Input-output Division

Technical Series

Statistics Canada   Statistique Canada

Canada

[redacted]

Input-Output
Technical Series

The Input-Output Division Technical Series are intended for users interested in input-output tables and related research for analysis and applications. Readers of the series are encouraged to contact the authors with comments and suggestions. A complete list of the titles that have been released appears at the back of this paper.

Papers in the series are distributed to Statistics Canada Regional Offices and Provincial Bureaus of Statistics. The series appears in the "Listing of Supplementary Documents" (11-207). A complete set is also maintained in the Statistics Canada Library and is available for consultation.

To obtain the list of titles and/or an individual paper, please contact:

Consulting and Marketing
Input-Output Division
Statistics Canada
23rd Floor, R.H. Coats Building
Ottawa, Ontario, K1A 0T6
(613) 951-3697

I/O TABLES IN CONSTANT PRICES: REVISED DEFLATION PROCESS AND ANALYSIS OF THE MACHINERY AND EQUIPMENT SECTOR

#39

(Paper Prepared for the Indexing and Forecasting
Seminar Sponsored by Bell Canada,
Sept. 24-26, 1984)

P.A. Généreux

Input-Output Division

Statistics Canada

Reprint July, 1991

I/O TABLES IN CONSTANT PRICES: REVISED DEFLATION PROCESS AND ANALYSIS OF THE MACHINERY AND EQUIPMENT SECTOR[1]

P.A. GENEREUX

Input-Output Division

Statistics Canada

I INTRODUCTION

In March 1982, Prices Division of Statistics Canada released a comprehensive set of Machinery and Equipment (M/E) price indexes classified by commodity, by origin and by industry of purchase (i.e. by M/E purchasers); such indexes, referred to as MEPI, estimate the changes in prices over time for the M/E purchases which form part of the capital formation. The availability of these price series and, further, their classification according to the one used for the Input-Output (I/O) tables, make it possible to enhance the deflation of the I/O tables in current prices.

The orientation of the I/O tables and their deflation is to the commodity accounts which detail the supply and the use of a commodity; domestic outputs and imports are the main sources of supply while the various M/E purchasers are examples of the users of a commodity. In the revised I/O deflation process, the available M/E price indexes classified by origin and by industry of purchase for a particular commodity

---

[1] This study was conceived and carried out as part of the programme of the Deflation Unit, Input-Output Division, Statistics Canada: J.M. Ferland, A.B. McCormick and M. Palme participated in the development of the ideas expressed in this paper and P. Latimer provided much valuable computer assistance. The cooperation of L. Graham of Prices Division, Statistics Canada should also be noted.

will be used to deflate the relevant M/E purchasers for the corresponding I/O commodity; further, they will be used to derive price series suitable for the deflation of domestic outputs and of total imports. This process differs from the one, historically used, whereby price series for domestic outputs and for total imports, both series derived from price data which purport to refer to domestic outputs and to total imports, are used for their deflation and, as averages, for the deflation of each of the various users including the M/E purchasers. Hence, for a number of I/O commodities, not only will the price indexes used in the revised I/O deflation process originate from a new data source, they will purport to refer to the M/E purchasers of the I/O commodities instead of the producers of the I/O commodities; also, the price indexes used in the revised deflation I/O process for a particular commodity will differ by classes of purchasers instead of using the same price series to deflata all purchasers. The revised deflation process was actually used for the calculation of the recently-published 1971-1980 I/O Tables in constant prices; the historically-used deflation process was used for the calculation of the sets of I/O Tables in constant prices published prior to the 1971-1980 ones.

The concern of this paper is to present the revised deflation process of the I/O tables as a result of the availability of the set of machinery and equipment price indexes by classes of buyers and to analyze the M/E sector of the economy based on the 1971-1980 I/O tables in constant prices.

The plan of this paper is to firstly present an overview of the I/O tables and of their historically-used deflation process followed by a presentation of the relevant MEPI characteristics. Against such a background, the revised deflation process will be introduced and discussed; it is the core of the paper. A brief analysis of the M/E sector for 1980, from an I/O point of view, is carried out next; it concludes that the MEPI use of producers' price series adjusted for only changes in federal sales tax rates as a proxy for purchasers' price series has not biased the total MEPI to any great extent. A few remarks conclude this paper; these remarks allude to possible additional work on the subject while at the same time stressing the use of the I/O tables in index-number construction.

II RELEVANT CHARACTERISTICS OF THE I/O TABLES AND OF THEIR HISTORICAL DEFLATION PROCESS

Input-Output (I/O) tables present a most detailed accounting of the economy. A time series of I/O tables expressed in current prices, that is in the prices of the period to which the I/O values refer, vary over time as a result of two elements - changes in prices and changes in quantities. There is also a need for a set of I/O tables in constant prices, that is in which price changes are removed; such tables present a quantum view of the structure of the economy. This process of eliminating price changes from the values in current prices is referred to as deflation;[2] in the I/O tables, to a large extent the process of removing price changes is carried out by the use of price indexes.

