



**International Trade Division**

**Data Integration - International Trade and  
Manufacturing Shipments Commodity Data**

by

Carlo Rupnik  
Statistics Canada

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## Executive Summary

There has long been demand by both industry associations and government departments to combine manufacturing shipments data with trade data. Users are combining the two sources of data, for reasons such as determining an estimate of the domestic market for a given commodity, and using the resulting information for decision-making. This paper attempts to determine the feasibility of integrating manufacturing shipments data and trade data at the commodity level.

The International Trade Division (ITD) compiles all data on imported and exported goods. The Manufacturing, Construction and Energy Division (MCED) compiles manufacturing shipments data for the manufacturing sector. This comprises the bulk of manufactured shipments.

Due to several reasons, shipments data from MCED and export trade data from ITD are not fully compatible. One of the most noticeable problem that arises is the illogical situation where exports exceed shipments for a commodity. Clearly, it is not possible to have more domestic exports than is actually manufactured domestically for any particular commodity. The principal problem affecting the compatibility of these data is that they are collected using different sources. The former is based on a quasi census, the Annual Survey of Manufactures (ASM) compiled by MCED while the latter is based on administrative data in the form of customs documents compiled by ITD. There are a number of other areas where the two sources of data differ including: coverage, valuation, classification, period of reporting, and level of estimation.

Research on the exports greater than shipments problem and the conceptual, definitional, and processing differences between the two sources was undertaken. The major differences are shown below.

### Shipments/Exports Reconciliation (within a 4 digit HS)

#### Major Differences

<i>Shipments</i>	<i>Exports</i>
Value of a good produced by a Canadian manufacturer (from ASM)	Value of an exported good
+ re-import value	- re-exports
+ undercoverage adjustment (small establishments)	- freight
+ time period adjustment (calendarisation)	
+ goods produced by Canadian wholesaling establishments	
= Adjusted value of shipments by Canadian manufacturers	= Adjusted value of exports

Remaining differences include:

- Classification differences
- Processing differences
- Wholesalers' markup: Establishments that export what they purchase from a manufacturer may markup the sale price of the exports. This will inflate the value of exports over the value reported in shipments.
- Goods produced by agricultural or fishery establishments: Statistics are available from various sources such as the Department of Fisheries and Oceans and the Agriculture Division at Statistics Canada.
- Goods produced by mining establishments: Statistics are available from Natural Resources Canada.
- Modeling imprecisions (e.g., trade/exports concordance, ASM undercoverage adjustments)
- ITD & MCED undercoverage differences
- Non-sampling errors.

With the above adjustments integrated shipments and trade data will be of reasonable quality. However, without spending massive amounts on micro-level adjustments, data quality will not be perfect. Caution and a data quality statement would still be required. Given that undertaking this work would constitute a private rather than a public good, expenses associated with this customized service should be borne by the user.

Finally, because changes in exports can be used to indicate changes in manufacturing shipments and vice versa, it is recommended that MCED and ITD could use changes in trade and shipments volume as a signal to adjust their respective commodity coverage.

To avoid major revisions, monitoring the export to shipment ratio could be part of the annual review of the data by both MCED and ITD. The two Divisions could examine establishments that are both exporters and manufactures to check for consistency in reporting of exports and shipments and to cooperatively contribute to the source and correction of any apparent problems. This should be done as soon as possible so that modifications can be made quickly and when hard copy records containing comments are still available.

## Introduction

There has long been demand by both industry associations and government departments to combine manufacturing shipments data with trade data. Users are combining the two sources of data and using the resulting information for decision-making. One of the main benefits of combining these two data sources is that it enables the calculation of an estimate for the domestic market for a given commodity. The domestic market refers to what may be available for the domestic market based on a mathematical calculation using available data. It is defined as shipments of commodities manufactured domestically less exports plus imports.

The integration of the two data sources requires that trade data and manufacturing shipments data be compatible. More specifically, because imports are independent of exports and manufacturing shipments while exports are directly linked to manufacturing shipments (exports are a portion of manufacturing shipments), export data and manufacturing shipments data should be compatible. The International Trade Division (ITD) compiles all data on imported and exported goods. The Manufacturing, Construction and Energy Division (MCED) compiles manufacturing shipments data, which are shipments from establishments classified in the manufacturing sector. This comprises the bulk of manufacturing shipments although there are manufacturing shipments made by establishments classified outside of the manufacturing sector, such as the wholesale sector and the agricultural sector. The scope of this paper is to analyze export estimates produced by ITD and shipments data as compiled by MCED.

Due to several reasons, shipments data from MCED and export trade data from ITD are not fully compatible. The principal problem affecting the compatibility of these data is that they are collected using different sources. The former is based on a quasi census, the Annual Survey of Manufactures, (ASM) compiled by MCED while the latter is based on administrative data in the form of customs documents compiled by ITD. There are a number of other areas where the two sources of data differ including: coverage, valuation, classification, period of reporting, and level of estimation.

Nonetheless, users are combining the two sources of data and using the resulting information for decision-making. Hence, it is important to determine the feasibility of integrating manufacturing shipments data from MCED and export data from ITD.

Previous work has been completed in this area. The article titled “The Valuation of Newsprint” provides a comparison of data from both divisions for newsprint, a very specific commodity. The authors found significant problems when comparing shipment and export information. These problems are the specific result of an incorrect assessment, including valuation and classification, of exports. For this commodity, total manufacturing shipments are lower than exports (Leonard, 1995).

The article titled “Comparison of data from the International Trade Division and the Annual Survey of Manufactures” evaluates the compatibility of manufacturing shipments data with import/export data at the industry level. The author concludes that, without adjustments, the data are not compatible at an industry level and research on commodity data integration is recommended (Lefebvre, 1998).

This paper attempts to determine the feasibility of integrating manufacturing shipments data from MCED and trade data from ITD at the commodity level. The first part of the paper will describe the conceptual differences between manufacturing shipments data and trade data. The next part will provide a description of the problem. That is, for what commodities the data are least compatible and to what extent the data are incompatible. The analysis is done on a value basis because all trade data are available on a value basis while only approximately 60% are available on a quantity basis. The following section will attempt to quantify conceptual differences by describing a set of adjustments, including their potential impact, which can make the data more compatible. Finally, the last section will provide conclusions and recommendations regarding the use of the data sets. An appendix is included where the adjustments are applied to three commodities.

## **Conceptual Differences:**

There are several conceptual differences between manufacturing shipments data and trade data.

### ***Collection Methods and Coverage:***

MCED utilizes an annual survey (ASM) to collect detailed data on commodities at an establishment level. The ASM gathers data from manufacturing industries about shipments as well as other variables such as input expenses, shipment destinations, and employment data including the total number of employees, salaries and wages. Data on total shipments, destined for either domestic or international markets, are collected from the manufacturer. To minimize the burden on respondents, shorter questionnaires and tax records are used to compile data for smaller establishments. Tax records and short questionnaires do not provide commodity detail. It is estimated that the ASM has a commodity undercoverage of 7 to 10 %.

