows that there is considerable variation in the quality of the goods priced by different economies. It is very difficult to find second-hand goods that are comparable for pricing purposes. Substantial quality adjustments may be necessary to make the prices comparable, but such quality adjustments are not feasible in practice at the present time. Therefore, as noted earlier, this survey is confined to new equipment goods. Prices of second-hand equipment goods are not acceptable even when the second-hand goods are more widely used than new goods.
- *Number of price observations.* In many economies, a single dealer will have the right to sell the specified type of equipment, and in this case a single price observation will be sufficient. In other economies, however, there may be several distributors of the specified type of equipment. Therefore, several price observations are required to establish the national average price. The decision on whether one or more price observations are necessary is left to the national experts.

Collecting and Recording Data

Annex A, the registration form, and annex B, the machinery and equipment data collection form, are the two main forms that economies are required to employ when collecting and recording data. The various points that follow are directly related to the parameters in the specification sheets in the ICP Kit:

- *Economy.* The economy box will be completed automatically by the ICP Kit when the introductory questions are completed in the setup box.
- *Make and model.* When the data collectors have found and priced an item, these details should be inserted. For some generic items, there will be no model; in this instance, the data collectors are advised to insert "unspecified."
- *Technical parameters.* The technical parameters for an item should be completed using the list in the specification sheet. The parameters can be completed in either metric or imperial units, depending on the choice made in the setup box in the ICP Kit. Data collectors are also asked to provide the technical parameters for all items, even when they are identical to the given ones.
- *Order quantity.* Normally, the order quantity for an item is one. However, for some items it will be realistic to order more than one. For example, it is not standard to order just one fire extinguisher. In commercial situations, an order of 10 is a normal occurrence. Naturally, this aspect can reduce slightly the unit price.
- *Currency.* The currency box is completed automatically by the ICP Kit after the economies complete the introductory questions in the setup box.
- *Unit price.* The unit price should be submitted, regardless of the order quantity.
- *Installation costs.* For some items, it may be relevant to include installation costs. Installation charges include not only any charges that the purchaser pays in order to have the item physically installed at the

factory or other site, but also any costs for testing, running-in, or calibrating the equipment. Transport equipment usually incurs no installation costs. This aspect is covered further in the ICP Kit.

- *Transport and delivery costs.* As a component of the total price the delivery cost should be included. For some items, the cost will be included in the price. For others, an allowance should be taken into account. When items do not include transport and delivery costs, these costs should be estimated by economies by selecting the average distance over which the items are transported and delivered. This aspect is also covered in the ICP Kit.
- *Discounts.* The price should refer to the purchase of a single item so it is not affected by discounts that may be available for large orders. However, the price of the single item should be reported after deducting any discount that is customarily available to most purchasers and that is available for most of the year.
- *Nondeductible taxes.* As noted, the price should include only nondeductible product taxes. Economies that levy value added taxes normally allow purchasers to deduct the full amount of the tax on capital goods. Sales and other product taxes and sometimes import duties may also be fully or partly deductible on capital goods.
- *Importance.* Economies are asked to classify each priced item as either important or less important. This process can be challenging because a certain degree of subjectivity is involved in assigning importance. However, if this factor is not taken into account when calculating the purchasing power parities (PPPs) for a basic heading, the PPPs will be biased.

Importance is a concept that relates to individual products within a basic heading. It should be introduced because no expenditure weights are provided below the basic heading level with which to determine the relative importance of the various products

priced within a basic heading. To ensure that a sufficient number of prices are collected for comparison between economies, the participating economies are required to price both important and less important products within each basic heading. Important products normally have a lower price level than less important products. An important item should be typical within the market for that product in a given economy. For example, consider a fire extinguisher, a common item because it is widely used globally. As a result, it is an important product within its basic heading. In addition, a particular make and model of fire extinguisher may be purchased more than other brands, and it is therefore classified as typical in the particular market. Such an item can be considered important.

- *Comparability.* Economies are asked to price products that are either identical or equivalent to the one requested. If economies identify the exact item listed in the specification, then the item will most likely be classified as identical. When a similar but not an exact item is priced, then it will most likely be classified as equivalent.

However, economies may find that even when the make and model are identical to the listed ones, there may be differences in the technical parameters. If these differences are minor and are not believed to be price determinants, the items can still be classified as identical. It is important that economies be flexible in dealing with this kind of issue because often decisions on how to classify products will be based on judgment.

Regional Strategies for Collecting Data on Machinery and Equipment Goods

Although some national statistical offices may choose to assign their staff to conducting part of the machinery and equipment goods surveys, the Global Office reiterates the need to entrust knowledgeable experts with this work under the supervision of the national statistical office in order to maximize data quality and coverage of the national/regional market of these goods. Another strategy might be for

national statistical offices to collect prices for the easiest part of the list and defer to national/regional experts for more specialized items.

Some items in the list of machinery and equipment goods are also included in the household consumption survey, which may prompt some economies to borrow price quotations from the latter survey. This should not be done for the following reasons:

- The types of prices to be reported are different.
- Tax structures and levels are different.
- Delivery costs or discounts may apply for machinery and equipment goods.

The approach of "comparing like with like" seems to place more emphasis on matching items rather than capturing the full picture of the economy through the notion of comparability. Regions could take some measures to mitigate this risk. For example, they may decide to expand the list in order to have an exact match for each specified item and equivalent or comparable products for unspecified items. The Global Office and regional coordinating agencies could use this approach during data validation.

Dealing with Discontinued Products

Changes in technology and economic conditions may convince some manufacturers of machinery and equipment goods to discontinue the production of some items in selected regions or worldwide. Usually, a new product is proposed to replace the previous one because the demand for the functionalities of the product still exists. When a product is discontinued by the manufacturer, data collectors are asked to check whether the product is still available on the market. When it is, they should collect prices in spite of the discontinuation by the manufacturer.

If the product is no longer available on the market, data collectors are asked to determine whether an equivalent or comparable item in the list could be priced instead of the one that was discontinued. Also, collectors should note on their collection forms that the prescribed item was discontinued.

Annex A

Registration Form, ICP 2011

Registration Form	
Designated staff or consultant	Name*:
	Email address*:
	Phone number:
Company	Name*:
	Address1:
	Address2:
	City/town:
	State/province:
	Country*:
Country and local currency unit (LCU) for data entry*:	

Source: ICP, <http://icp.worldbank.org/>.

Note: An asterisk (*) indicates a required field. The machinery and equipment data collection form (including the registration form as a component) are also available in French, Spanish, and Arabic.

Annex B
Machinery and Equipment Data Collection Form, ICP 2011

Data Collection Form			
Product Code	Product Name	Proposed	Observed
	Make (and nationality)		
	Model		
Prices			Total unit price (LCU)
Unit base price ^δ		* Installation cost ^δ	
Order quantity ^{δδ}		* Other costs (please specify) ^δ	
Delivery cost [°]		* Discount ^δ	
Specifications			
Specification	Metric	Imperial	Observed
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
Notice: Fill in all required cells, Options and Notes, then proceed to "Add record to / Update database" below.			
Options/Additional Specifications			
Notes			

Source: ICP, <http://icp.worldbank.org/>.

Note: δ = Per unit amount, if not included in Equipment unit price

δδ = Number of units for one purchase

° = Per unit cost, if not included in Equipment unit price. This data collection form is also available in French, Spanish, and Arabic. More information on machinery and equipment is available on the ICP website at <http://icp.worldbank.org/>. LCU = local currency unit.