The I/O tables contain two sets of inter-related accounts - a set of commodity accounts and a set of industry accounts. The commodity accounts show the supply and the demand for individual commodities while the industry accounts display the commodity composition of the output of industries and the costs of production (including earnings of the primary factors of production) of industries; supply equals disposition for each of the commodities. These accounts can be visualized in either of two valuation systems, purchasers' prices and producers' prices; purchasers' prices are the costs of the commodities in the market to the point of delivery to the purchasers whereas the producers' prices equal

---

[2] The nature of the I/O tables in current prices is presented in Chapters 1 to 4 of The Input-Output Structure of the Canadian Economy whereas the deflation of the I/O tables is described in Chapter 2 of The Input-Output Structure of the Canadian Economy in Constant Prices, Statistics Canada, Catalogue numbers 15-201 and 15-202, respectively.

the selling prices at the boundary of the producing establishments (total imports in both systems are valued at the Canadian border inclusive of transportation-to-border-costs and of duties.) The additional cost elements between the producers' prices and the purchasers' prices are called the margins[3]. Operationally, the accounts in purchasers' prices are initially calculated; the appropriate margins are then separately identified and allocated so that the accounts in purchasers' prices are converted to accounts in producers' prices. The producers' price concept implies on uniform basis of valuation throughout a commodity account; in other words, both the supply and the use are on the same valuation base.

The historically-used deflation process starts with the commodity accounts in current producers' prices since they yield a uniform valuation that permits the use of a particular commodity price index for the deflation of both the supply and the use of a commodity account[4]. If, however, there is a reason to suspect that a subset of a particular commodity account displays a different price movement than the price change of another subset, the subset(s) should be identified and separately deflated[5]. One step in this direction is the use of price indexes for domestic outputs and for imports for the deflation of

---

[3] There are seven margins distinguished in the I/O tables; retail margins, wholesale margins, tax margins, transport margins, gas margins, storage margins and pipeline margins.

[4] Further, most of the price indexes available for deflation purposes are really suitable for the deflation of the commodity accounts in current producers' prices.

[5] The identification and the deflation of the I/O commodities' subsets, which display different price movements are limited for a number of reasons, one of which is the operational considerations.

domestic outputs and of total imports, respectively,[6] both of which usually constitute the main sources of supply.

On the use side of the commodity accounts, the exports originating from domestic industries are usually deflated with the available domestic output price series[7]. The other users including the M/E purchasers are deflated with a weighted index of domestic output and total import prices, the weights being the I/O current shares between domestic and import sources of domestic supply; hence, each user of a commodity is deflated by the same price index, which is an average of the price indexes for domestic output and for total imports.

The I/O commodity price indexes, whether they refer to the domestic outputs or to total imports, are themselves weighted averages of price series. This is so because the I/O commodities do not correspond to narrowly-defined commodities but rather to groupings of similar varieties (i.e. all varieties of automobiles are grouped under I/O commodity 334 Passenger Automobiles). For a particular I/O commodity, many different price series are used, each representing the price changes of the varieties classified to that commodity. The various users of the commodity may in fact purchase different varieties or different combinations of the varieties of the commodity; this implies the calculation of separate price indexes for each user, with the price indexes more than likely different by class of user. However, in this

---

[6] If no import series are available, the domestic output ones are used.

[7] If the movement of the export prices for a particular commodity has differed from the change in the prices for the domestic market, an export price index is used instead of domestic output price series.

I/O deflation process, the same price index is applied to each class of user including each M/E purchaser. Further, this deflation process assumes that, for a particular I/O commodity, the proportion between the import and domestic sources is the same for each user.

The I/O commodity price indexes are based on a number of sources; the largest number of the domestic output price series were constructed from price information collected for the construction of Industry Selling Price Indexes (ISPI)[8] while the price indexes for total imports are mainly derived from the Price and Volume Indexes of Imports[9].

Such deflation process yields a set of commodity accounts in constant prices which are in balance; that is, the supply in constant prices equal the use in constant prices for a particular commodity. The commodity accounts in constant prices and the use of the double deflation technique[10] are the basis for the deflation of the industry accounts.

---

[8] Industry Price Indexes, Statistics Canada, Catalogue 62-011, Monthly.

[9] Summary of External Trade, Statistics Canada, Catalogue 65-001, Monthly.

[10] See Chapter 2 of SC 15-202, op. cit., for more information.

III RELEVANT CHARACTERISTICS OF THE MEPI

The Machinery and Equipment Price Indexes by Industry of Purchase (MEPI) are explicitly designed for the deflation of the M/E sector of the Gross National Expenditure; their use in the revised I/O deflation process will conform to that purpose. The emphasis in the MEPI publications is on the M/E price indexes classified by industry of purchase and by origin (domestic or imported) though these price series are also available classified by commodity, by origin and by purchasing industry. The latter are the series relevant to the revised I/O deflation process and correspond to the lowest-level price series made available; one example is the price index for the Canadian-made Transformers for the Electric Power Industry. A discussion of the relevant characteristics of the M/E price series[11] is following.