Although the manufacturing shipments data compiled by MCED comprises the vast bulk of manufacturing shipments, shipments are also made from establishments classified outside of the manufacturing sector, as their major activity is in other sectors such as wholesale or agriculture.

ITD utilizes administrative sources to compile trade data. Customs documents are used to establish these statistics. Importers, exporters, or their agents are responsible for properly completing forms by declaring, among other things, the destination, the value of the merchandise, the origin (province or territory) of goods, and the method of transportation used. Considering that customs agents are more vigilant about merchandise entering the country, the customs basis is more accurate for assessing imports than exports. Exports include products cultivated, extracted or manufactured in Canada (including products of foreign origin that are processed in Canada). Exports to countries other than the United States are assessed based on the value declared in export documents. In accordance with the Memorandum of Understanding on the Exchange of Imports Data (MOU) signed in July 1987 and implemented in January 1990, exports to the United States are based on United States imports from Canada, collected by the United States Customs Service. Replacing Canadian export statistics with more dependable U.S. import figures increases the reliability of trade data.

Trade data coverage by ITD is not complete. Low value transactions (defined as less than \$2,000) are excluded from exports data at the commodity detail. In practice, this applies to U.S. destinations. To non-U.S. destinations, transactions with values less than \$10,000 are being excluded from exports data at the commodity detail. All low value transactions are aggregated into a separate total rather than being allocated to their respective commodities. As a result, the value of exports for some commodities may be understated by varying, but usually relatively small, amounts. Low value transactions account for less than 1% of total exports.

Incomplete coverage of trade data also results from omissions or errors in the completion of customs documents. At times documents for exports are not filed and for the ones that are, errors can occur in the documentation process. The principal cause of this deterioration in coverage is a lack of awareness or misunderstanding on the part of Canadian exporters of Canada Customs reporting procedures.

### ***Valuation***

The value of manufacturing shipments is defined as the net value of the commodity excluding freight charges, sales taxes, excise duties and excise taxes, sales discounts, allowances, and rebates. The value that is attached to the commodity is the actual purchase cost to the buyer. The value of shipments represents the net sales of the manufacturing establishment. Net sales value excludes freight charged by carriers, but it does include freight costs incurred by the company's own carriers. Transfers to other establishments of the same company are included and valued at cost, based on the transfer book value.

Export values include the value of the commodity and the costs of domestic or internal freight charges but net of taxes, discounts, allowances, and rebates. The value of exports represent actual sale prices or transfer prices that have been adopted by the companies for accounting purposes. These prices include inland freight to the port of export.

The shipment destination variable from the ASM is the first destination of shipments after leaving the factory or manufacturing warehouses. Meanwhile, exports are attributed to the final known destination for merchandise at the time of export.

## *Classification*

Shipments data from the ASM are gathered by industry according to the Standard Industrial Classification (SIC). The North American Industrial Classification System (NAICS), an updated industry classification system, is to replace the SIC for the 1998 reference year. The ASM also collects data on commodities shipped by establishments according to the Standard Classification of Goods (SCG). Trade data are collected and classified according to the SCG and the Canadian Export Classification (CEC).

The SCG and CEC are numeric commodity classification systems based upon the international Harmonized Commodity Description and Coding System (HS). The HS is the international product nomenclature used by more than 150 countries as a basis for their national Customs Tariffs and for collection of trade statistics. The SCG and CEC are Canadian expansions of the HS to identify commodities of particular significance in the Canadian economy. They are updated annually.

The structure of the HS is based on the addition of 2 extra digits at a time to reflect progressively finer levels of detail. For example, HS chapter 02 (the first 2 digits indicates the chapter), “Meat and edible meat offal”, is subdivided into codes 0201, “meat, bovine, fresh or chilled”; 0202, “Meat of bovine animals, frozen”; 0203, “Pork, fresh, chilled or frozen”; etc. Similarly these 4-digit codes are split into 6-digit codes as the next finer level of detail. Thus code 0201 splits into 020110, “bovine carcasses and half carcasses, fresh or chilled”; 020120, “Bovine cuts with bone in, fresh or chilled”; and 020130, “Bovine cuts, boneless, fresh or chilled”.

At this point the international HS does not subdivide further, so, to meet Canadian needs the SCG and CEC were created. **The first six digits of each SCG and CEC code are taken directly from the HS.** The HS, SCG, and CEC are exactly the same to this level.

## *Period of Reporting*

Data from the ASM includes information from the financial year of the establishment. Manufacturing shipments data for a given year are based on shipments from establishments whose financial year ends anywhere between April 1 of the reference year to as late as March 31 of the following calendar year. (It should be noted that this has been changed from January 1 to December 31, effective with the 1998 reference year.) This means that each establishment reporting manufacturing shipments can have a different financial year end. As long as their financial year ends between April 1 of the reference year to as late as March 31 of the following calendar year their shipments are reported as manufacturing shipments for the reference calendar year. As a result, shipments made by establishments during times outside of the calendar year are included in the annual calendar year shipments total for any given year.

Thus, in extreme cases, manufacturing shipments from establishments whose financial year ends on April 1 of the reference year would have all their shipments reported as shipments made in the reference year even though only 25% of their reporting period falls in the reference year and 75% falls in the previous year. For these establishments, their shipments made during the remaining 75% of the reference year are reported as shipments made in the following year.



Trade statistics are gathered on a monthly basis and annual totals are based on the January 1 to December 31 calendar year. The reference period is the month and calendar year.

### ***Level of Estimation***

A portion of the shipment value is contributed by an estimate rather than a reported figure. There are three possible levels of estimation for each code:

0-30% less than 30% of the shipment value was contributed by an estimate rather than a reported figure.  
This is the lowest level of estimation.

31-60% between 31 and 60% of the shipment value was contributed by an estimate rather than a reported figure.

61-100% over 61% of the shipment value was contributed by an estimate rather than a reported figure.  
This is the highest level of estimation.

## **Description of the Problem**

The different sources and valuation methods used to compile shipments and trade data leads to their incompatibility. The most noticeable problem that arises is the illogical situation where exports exceed shipments for a commodity. Clearly, it is not possible to have more domestic exports than is actually manufactured domestically for any particular commodity for a given reference year, unless there is a major draw down of inventories. Such a case is highly unlikely.

Customs data from ITD have been compared and extensively analyzed with shipments data from MCED at the four-digit HS level for the period 1992 to 1996. (Codes for which exports exceed shipments will be referred to as 'problem cases'). The analysis has been done on a value basis because trade data are not as available on a quantity basis. Hence, any conclusions made are based on the value of trade and shipments data. An analysis made on a quantity basis may further specify the problem as being one of valuation. The four-digit HS level was chosen for the analysis because previous work has concluded that industrial classification differences were too extensive (Lefebvre, 1998).

