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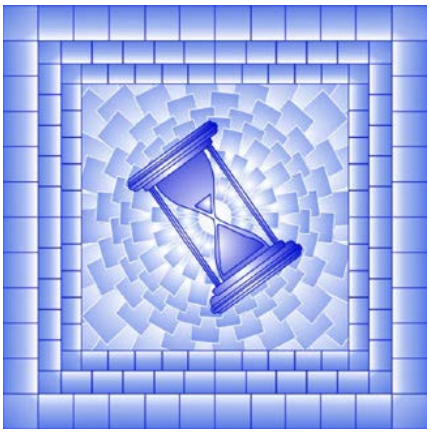
Technical guide for the Machinery and Equipment Price Index



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1 Introduction

The Machinery and Equipment Price Index (MEPI) is an input price index that measures the quarterly change in the price of machinery and equipment purchased by industries in Canada. The MEPI is an important indicator of economic activity in all industries undertaking capital investment, serving as a tool for performance evaluation, cost monitoring, contract assessment and benchmark comparisons. It also provides supplemental information to the Canadian System of Macroeconomic Accounts to calculate gross domestic product and measure changes in productivity.

The MEPI is composed of two separate indexes: a product-based index and an industry-based index.

The product-based index covers all domestic and imported machinery and equipment products acquired by industries in Canada, while the industry-based index covers all Canadian industries that purchase machinery and equipment. The product-based and industry-based indexes are identical for each aggregated purchase origin (domestic versus imported) and for the overall MEPI, reflecting the identity between the supply of products and their use by industries.

While most of Statistics Canada's price indexes are constructed using data collected through surveys or alternative data sources, the MEPI reaggregates existing index series. Data for domestic products come from the Industrial Product Price Index (IPPI) and data for imported products come from the International Merchandise Trade Price Index (IMTPI). The IPPI measures price changes for major products sold by manufacturers in Canada. The prices collected are for goods sold free on board (f.o.b.) at the factory gate. The IMTPI is an indicator of the changes in import and export prices. Its purpose is to provide statistical information and analysis of the price and volume of Canada's merchandise exports and imports by commodity on a customs and balance of payments basis.

For more information on these programs, refer to their associated methodology pages.

2 Index estimation and aggregation

Index calculation

The MEPI follows the usual two-step procedure for constructing a price index, starting with a collection of elemental indexes for each product group in the Supply and Use Product Classification (SUPC) and purchase origin (domestic or imported). These elemental indexes aggregate various monthly indexes from the IPPI, Computer and Peripherals Price Indexes (CPPI), and IMTPI using a weighted geometric mean, with weights derived from the fixed aggregation weights for each of these indexes (i.e., a geometric Young index).[1]

The quarterly index for product *j* from origin *i* is given by:

$$EA_{ij}^{t} = \prod_{m=1}^{M} \left(\frac{p_{ijm}^{t}}{p_{ijm}^{t-1}} \right)^{w_{ijm}} \quad for\, t \geq 1$$

1. Product groups for the IPPI, CPPI and IMTPI are classified according to the North American Product Classification System (NAPCS). Despite the NAPCS being largely consistent with the SUPC, a concordance between the NAPCS and SUPC is used to construct the elemental aggregates for the MEPI.

EA_{ij}^{t} : The elementary aggregate of product *j* from origin *i* at time *t*.

p_{ijm}^{t} : The price of product *m* at the North American Product Classification System (NAPCS) level for product *j* from origin *i* at time t.

w_{ijm} : The base weight of NAPCS-level product *m* for product *j* from origin *i*.

m : The number of NAPCS-level products under product *j* from origin *i*.

The quarterly index for industry *k* from origin *i* can be calculated using the same formula above by replacing the NAPCS-level product *m* prices with the calculated Elementary aggregate (EA) index values for product *j*.

Both the product-based and industry-based MEPI are arithmetic indexes that aggregate these elemental indexes using values for capital expenditure (excluding margins) from the supply and use table as weights (i.e., a Lowe index). The only difference between these indexes is their hierarchical structure, with the product-based index using the SUPC and the industry-based index using the Input-Output Final Demand Classification. Consequently, the top-level product and industry indexes are identical for each purchase origin.

Despite being calculated monthly, the MEPI is turned into a quarterly index by taking the average of each index value in a quarter. The MEPI has a two-quarter revision policy, reflecting the revision policy for the IPPI.

Aggregation weights

To aggregate the elemental indexes, weights for the product-based index are simply the value of domestically produced and imported machinery and equipment products from the supply and use table. Deriving the value of domestic and import expenditures for each industry relies on the assumption that the value share of domestically produced products is the same for each industry (i.e., industries have equal access to machinery and equipment). Industry by purchase origin weights can then be constructed from knowledge of each industry's use of each product.

Table 1
Hypothetical calculation of the weights using supply identity

Exemple weight matrix with supply identity (import/domestic)	Industry X			Industry Y			Industry Z			All industry total		
	Total	Import	Domestic	Total	Import	Domestic	Total	Import	Domestic	Total	Import	Domestic
	millions of dollars											
Product A (70/30)	50	35	15	100	70	30	200	140	60	350	245	105
Product B (80/20)	75	60	15	75	60	15	100	80	20	250	200	50
Product C (50/50)	80	40	40	20	10	10	50	25	25	150	75	75
All product total	205	135	70	195	140	55	350	245	105	750	520	230

Source: Statistics Canada.

Description of Table 1

Table 1 is a hypothetical example of the industry–product matrix used to create the MEPI weights based on the industries' use of products and the supply identity indicating domestic and imported shares of products.

The columns of the table show the industries' product purchases and the rows show the value of the products split among the industries.

For product A, the supply identity indicates that 30% of the product is sourced domestically and 70% is imported. Industry X purchases $50 million worth of Product A, therefore $15 million is purchased domestically and $35 million is imported. The sum of Industry X's purchases shows that Industry X imported $135 million worth of goods and purchased $70 million worth of goods domestically. The sum of industries X, Y and Z shows that imported goods amount to $520 million and domestically sourced goods amount to $230 million. The sum of products by origin of purchase gives the same totals as the sum of industries by origin of purchase because of the identity between the supply of products and their use by industries.