The classification (by commodity, by origin and by industry of purchase) used for the MEPI closely corresponds to the one established for the I/O tables. The industries of purchase in the M/E price programme, with minor adjustments, refer to the 39 M/E purchasers identified in the I/O tables; these purchasers, in turn, generally correspond to industry groupings at the divisional level of the Standard Industrial Classification; the two origins correspond to the two sources of supply also identified in the I/O tables. The commodities are those I/O commodities for which part of their supply is bought by the M/E purchasers.

---

[11] For additional information, see *Machinery and Equipment Price Indexes by Industry of Purchase. 1971=100. 1971-1979*, Statistics Canada, Catalogue 62-552, Occasional.

Ideally, the M/E price indexes should measure changes in prices paid by purchasers over time for comparable machinery and equipment. Because of the difficulty in obtaining purchasers' prices for comparable M/E purchases over time, in lieu, extensive use is made firstly of existing sources of producers' price data and secondly of estimates of various margins. Hence, the addition of margins to producers' prices renders them in purchasers' prices and the synthetic purchasers' prices so constructed are used as a proxy to measure changes over time in observed purchasers' prices. This is consistent with the I/O practice whereby the producers' prices are the basis of the valuation of the I/O commodities with the margins being separately identified; the sums of producers' prices and margins yield purchasers' prices. The main sources of the domestic and import producers' price data are the Canadian Industry Selling Price Indexes (ISPI) and the United States Bureau of Labor Statistics Producer Price Indexes[12], respectively.

The M/E domestic and the M/E import price indexes are often different by classes of purchasing industries. This results mainly from the purchase by industries of different varieties or of different combinations of varieties since a commodity corresponds to groupings of similar varieties; the price series assigned to represent a variety is the same one used in the calculation of the price index of each industry purchasing that variety. The selection of the varieties and of the price series used to represent the price experience of the varieties as well as the computation of the weights to aggregate the varieties by purchasing industries reflect Prices Division expertise on the subject.

---

[12] For a more complete description of these two series, see pages 10-16 of Statistics Canada 62-552, op. cit.

As mentioned, to more closely approximate a purchasers' price concept, various margins are estimated; more precisely, the BLS series are adjusted for changes in the Canada/USA exchange rates and in duty rates[13] while M/E domestic and M/E import price indexes are adjusted for changes in federal sales tax rates. In regards to the other margins (e.g. other taxes, trade and transport costs), no adjustment is made; not adjusting for these margins is equivalent to an implicit assumption that the price changes associated with them are the same as that of the producers' price indexes adjusted for changes in federal sales tax rates and in exchange and duty rates.

The M/E price indexes are base(1971)-weighted, with the weights derived mostly from I/O data. There is no need to elaborate on the subject; suffice to say that the base-weighted aggregates from the M/E price programme do not correspond to the I/O deflation need which requires currently-weighted aggregates.

---

[13] In the I/O framework, both of these rate changes are not considered as margins.

IV REVISED I/O DEFLATION PROCESS

An ideal I/O deflation process would be based on the premise of using all of the available price information; that is, using the M/E price indexes as well as the price series for domestic outputs and for total imports, with the latter two price series already used in the historical deflation process. In such an approach, the domestic outputs, the total imports, and the M/E purchasers would be deflated by the relevant price series with exports deflated by the price series for domestic outputs. The other commodity users would be deflated residually; that is, by a currently-weighted index of domestic outputs and import prices less M/E prices and less export prices. Such deflation process would yield a set of accounts in constant prices which are in balance.

There are a number of advantages to such a deflation process: the use of all the price data available and the use of the more appropriate M/E price series to deflate the M/E purchasers. Unfortunately, this deflation process is operationally unacceptable because, among other things, the lack of consistency between various sources of price data. For example, assuming a particular variety within an I/O commodity is produced by one domestic industry and purchased entirely by one M/E purchaser; there is no guarantee that the price movement for that variety in the domestic output price index is the same as the price change for the same variety in the M/E domestic price series; it is impossible to ensure such consistency at present. As a result, a bias is introduced in the deflation process and hence, was rejected.

The following deflation process was then derived. For a particular commodity, the M/E purchasers will be deflated by a currently-weighted average of M/E domestic and M/E import price indexes for the relevant commodity and industry of purchase, the weights being the I/O current shares between the domestic and import shares of domestic supply.

The domestic output price index for a commodity will be calculated as a currently-weighted index of the M/E domestic price series available by industry of purchase for the relevant commodity, the weights being the I/O current shares between the M/E purchasers. The total import price index for a commodity will be derived in a similar way as the domestic output price index, though using M/E import price series available by industry of purchase. Both these derived series will then be used to deflate the domestic outputs and the total imports; the domestic one will also continue to deflate the exports. It should be emphasized that the price series for domestic outputs and imports are then proxies since they reflect aggregations of M/E domestic and M/E import price indexes by industry of purchase. The other users (excluding the M/E purchasers naturally) will be deflated using a currently-weighted index of domestic output and total import prices which, in turn, are proxies; the weights being the I/O current shares between domestic and import sources of domestic supply. Such deflation process yields a set of commodity accounts in constant prices which are in balance.