The following table summarizes the extent of the problem:

**Table 1 Data Summary**

Exports as a % of Shipments (Value)	1992		1993		1994		1995		1996	
	%	#	%	#	%	#	%	#	%	#
<100	87.3	267	84.9	236	85.6	386	85.7	395	75.0	698
<110	88.9	272	87.1	242	87.1	393	88.5	408	77.1	718
<120	89.2	273	88.1	245	89.1	402	90.2	416	79.0	735
<130	89.9	275	88.1	245	90.5	408	92.0	424	80.3	748
<140	90.9	278	88.9	247	91.1	411	92.6	427	81.0	754
<150	91.2	279	89.2	248	92.0	415	93.3	430	81.6	760
<160	92.5	283	90.3	251	92.7	418	94.1	434	82.5	768
<170	92.8	284	91.4	254	93.6	422	94.4	435	83.4	776
<180	93.1	285	91.4	254	93.6	422	94.8	437	83.8	780
<190	93.5	286	91.7	255	93.6	422	95.7	441	84.3	785
<200	93.5	286	92.8	258	94.2	425	95.9	442	84.6	788
<220	94.4	289	94.2	262	94.9	428	96.1	443	85.3	794
<240	94.8	290	95.0	264	96.2	434	96.8	446	86.1	802
<260	95.4	292	95.7	266	96.5	435	97.2	448	86.7	807
<280	97.1	297	96.4	268	96.9	437	97.4	449	87.4	814
<300	97.1	297	97.1	270	97.3	439	98.1	452	87.8	817
<350	97.7	299	97.1	270	98.2	443	98.5	454	89.0	829
<400	97.7	299	97.1	270	98.5	444	98.9	456	89.8	836
401 or more	2.3	7	2.9	8	1.6	7	1.1	5	10.2	95
Total Commodities		306		278		451		461		931

**Note:** The % and # refers to the percentage and number of commodities with published export and shipment data, from each year, that fall into the specified range.

The increase in the number of commodities covered over the 1992 to 1996 period is largely due to a change in the application of the confidentiality process for shipments. The first change that occurred was in 1994 where the emphasis was shifted from publishing all possible codes at the 4-digit SIC level to publishing all possible codes for the manufacturing sector as a whole. The second change, in 1996, resulted from recoding all cases where reporting at the aggregated, rollup level instead of the disaggregated reporting level would lead to "nuisance" suppression. As a result, codes with significant value no longer had to be suppressed to avoid residual disclosure.

The first row of the table shows the percentage and number of commodities from each year for which the value of exports to the value of shipments ratio is less than 100%. That is, for which the value of exports is less than the value of shipments, as one would logically expect. The number of codes for which this exports to shipments ratio is greater than 100%, that is, for which exports are greater than shipments and hence for which there is a problem, can be deduced from the table. For example, in 1992, 87.25% of the commodities (267) had exports less than shipments. From this it can be deduced that 12.75% of the commodities (39) were goods with exports greater than shipments.

The table shows that from 1992 to 1995, on average, 86% of the four-digit HS level codes had exports less than shipments. On average, then, 14% of the codes were problem cases with exports greater than shipments. On average, 11% of the codes had exports exceeding shipments in value by 20% or more. In 1996, 25% of the four-digit HS level codes had exports greater than shipments. Twenty one percent of the codes had exports exceeding shipments in value by 20% or more.

The graphs in Appendix A rank the commodities in each year from 1992 to 1996 in terms of by how much exports exceed shipments.

The table and graphs show that the exports greater than shipments problem hindering the integration of shipments and trade data is not insurmountable. The graphs show that most of the problem cases are clustered within the range of exports being greater than shipments by less than 30%. On average from 1992 to 1995 only 10% of the codes had exports greater than shipments by 30% or more. If the extreme cases, where exports are more than 300% greater than shipments, are removed then this number falls to 8%. In 1996, 20% of the codes had exports greater than shipments by 30% or more. Without the extreme cases this number falls to 9%. This implies that with certain adjustments shipments and trade data could be integrated.

Three industry classes dominate the persistent problem cases: the Other Machinery and Equipment Industry, the Other Instruments, Related Products Industry, and the Fish Products Industry.

There are fifty-four HS codes with exports greater than shipments for three or more years between 1992 and 1996. Eleven (20%) of the codes come from SIC 3199 - Other Machinery and Equipment, (NEC) (Major Group 31 - Machinery Industries). Seven (13%) of the codes come from SIC 3912 - Other Instruments, Related Products (Major Group 39 - Other Manufacturing Industries). Five (9%) of the codes come from SIC 1021 - Fish Products Industry (Major Group 10 - Food Industries).

No other industry class has more than two (4%) of the fifty-four above mentioned problem codes.

Of the eleven HS codes from SIC 3199, nine are from HS chapter 84 (Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof). All seven HS codes from SIC 3912 are from HS chapter 90 (Optical, photo-cinematographic, measuring, checking, precision, medico-surgical instruments, apparatus; parts and accessories). Of the five HS codes from SIC 1021, three are from HS chapter 03 (Fish, crustaceans, molluscs and other aquatic invertebrate).

There are fourteen four-digit HS level codes where exports exceed shipments for all five years:

HS Code	Description
0306	Crustaceans, w/n in shell, cooked in water
0307	Molluscs, w/n in shell, aquatic invertebrates
1214	Swedes, mangolds, fodder roots, etc. w/n pelleted
1605	Crustaceans, molluscs & other ... prepared or preserved
2711	Petroleum gases & other gaseous hydrocarbons
8411	Turbo-jets, turbo-propellers & other gas turbines
8454	Converters, ladles, ingot moulds & casting machines
8466	Parts, accessories & special attachments for mach. tools
8479	Machines & mechanical appliances having indiv ftn, n.e.s.
8481	Taps, cocks, valves & similar appliances for pipes, etc.
8529	Parts of transmission, radar, radio or TV apparatus
8702	Public transport type passenger motor vehicles
9027	Instruments & apparatus for physical or chem. analysis
9031	Measuring or checking instruments, appliance & mach.

Of these fourteen cases, two have been resolved. Shipments are less than exports for HS code 0306 (crustaceans, whether or not in shell, cooked in water) because of coverage. Manufacturing shipments data are undervalued because they did not include a large portion of shipments made from small establishments not classified to manufacturing.

Shipments are less than exports for HS code 8702 (Public transport type passenger motor vehicles) because of misclassification. There were establishments whose manufactured shipments were not being included in the ASM but were correctly classified as exports in ITD data. Making adjustments for this raises shipments above exports.

## Quantifying Conceptual Differences

Since shipments data and trade data are derived from different sources with different valuation methods, several adjustments can be applied to make the two data sets more compatible. Adjustments can be made for small establishments, time periods, wholesale manufacturing by wholesale establishments, re-exports, freight, and re-imports. Appendix B provides a more detailed description of these adjustments.