For those I/O commodities for which no M/E price indexes are available, the I/O historical deflation process, presented in Section II above, continues to be used.

V CHOICE OF WHICH I/O COMMODITIES WILL BE DEFLATED USING THE REVISED I/O DEFLATION PROCESS

Conceivably, this revised deflation process could be incorported for the deflation of all of the 79 I/O commodities for which M/E price indexes are available. However, the choice of which one of the 79 I/O commodities would be deflated via this revised deflation process depends on two main criteria:

- the importance of a commodity's sum of M/E values in relation to the economy's total M/E values. The reason is that extra care and resources would be directed towards the computation of the price series for the most important M/E commodities;

- the importance of a commodity's sum of M/E values in relation to its total supply. The reason is that this criteria tests an implicit assumption incorporated in the revised deflation process; that is, the currently-weighted indexes of the M/E domestic and M/E import price series are an adequate reflection of those for domestic outputs and total imports, respectively.

In all, there will be 24 I/O commodities deflated via the revised deflation process; they are listed in Appendix I. Two worth-noting exceptions are: I/O commodities 334 Passenger Automobiles and 335 Trucks. Here are the main reasons for these exceptions. Firstly, the weighted sums of M/E domestic and M/E import price indexes may not necessarily represent the price movements for the domestic outputs

and for the total imports, respectively, especially for I/0 commodity 334 where the ratio of sum of M/E values in relation to its supply is very low. Secondly, the M/E price data would not yield separate price indexes for the deflation of outputs and of exports, while the separate deflation would seem necessary considering the significant share of exports and the price indexes for exports being different; the historical deflation process ensures separate deflation of outputs and exports. Thirdly, the ISPI series for automobiles used in the M/E domestic price indexes refer to the price changes associated with the production of automobiles shipped to domestic market only while the deflation of the domestic outputs would required a price series that refer to the production of automobiles for both the domestic and export markets.14

The sum of M/E values for the 24 I/0 commodities which will be deflated using the revised I/0 deflation process account for approximately 54% of the economy's total M/E values, based on the 1971 I/0 tables. The M/E values for I/0 commodities 334 and 335 account for a further 11%; the tax, trade and transportation margins, which are separately identified and deflated in the I/0 tables, for 24% and the other I/0 commodities which are not deflated using the revised deflation process, for 11%.

---

[14] The use in the MEPI of the ISPI automobiles series is, however, perfectly valid.

VI SUITABILITY OF THE M/E PRICE INDEXES

An evaluation of the suitability of the M/E price indexes for the revised I/O deflation process revealed that they are deficient in two ways. Firstly, the M/E domestic and M/E import price series reflect changes in producers' prices and in federal sales taxes; since all margins in the I/O deflation process are separately deflated, the required M/E price series would exclude changes in federal sales taxes. The available M/E price indexes were, therefore, adjusted by removing the impact of the changes in federal sales tax rates; such rates were calculated from I/O data. Secondly, M/E import price indexes fail to reflect the changes in transport-to-Canadian-border costs as the total imports in the I/O tables include the transport-to-Canadian-border costs. The available M/E import price indexes were, therefore, adjusted by adding the impact of the changes in the transport-to-Canadian-border costs, using again I/O data.

VII INTERPRETATION OF RESULTS BASED ON THE 1980 I/O TABLES IN CURRENT AND IN CONSTANT PRICES.

(A) Commodity Price Indexes by M/E Purchasers

One of the characteristics of the revised I/O deflation process is the use of different commodity price indexes by M/E industry of purchase for the deflation of the various M/E purchasers contrary to the practice of using only one commodity price index to deflate each and every user including the M/E purchasers; the latter is usually a currently-weighted index of domestic output and total import prices. The following table presents the 1980 (1971=100) producers' price indexes for selected M/E purchasers for the I/O commodity 323 (Special Purpose Machinery and Equipment), the most important M/E commodity as determined by the ratio of its sum of M/E values in relation to the economy's total M/E values.

TABLE 1 - 1980 PRODUCERS'PRICE INDEXES BY M/E PURCHASERS FOR I/O COMMODITY 323 SPECIAL PURPOSE MACHINERY AND EQUIPMENT[1] (1971=100)

M/E PURCHASERS	PRICE INDEXES[2] (1971=100)
Forestry	246.0
Mining, Quarrying and Oil Wells	281.0
Food and Beverages	248.3
Wood Products	237.2
Paper and Allied Industries	269.3
Metal Fabricating	299.3
Construction Industry	237.9
Electric Power	260.2
Range for the Other M/E Purchasers	132.4 to 328.1

[1] The M/E purchasers used for this table are the same ones used for Table 25 of Construction Price Statistics, Statistics Canada, Catalogue 62-007, Monthly.

[2] Currently-weighted averages of M/E domestic and import prices.

For I/O commodity 323, the 1980 price index for domestic outputs is 256.1 and, for total imports, 270.6; both are currently-weighted indexes of the M/E domestic and M/E import prices series available by M/E purchasers, respectively. The 1980 currently-weighted price index of domestic outputs and of total imports (less exports) is 265.3. Therefore, the revised I/O deflation process uses M/E price indexes which varies from 132.4 to 328.1 while the practice of using the same currently-weighted index of domestic output and total import prices (less exports) for the deflation of each M/E purchaser would imply the use of 265.3 as a deflator; the latter practice has been historically used and, in fact, is the one used for the deflation of the I/O commodities for which no M/E price series are available.

(B) Price Indexes and Volume Indexes for the Economy's Total M/E Sector

A characteristic of the I/O tables is the possibility of identifying the various margins which facilitate, as a result, an analysis of the difference between the price paid by the purchaser and that received by the producer. The following attempts to present such analysis for the economy's total M/E sector for 1980.

TABLE 2 - 1980 VOLUME AND PRICE INDEXES FOR THE M/E SECTOR.[15]

M/E SECTOR	INDEXES (1971=100)		PERCENTAGES BASED ON I/O VALUES IN CONSTANT PRICES %
	VOLUME	PRICE	
I/O Purchasers' Prices	181.7	208.3	100.0
I/O Wholesale Margins	184.5	213.8	11.6
I/O Retail Margins	189.0	171.6	2.0
I/O Transportation Margins	166.4	210.1	1.7
I/O Indirect Taxes (excluding Federal Sales Taxes)	185.6	132.0	3.8
I/O Producers' Prices and Federal Sales Taxes	181.3	212.0	80.9
I/O Producers' Prices	180.5	218.0	75.8
I/O Federal Sales Taxes	195.0	121.6	5.1
I/O Margins (Trade, Transportation and Tax)	185.7	177.9	24.2

---

[15] Volume and price indexes for the entire 1971-1980 period are available in Appendix II.

Considerable variation in volume and price indexes is observed for the economy's M/E sector. However, the variation is more pronounced in the price indexes with the price change for the I/O producers' prices (+118.0%) increasing at a faster rate than the one for the I/O margins (+77.9%) over the 1971-1980 time period; the price change for the I/O Indirect Taxes, and especially for the I/O Federal Sales Taxes, have not increased as fast as the other components since 1971 (only +21.6%).

The use in the MEPI of producers' price series adjusted only for changes in federal sales tax rates as a proxy for purchasers' price series can be evaluated from the data provided in the table. The 1980 I/O price index for producers' prices and federal sales taxes is 212.0 while the I/O price series for purchasers' prices is 208.3; the difference between the two equals the trade and transport margins and the other indirect taxes, which are not part of the MEPI. Hence, the 1980 price data suggests that the use of producers' price series adjusted for only changes in federal sales tax rates as a proxy for purchasers' price series has not biased the MEPI to any great extent; that is mainly because the price index for the wholesale margins, the most important one, has increased at similar rates as the producers' price series. However, the possibility of incorporating all margins should be considered.

VIII CONCLUSION

A number of comparisons could prove very interesting. For example, the economy's M/E sector in constant prices derived using the revised I/O deflation process can be compared to the equivalent series derived using the historical deflation approach (i.e. the one described in Section II above); further, the price indexes for the M/E sector based on the I/O tables can be compared against the equivalent series from the Gross National Expenditure (GNE) of the National Income and Expenditure Accounts[16] and against the total MEPI. Both comparisons are not presented in this paper as caution is advised. In the case of the first comparison, any difference between the two series can not be solely the result of the revision in the I/O deflation process since the I/O tables in current prices and other commodity price indexes are not consistent for the calculation of the two M/E sectors in constant prices. For the second comparison, even though the current GNE price index for the M/E sector emanates from the MEPI programme, it does not reflect for the entire 1971-1980 period the MEPI series; also the total MEPI is base-weighted while the other two series are currently-weighted.

Another comparison, not carried here as it is outside the scope of this paper, would present the impact of using base-period weights instead of current-period ones in the calculation of the price index for the M/E sector. Such a comparison would in fact quantify the divergence between

---

[16] *System of National Accounts. National Income and Expenditure Accounts*, Statistics Canada, Catalogue 13-201, Annual. For more information on the price index for the M/E sector of the GNE, see the attached Appendix III.

a Laspeyres and a Paache price series for the M/E sector and would provide some hindsight on the timing of the revision of the weights for the MEPI.

As a result of the release of the MEPI, the number of price indexes by I/O commodity to be used in the I/O deflation process has been significantly increased; they purport to refer to the M/E purchasers of the I/O commodities instead of their producers as has been the case historically in the I/O deflation process. These I/O commodity price indexes have the further advantage of being available by classes of M/E purchasers which permits the various classes of purchasers to be deflated by different and more appropriate price indexes instead of using the same deflator to deflate all classes. Consequently, the release of the MEPI has made it possible to revise the I/O deflation process and as a result to enhance the I/O tables in constant prices.