Shipments data does not include commodity detail from small establishments. These shipments are reported on tax forms and short questionnaires. The criteria for differentiating large and small establishments vary by province and are governed by the objective of minimizing the burden on respondents without the loss of a too significant amount of shipment data detail. Shipments from small establishments can be added to commodity shipments to make the data more compatible with exports. In 1996, shipments from small establishments account for an additional 7% of total shipments.

The amounts of these shipments vary by industry and commodity. For example, if there is only one small establishment in the industry, then MCED would report no manufacturing shipments at a commodity detail for that industry even though the establishment may make a significant amount of shipments and exports of a particular commodity.

Shipments data are based on fiscal years that range from ending as early as April 1 of the reference year to as late as March 31 of the following calendar year. As a result, a significant amount of shipments are reported from time periods outside of the reference year. Table 4 in Appendix C provides a summary of the distribution of shipments by reporting periods for each SIC in 1996. Export and import data are based on the January 1 to December 31 calendar year. As a result, shipment data and export data do not align on the same 12-month time period. Adjustments can be made to align shipment data and trade data on the same January 1 to December 31 calendar year. The January 1 to December 31 calendar year was chosen because of its ease of reference and simplicity. This time period is common to both trade and shipments data. Trade data are presented on an annual basis while shipments data are compiled from several possible time periods, depending on the financial year of the establishment. Making adjustments for this increases shipments by up to 9%.

In addition to shipments reported by manufacturers in the ASM, establishments classified outside of the manufacturing sector, such as in the fishery, agricultural, and wholesale sectors, also make shipments. In the fishery and agricultural sector these statistics are available from various sources such as the Department of Fisheries and Oceans and the Agriculture Division at Statistics Canada. The final destination or the markets (retail, wholesale, exports) for shipments originating from these two sectors are not available. The principal source for data from the wholesale sector is the Annual Wholesale and Retail Trade Survey (AWRTS) compiled by the Distributive Trades Division and published in the Wholesaling and Retailing in Canada publication. Summary statistics using the SIC system are available. Commodity detail is not provided for these shipments.

Since the establishments manufacturing these goods are not classified in the manufacturing sector, their shipments are not included in MCED manufacturing shipments. As a result, their shipments can be added to manufacturing sector shipments. The following table summarizes the impact these shipments can have on total manufacturing shipments. Manufacturing shipments from the wholesale sector usually add 2 to 3 % to total shipments but the amounts vary by industry.

**Table 2 Wholesale Sector Shipments of Goods of Own Manufacture**

Year	Wholesale Sector Shipments (\$millions)	Percentage of total manufacturing shipments (%)
1993	6 477	2.09
1994	7 551	2.14
1995	12 273	3.10

The ASM reports shipments of commodities that are manufactured domestically. Therefore, these shipments should be compared with domestic exports. Hence re-exports need to be removed from total exports when comparing shipments and trade data. Re-exports amounted to approximately 6% of total exports in 1995 and 1996.

ITD valuation of export figures includes freight to the Canadian border. This is not included in shipments data. Hence, adjustments made for inland freight, available from ITD, should be made to exports data. Estimates may be used in determining the freight value. The adjustment for freight varies by commodity and ranges from 0.0006% of exports to as high as 30% of exports (HS 4004 (waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom)).

Finally, in some cases there are imports into Canada of commodities of Canadian origin where the value added outside the country was not sufficient to change the origin of the commodity (re-imports). These figures can be added to shipments. Re-imports range from 1 to 2 % annually.

The potential impact of the above adjustments on lowering the export to shipment ratio varies depending on the commodity. Typically, the above adjustments could lower the export to shipment ratio by up to 30%.

It is also worth noting the level of estimation in the shipments data. This quantifies the proportion of the shipment value that was contributed by an estimate rather than a reported figure. As mentioned earlier, there are three possible levels of estimation for each code:

- 0-30%    less than 30% of the shipment value was contributed by an estimate rather than a reported figure.  
          This is the lowest level of estimation.
  
- 31-60%    between 31 and 60% of the shipment value was contributed by an estimate rather than a reported figure.
  
- 61-100%    over 61% of the shipment value was contributed by an estimate rather than a reported figure.  
          This is the highest level of estimation.

Annually, there is a lower percentage of problem cases with estimations at the lowest level (0-30%) than the non-problem cases. Also, there is a higher percentage of problem cases with estimations at the highest level (61-100%) than the non-problem cases.

The level of estimation does not necessarily reflect the level of accuracy of the data. It does, however, permit the analyst to treat certain data with more confidence and others with more caution.

Appendix B includes a sample consisting of three commodities where the above adjustments are applied to illustrate the potential impact they can have.

The following table summarizes adjustments that should be made to integrate shipments and export data:

Table 3 **Shipments/Exports Reconciliation (within a 4 digit HS)**

**Detailed Adjustment formula**

<i>Shipments</i>	<i>Exports</i>
<b>Starting point: Value of a good produced by a Canadian manufacturer (from ASM)</b>	<b>Starting point: Value of an exported good</b>
<b>ASM data adjustments</b>	<b>Trade data adjustments</b>
+undercoverage adjustment	+undercoverage adjustment
+allocated shipments coded to miscellaneous(999)	-re-exports
+ time period adjustment (calendarisation)	- freight
-double processing of primary goods(e.g., by metal fabricators)	-re-import price
+/-known classification errors	+/-known classification errors
+/-known transfer price differences	+/-known transfer price differences
+other known adjustments	+other known adjustments
<b>=adjusted manufacturing shipments</b>	
<b>Non-manufacturing adjustments:</b>	
+ goods produced by Canadian wholesaling establishments	
<b>= Adjusted value of shipments by Canadian manufacturers</b>	<b>= Adjusted value of exports</b>

**Remaining Differences**

In addition, there are differences that remain between shipments and trade data. Remaining differences include:

Classification differences

Processing differences

Wholesalers' markup: Establishments that export what they purchase from a manufacturer may markup the sale price of the exports. This will inflate the value of exports over the value reported in shipments.

Goods produced by agricultural or fishery establishments: Statistics are available from various sources such as the Department of Fisheries and Oceans and the Agriculture Division at Statistics Canada.

Goods produced by mining establishments: Statistics are available from Natural Resources Canada.

Modeling imprecisions (e.g., trade/exports concordance, ASM undercoverage adjustments)

ITD & MCED undercoverage differences

Non-sampling errors.

## **CONCLUSIONS AND RECOMMENDATIONS:**

Although it is useful to integrate shipments and trade data, for reasons such as estimating the domestic market for a commodity, because the data are derived from different sources, they are not fully compatible. In some cases, the illogical situation of exports exceeding shipments is found. An analysis done on a value basis shows that the persistent problem cases are mainly found in the Other Machinery and Equipment Industry, the Other Instruments, Related Products Industry, and in the Fish Products Industry.