In turn, the I/O tables can be useful to index-number makers; for example, they can serve to uncover anomalies between price indexes or as the source of the algorithms in the development of the weighting patterns of price indexes. The I/O tables can also be used to test some of the assumptions underlying the price indexes; in this regard, the MEPI use of producers' price series adjusted for only changes in federal sales tax rates as a proxy for purchasers' price series has not biased the total MEPI to any great extent though the possibility of incorporating all margins should be considered.

APPENDIX III PRICE INDEX FOR THE M/E SECTOR OF THE GNE

Up to the mid-1970's, the price index for the M/E sector of the Gross Natinal Expenditure (GNE) is a currently-weighted average of industry price series emanating mainly from the set of unpublished and now-defunct Industrial Machinery and Equipment Price Index (1955=100), with the weights being the current industry expenditures on machinery and equipment. As of the mid-1970's, the GNE price index is a currently-weighted average of industry price series, this time originating from the set of MEPI the weights still being the current industry expenditures on machinery and equipment.

Any difference between the GNE series, on one hand, and the total MEPI and the I/O equivalent for the M/E sector, on the other, can be traced to two main reasons: different sources of the price series (at least up to 1975) and different weighting patterns. In regards to the first reason, it is expected that the GNE price series will be revised historically so to incorporate for the entire 1971-1980 period the various MEPI series so that any discrepancy between the GNE price series and total MEPI will be attributable mainly to the different weighting patterns.

As it now stands, the weights for the total MEPI are base-weighted whether they refer to the commodities, origins or

APPENDIX I I/O COMMODITIES DEFLATED VIA THE REVISED DEFLATION PROCESS

In all, there will be 24 I/O commodities deflated via the revised deflation process; they are:

I/O COMMODITY NUMBERS	I/O COMMODITY NAMES
205	Office Furniture
206	Special Purpose Furniture
304	Appliances for Cooking and Warming Food
314	Tractors
315	Other Agriculture Machinery
316	Mechanical Power Transmission Equipment
317	Pumps, Compressors and Blowers
318	Conveyors and Hoist Machinery
319	Industrial Trucks, Tractors, Trailers
321	Packaging Machinery, Lubrication Equipment
322	Industrial Furnaces, Kilns and Ovens
323	Special Purposes Machinery and Equipment
329	Office Machines and Equipment
330	Aircraft
339	Trailers and Semi-Trailers
345	Locomotives and Rolling Stock
346	Self-Propel Cars
358	Telephone and Telegraph Line Equipment
359	Radio and TV Broadcasting Equipment
365	Welding Machinery and Equipment
366	Engines, Marine, Electric Turbines
367	Transformers and Converters
368	Electric Equipment Industrial nes.
498	Lab and Scientific Apparatus

APPENDIX II PRICE AND VOLUME INDEXES FOR THE M/E SECTOR, 1971-1980 (1971=100)

The following two tables presents the price and volume indexes (1971=100) for the M/E sector for the 1971-1980 period.

TABLE 1 - PRICE INDEXES FOR THE M/E SECTOR, 1971-1980 (1971=100)

M/E Sector	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
I/O Purchasers' Prices	100.0	102.9	106.1	118.5	133.5	143.4	155.5	172.7	188.4	208.3
I/O Wholesale Margins	100.0	106.3	103.3	118.6	138.7	150.7	154.3	169.3	183.4	213.8
I/O Retail Margins	100.0	101.2	97.4	106.0	116.1	126.1	133.9	144.8	148.2	171.6
I/O Transportation Margins	100.0	104.9	108.9	122.0	137.0	156.1	168.8	179.3	187.5	210.1
I/O Indirect Taxes (excl. Federal Sales Taxes)	100.0	95.3	101.7	120.3	92.2	100.2	109.7	105.0	127.2	132.0
I/O Producers' Prices and Federal Sales Taxes	100.0	102.8	106.9	118.7	135.0	144.5	158.2	177.0	193.0	212.0
I/O Producers' Prices	100.0	102.6	106.8	118.6	137.8	146.3	160.6	180.2	198.8	218.0
I/O Federal Sales Taxes	100.0	105.5	108.2	120.1	93.9	114.9	119.6	127.8	108.1	121.6
I/O Margins (Trade, Transportation and Tax)	100.0	103.9	104.0	118.3	120.4	134.5	139.6	149.0	155.6	177.9

TABLE 2 - VOLUME INDEXES FOR THE M/E SECTOR, 1971-1980
(1971=100)