In general, the adjustments and cautions described above can be made to account for the conceptual differences found in the collection of shipments and trade data, thereby increasing the reliability of integrating the two sets of data.

Therefore it is recommended that shipments and trade data can be integrated but the adjustments and cautions described above should be taken to ensure correct usage of the data. Since these adjustments vary by commodity and are computationally intensive, it is most feasible to make adjustments on a per commodity basis, as required. Given that undertaking this work would constitute a private rather than a public good, expenses associated with this customized service should be borne by the user.

In certain extreme cases, where the value of exports are substantially higher than the value of shipments, these adjustments are not likely to be large enough to correct the exports greater than shipments problem. In such cases, further investigation is necessary.

It is recommended that an analysis could be done on a quantity basis to further specify the problem.



Finally, because changes in exports can be used to indicate changes in manufacturing shipments and vice versa, it is recommended that MCED and ITD could use changes in trade and shipments volume as a signal to adjust their respective commodity coverage. For example, if ITD shows exports as increasing rapidly for a particular commodity, this could be used by MCED as a signal to examine the industry from which the commodity is classified and to possibly increase or modify the ASM commodity coverage in that industry.

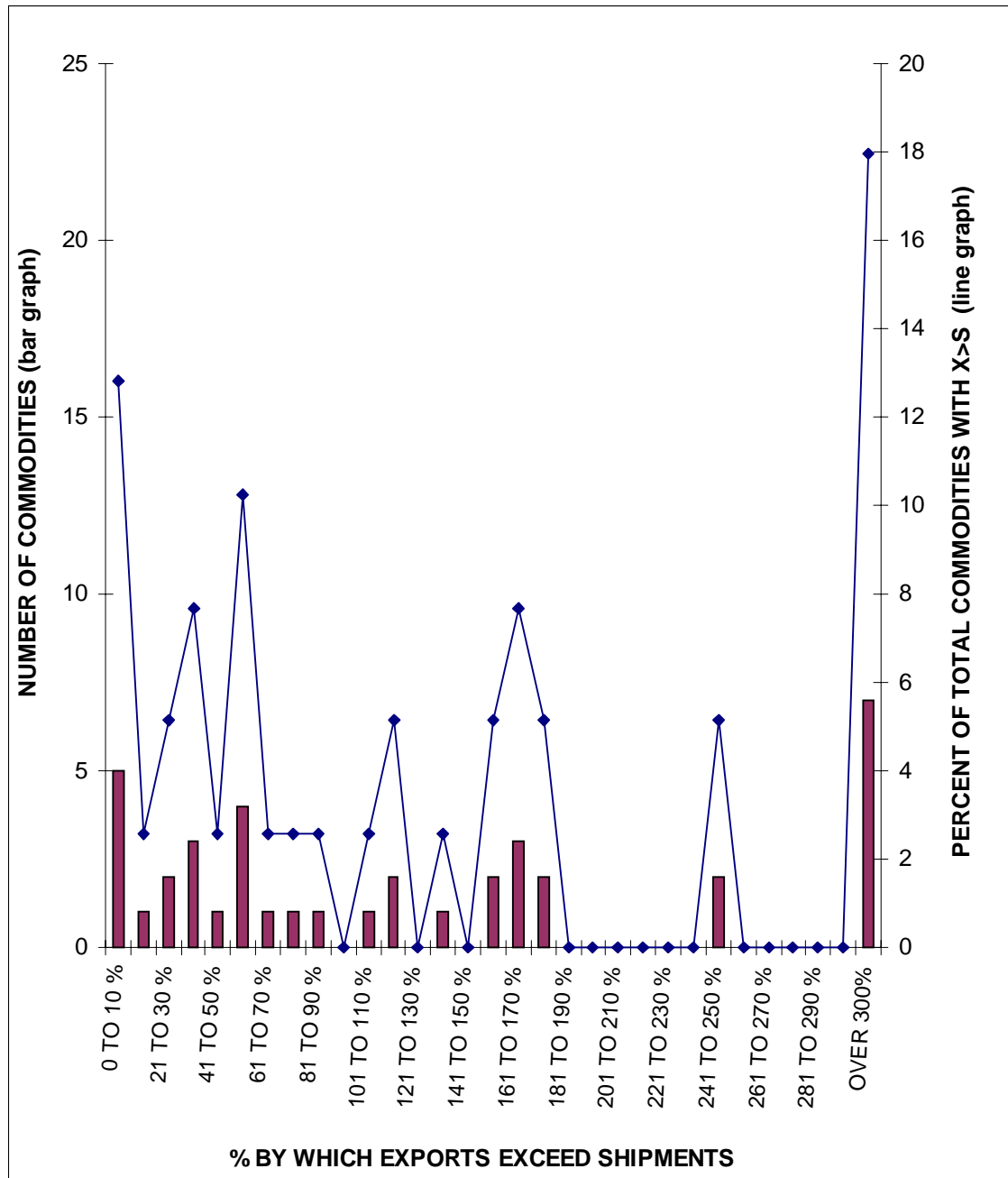
To avoid major revisions, monitoring the export to shipment ratio could be part of the annual review of the data by both MCED and ITD. The two divisions could examine establishments that are both exporters and manufactures to check for consistency in reporting of exports and shipments and to cooperatively contribute to the source and correction of any apparent problems. This should be done as soon as possible so that modifications can be made quickly and when hard copy records containing comments are still available.

# Appendix A

## COMMODITIES (4-digit HS level) WHERE EXPORTS ARE GREATER THAN SHIPMENTS, 1992

TOTAL NUMBER OF COMMODITIES WITH EXPORTS LESS THAN SHIPMENTS: 267 87.3%

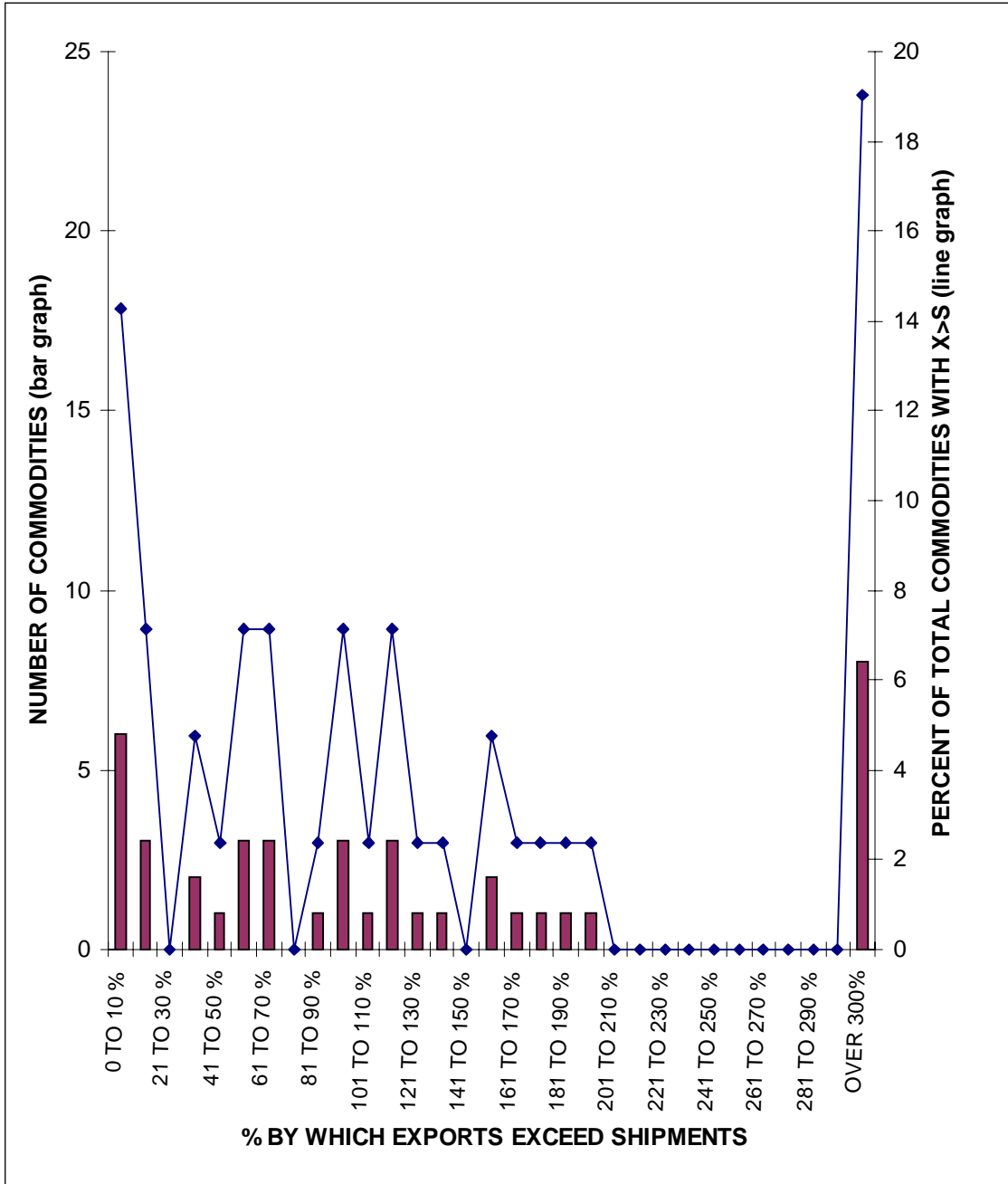
TOTAL NUMBER OF COMMODITIES WITH EXPORTS GREATER THAN SHIPMENTS: 39 12.7%



## COMMODITIES (4-digit HS level) WHERE EXPORTS ARE GREATER THAN SHIPMENTS, 1993

TOTAL NUMBER OF COMMODITIES WITH EXPORTS LESS THAN SHIPMENTS:                   236     84.9%

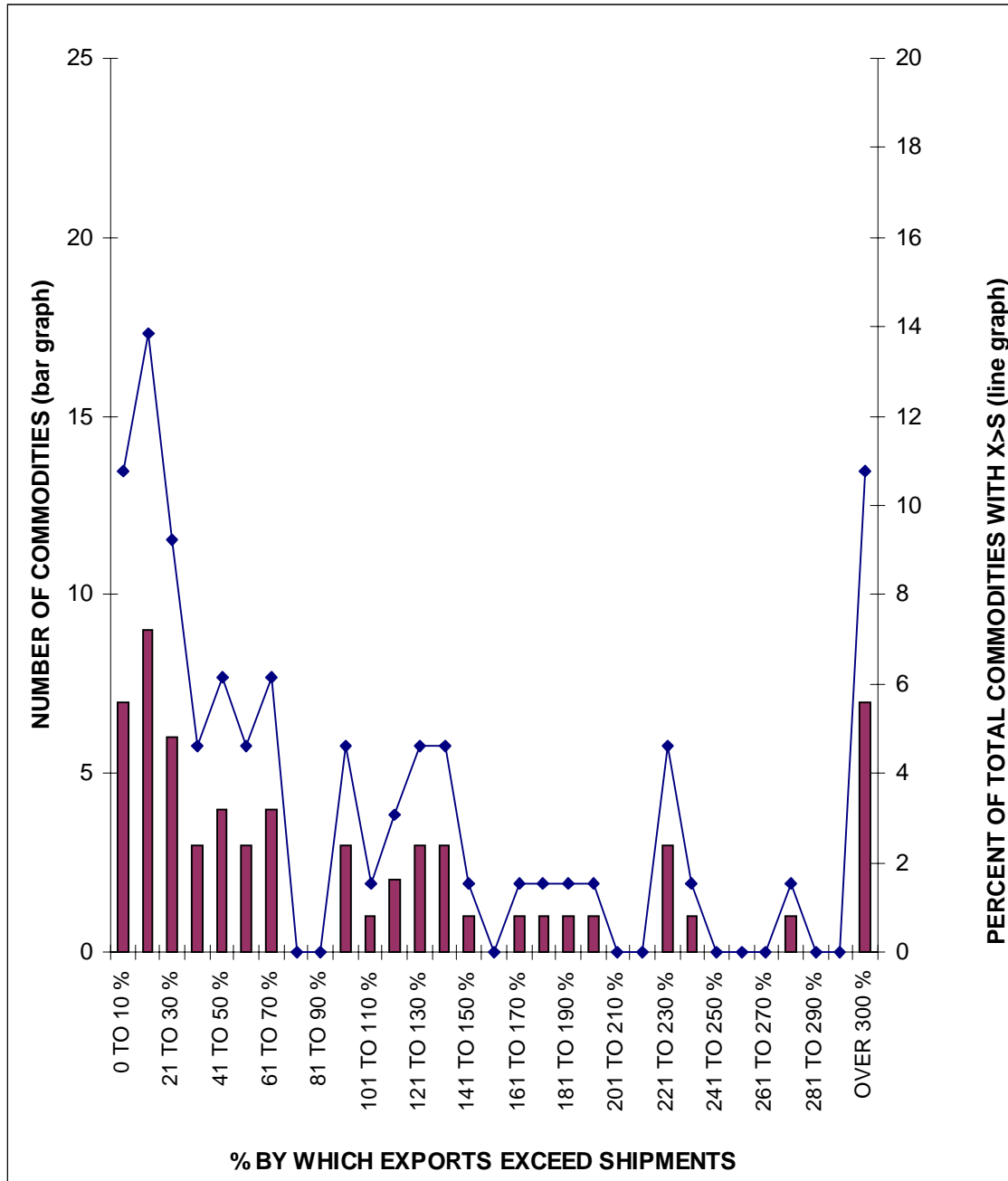
TOTAL NUMBER OF COMMODITIES WITH EXPORTS GREATER THAN SHIPMENTS:                   42     15.1%