M/E Sector	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
I/O Purchasers' Prices	100.0	109.1	132.3	146.4	153.3	157.2	154.6	155.8	173.9	181.7
I/O Wholesale Margins	100.0	110.8	130.4	153.5	158.3	169.0	157.2	152.6	170.9	184.5
I/O Retail Margins	100.0	126.7	159.6	171.8	184.0	191.0	187.4	187.9	205.6	189.0
I/O Transportation Margins	100.0	119.3	128.2	138.8	148.7	144.2	134.1	136.5	161.4	166.4
I/O Indirect Taxes (excl. Federal Sales Taxes)	100.0	110.3	131.7	147.5	150.9	152.6	151.3	153.5	172.5	185.6
I/O Producers' Prices and Federal Sales Taxes	100.0	108.1	132.0	144.9	152.1	155.2	154.1	156.1	173.9	181.3
I/O Producers' Prices	100.0	107.9	131.4	144.2	151.3	155.0	153.9	155.6	172.9	180.5
I/O Federal Sales Taxes	100.0	111.5	141.7	156.1	164.2	158.2	157.9	163.9	190.1	195.0
I/O Margins (Trade, Transportation and Tax)	100.0	112.8	135.1	153.4	159.7	164.1	157.1	156.6	177.1	185.7

APPENDIX III PRICE INDEX FOR THE M/E SECTOR OF THE GNE

Up to the mid-1970's, the price index for the M/E sector of the Gross Natinal Expenditure (GNE) is a currently-weighted average of industry price series emanating mainly from the set of unpublished and now-defunct Industrial Machinery and Equipment Price Index (1955=100), with the weights being the current industry expenditures on machinery and equipment. As of the mid-1970's, the GNE price index is a currently-weighted average of industry price series, this time originating from the set of MEPI the weights still being the current industry expenditures on machinery and equipment.

Any difference between the GNE series, on one hand, and the total MEPI and the I/O equivalent for the M/E sector, on the other, can be traced to two main reasons: different sources of the price series (at least up to 197~~1~~5) and different weighting patterns. In regards to the first reason, it is expected that the GNE price series will be revised historically so to incorporate for the entire 1971-1980 period the various MEPI series so that any discrepancy between the GNE price series and total MEPI will be attributable mainly to the different weighting patterns.

As it now stands, the weights for the total MEPI are base-weighted whether they refer to the commodities, origins or

industries; they are based on the data from the 1971 Input-Output tables which, in turn, reflects values extracted from a 1971 annual investment survey[1] of new machinery and equipment. The industry weights for the GNE price series originate from the same data source though they refer to the current period. Contrary to the GNP series which incorporates only current industry weights, the I/O equivalent series incorporates current weights when aggregating price series classified by commodities, by origins and by purchasing industries. Hence, the total MEPI is entirely base-weighted while the I/O series is totally currently-weighted; because the GNE price index uses the MEPI industry price series which are, in turn, base-weighted, the GNE series is partly currently-weighted (by industry) and partly base-weighted (by commodity and by origin).

---

[1] Private and Public Investment in Canada, Statistics Canada, Catalogue 61-205, Annual.

TECHNICAL SERIES

INPUT-OUTPUT DIVISION

STATISTICS CANADA

(1)
Hoffman et al., "*User's Guide to Statistics Canada Structural Economic Models*", Input-Output Division, Statistics Canada, Revised september 1980.

(2)
Hoffman et al., "*Guide d'utilisation des modèles économiques et structuraux de Statistique Canada*", Division des entrées-sorties, Statistique Canada, Révision septembre 1980.

(3)
Durand R. and Rioux R., "*On the Accounting Decomposition of Input-Output Price Indices Into Their Cost Components: The Case of Indirect Taxes*", Paper Presented at the International Round Table on Taxes and the CPI, Ottawa, Input-Output Division, Satistics Canada, March 1987, revised May 1989.

(4)
Siddiqi Y., Murty P.S.K., Diena J., "*Highlights of the Public Sector Market Study, 1983*" Input-Output Division, Statistics Canada, September 1987.

(5)
Murty P.S.K., "*Size and Structure of the Public Sector Market, 1983, Sources and Methods*" Input-Output Divison, Statistics Canada, September 1987.

(6)
Durand R., "*The Adding-Up Problem in the Computation of Aggregate Price GDP*", Input-Output Division, Statistics Canada, October, 1987.

(7)
Durand R. and Markle T., "*Measuring the Variability of Input-Output Structures: A Progress Report*", Input-Input-Output Division, Statistics Canada, December 1987.

(8)
Durand R. and Markle T., "*On the Variability of Input-Output Structures: A Progress Report on the Constant Price Industrial Input Structures*", Input-Output Division, Statistics Canada, April 1988.

(9)
Durand R. and Markle T., "*Structural Change in the Canadian Economy: The Supply Side in Current Prices*", Input-Output Division, Statistic Canada, July 1988.

(10)
Durand R., "*Statistics Canada's Price Model: A Detailed Description of the Structure and Simulation Capacities*", Input-Output Division, Statistics Canada, August 1988.

(11)
Durand R. and Markle T., "*Structural Change in the Canadian Economy: The Supply Side in Constant Prices*", Input-Output Division, Statistics Canada, October 1988.

(12)
Durand R. and Markle T., "*A Diversity Analysis of Structural Change Based on the Canadian Input-Output Tables*" Input-Output Division, Statistics Canada, January 1989.

(13)
Durand R. and Diaz A., "*Input-Output Modelling of Commodity Indirect Taxes for Macroeconomic Analysis*", Input-Output Division, Statistics Canada, January 1989.