## COMMODITIES (4-digit HS level) WHERE EXPORTS ARE GREATER THAN SHIPMENTS, 1994

TOTAL NUMBER OF COMMODITIES WITH EXPORTS LESS THAN SHIPMENTS:                   386     85.6%

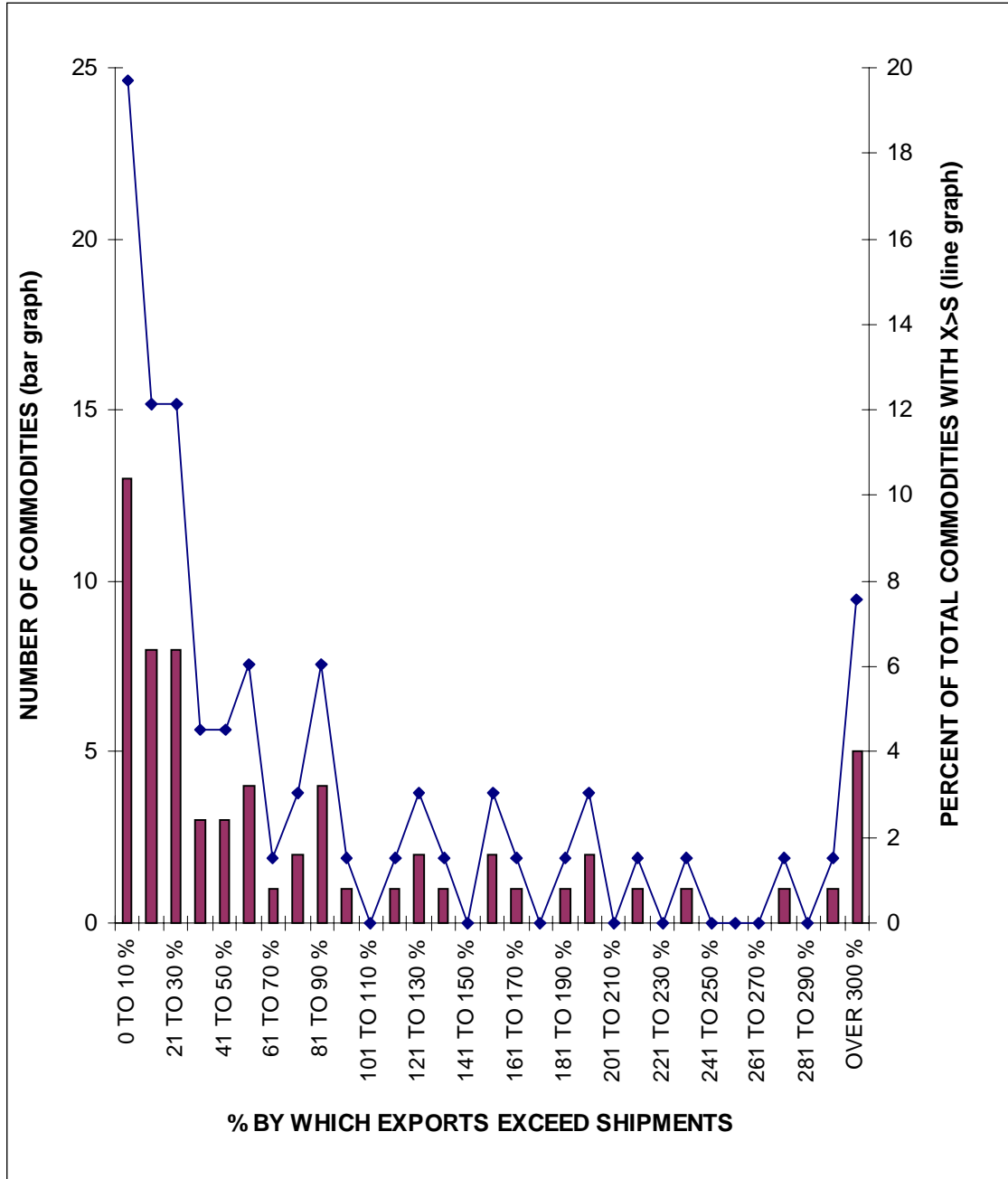
TOTAL NUMBER OF COMMODITIES WITH EXPORTS GREATER THAN SHIPMENTS:                   65     14.4%



## COMMODITIES (4-digit HS level) WHERE EXPORTS ARE GREATER THAN SHIPMENTS, 1995

TOTAL NUMBER OF COMMODITIES WITH EXPORTS LESS THAN SHIPMENTS:                   395     85.7%

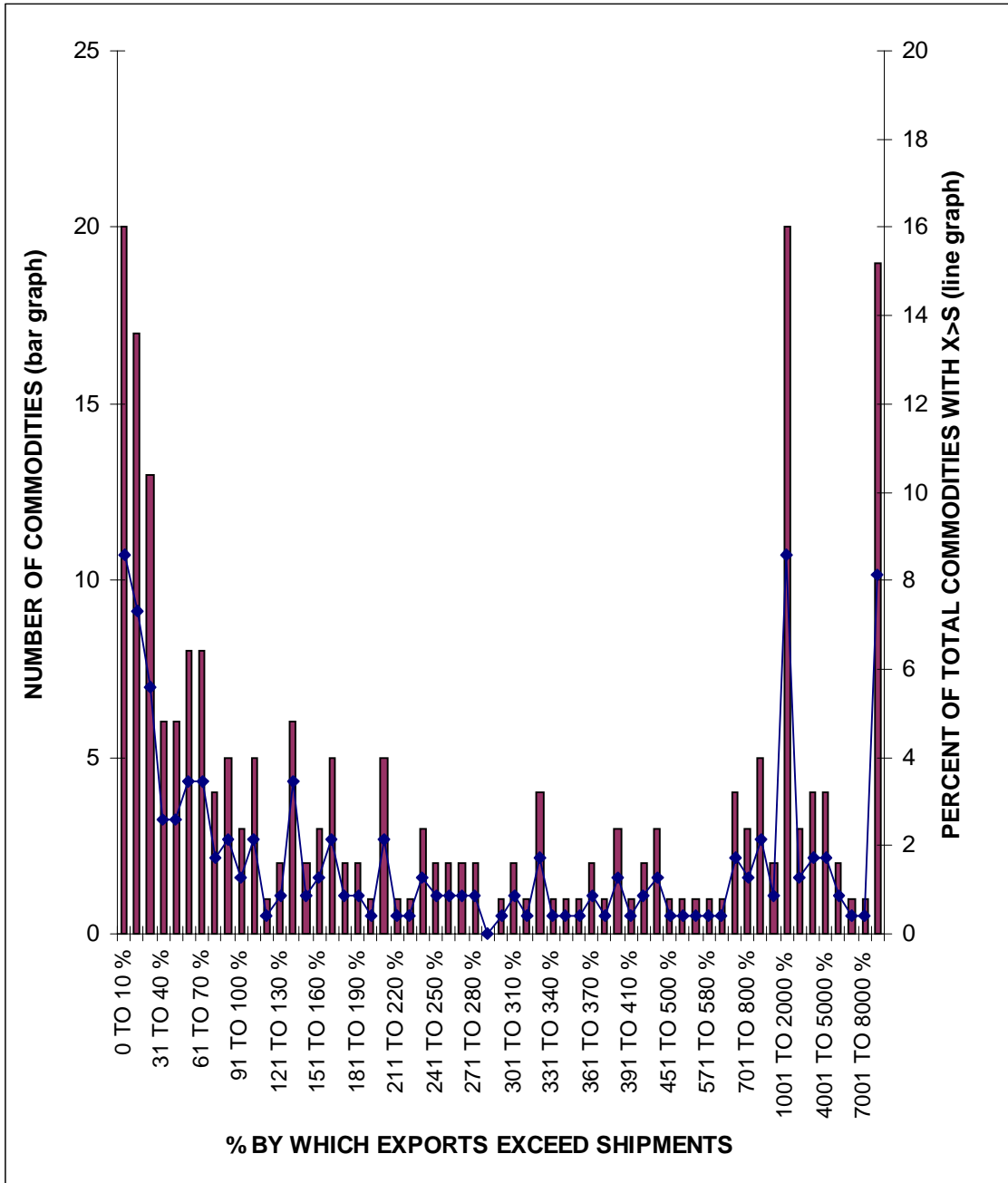
TOTAL NUMBER OF COMMODITIES WITH EXPORTS GREATER THAN SHIPMENTS:           66     14.3%