(14)
Murty P.S.K., Généreux P.A., Leblanc D., Greenberg M. "*Provincial Sales Tax Commodity Allocation Project, 1984 Sources and Methods*" Input-Output Division, Statistics Canada, January 1989.

(15)
Durand R., "*The Balancing Process of the Regional Input-Output Tables*", Input-Output Division, Statistics Canada, February 1989.

(16)
Siddiqi Y., Murty P.S.K., Diena J., "*Highlights of the Provincial Sales Tax Commodity Allocation Project, 1984,*" Input-Output Division, Statistics Canada, January 1989. Reprinted from Canadian Economic Observer, May 1989.

(17)
Durand R., "*Aggregation Formulas for Multifactor Productivity*", Input-Output Division, Statistics Canada, June 1989.

(18)
Durand R. and Diaz A., "*A New Specification of the Leakage Parameters of the Input-Output Model*", Input-Output Division, Statistics Canada, July 1989.

(19)
Siddiqi Y., Murty P.S.K., "*Commodity Indirect Taxes in the Canadian Input-Output Accounts, 1984*" Input-Output Division, Statistics Canada, July 6, 1989.

(20)
Markle T., "*Progress Report # 5: On the Temporal Variability of the Aggregate Input Structure*", Input-Output Division, Statistics Canada, September 1989.

(21)
Siddiqi Y., Murty P.S.K., "*Highlights of Commodity Taxes for 1984*", Input-Output Division, Statistics Canada, Canadian Economic Observer, September 1989.

(22)
Siddiqi Y., Murty P.S.K, "*Commodity Indirect Taxes - An Inventory before the GST*", Input-Output Division, Statistics Canada, Canadian Economic Observer, October 1989.

(23)
Murty P.S.K., Siddiqi Y., "*Government Expenditures on Goods and Services and Transfer Payments in Canada, 1961-1985*" Input-Output Division, Statistics Canada, December 1989.

(24)
Murty P.S.K., Siddiqi Y., "*Government Expenditures on Goods and Services anf Transfer Payments in Canada 1961-1985 – Reprint from Canadian Economic Observer May 1990*" Input-Output Division, Statistics Canada.

(25)
Siddiqi Y., Murty P.S.K., "*Commodity Indirect Taxes in the Canadian Input-Output Accounts, 1984-1986*" Input-Output Division, Statistics Canada, February 1990.

(26)
Durand R., "*Growth Accounting and the Quality Adjustment of the Capital Stock*", Input-Output Division, Statistics Canada, February 1990.

(27)
Durand R., Salem M., "*On a Dynamic Productivity Index Number Formula*", Input-Output Division, Statistics Canada, revised version February 1990.

(28)
Diaz A., "*The 1989 increase in Labour Compensation per Person: Was it caused by wage demands?*", Input-Output Division, Statistics Canada, June 1990.

(29)
Murty P.S.K., "*Federal Goods and Services Tax and the Canadian System of National Accounts*" Input-Output Division, Statistics Canada, October 1990.

(30)
"*Effective tax rates and net price indexes*", Feature Article, Canadian Economic Observer, November, 1990.

(31)
Salem M., "*Documentation of Capital Input and Capital Cost time series for Multifactor Productivity Measures*", Input-Output Division, Statistics Canada, reviewed and updated by R. Fortin and Y. Sabourin, December 1990.

(32)
Siddiqi Y., Murty P.S.K., "*Federal Sales Tax in the Canadian Input-Output Accounts*" (Draft: For internal discussion only), Input-Output Division, Statistics Canada.

(33)
Murty P.S.K., "*New Paradigm to Analyze Government Transfer Payments with special reference to Canada*", Input-Output Division, Statistics Canada, Draft, January 3 1991.

(34)
Durand R., "*Productivity Analysis and the Measurement of Gross Output Net of Inter-Industry Sales*", Input-Output Division, Statistics Canada, January 1991.

(35)
Murty P.S.K. and Siddiqi Y., "*A New Paradigm to Analyze Commodity Indirect Taxes and Subsidies, 1986-1989*", Input-Output Division, Statistics Canada, April 5, 1991.

(36)
Généreux P., "*The Input-Output Structure of the Economies of the Yukon and Northwest Territories, 1984*", Input-Output Division, Statistics Canada, May 1991.

(37)
Généreux P., "*La structure par entrées-sorties des économies du Yukon et des Territoires du Nord-Ouest, 1984*", Division des entrées-sorties, Statistique Canada, Mai 1991.

(38)
Durand R., "*An Alternative to Double Deflation for Measuring Real Industry Value-Added*", Input-Output Division, Statistics Canada, June 1991.

(39)
Généreux P., "*I/O Tables in constant prices: Revised deflation process and analysis of the machinery and equipment sector*", Input-Output Division, Statistics Canada, September 1984. Reprint July, 1991

(40)
Murty P.S.K. and Siddiqi Y., "*Government subsidies to industries*", Input-Output Division, Statistics Canada,Reprint from Canadian Economic Observer, May 1991.