**COMMODITIES (4-digit HS level) WHERE EXPORTS  
ARE GREATER THAN SHIPMENTS, 1996**

TOTAL NUMBER OF COMMODITIES WITH EXPORTS LESS THAN SHIPMENTS:                   698           75%

TOTAL NUMBER OF COMMODITIES WITH EXPORTS GREATER THAN SHIPMENTS:           233           25%



# Appendix B

## Applying the Adjustments

The above adjustments were applied to three commodities for the 1996 year. The following describes the specifics of the adjustments.

The small establishments' adjustment was calculated by multiplying the total small establishments' shipments value for an industry by the proportion of the large establishments' shipments value that was allocated to the HS commodity code. That is, the same proportion of the large establishments' shipments that was allocated to the HS commodity code was taken from the small establishments' shipments value and allocated to the HS commodity code.

The time period adjustments were made to each industry and then allocated proportionally to the HS commodity code. Time period adjustments were done for the 1995 year because doing the adjustments for the 1996 year would require 1997 shipments data which were not available at the time this paper was written. Because reporting periods in the ASM tend to be similar each year; it is not expected that there would be significant differences in the results between 1996 and 1995 adjustments. The time period adjustments were made as follows:

Shipments from the year in question (1995) that were derived from time that fell in the previous year (1994) were replaced with the corresponding shipments from the following year (1996) of the year in question.

Similarly, the shipments from the year in question that were derived from time that fell in the following year (1996) were replaced with the corresponding shipments from the previous year (1994) of the year in question.

For example, the shipments from the 1995 ASM that were derived from time that fell in 1994 were replaced with the corresponding shipments from the 1996 ASMs.

Similarly, the shipments from the 1995 ASM that were derived from time that fell in 1996 were replaced with the corresponding shipments from the 1994 ASMs.

Note: Only the portion of the shipments that fell in the preceding or following years (not all of the shipments in the time period) were adjusted so to avoid replacing shipments from the year in question with shipments from outside of the year in question.

The following timeline provides a graphic depiction of the time period adjustments.

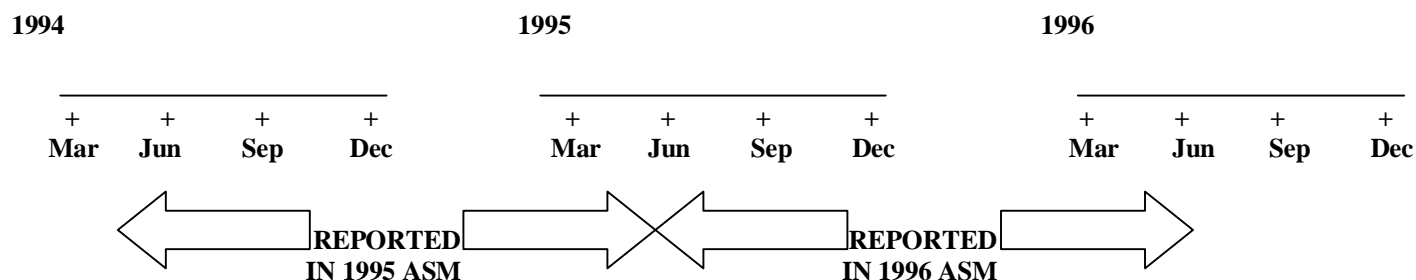
**Trade data for a given year, say 1995, are based on the January 1, 1995 to December 31, 1995 calendar year.**

Manufacturing shipments data for a given year, say 1995, are based on shipments from establishments whose financial year ends any where between April 1, 1995 and March 31, 1996.

This means that each establishment reporting manufacturing shipments can have a different financial year end. As long as their financial year ends between April 1, 1995 and March 31, 1996 their shipments are reported as 1995 manufacturing shipments.

Thus, in extreme cases, manufacturing shipments from establishments whose financial year ends on April 1, 1995 would have all their shipments reported as 1995 shipments even though only 25% of their reporting period falls in 1995 and 75% falls in 1994. For these establishments, their shipments made during the remaining 75% of 1995 are reported as 1996 shipments. Note: In most cases, the earliest financial year end reported by an establishment is April 30 of the reference year.

**EXAMPLE OF ADJUSTMENTS MADE:**



SIC 3913: 1995 total shipments are reported as \$34 305 000  
 1996 total shipments are reported as \$39 300 000

For this particular SIC, 75.9% of the reported 1995 total shipments are from establishments whose financial year ends on April 30, 1995. These shipments are all reported as 1995 manufacturing shipments, even though two thirds of this time period falls in 1994.

The remaining 24.1% (100-75.9%) of shipments are made from other time periods from within the acceptable range of ending as early as April 1 of the reference year (1995) to as late as March 31 of the following calendar year (1996).



*ADJUSTMENTS MADE:*

The total shipments value from establishments whose financial year ends on April 30, 1995 is \$26 037 495 (75.9%\*\$34 305 000).

Because 8 months of this time period is from 1994, assuming an equal proportion of shipments per month, \$17 358 330 (8/12\*\$26 037 495) are shipments actually made in 1994.

For these establishments, only 4 months of shipments, whose value is \$8 679 165 (4/12\*\$26 037 495), are actually made in 1995. The remaining 8 months of 1995 shipments are actually reported in 1996.

*ADJUSTMENTS*

The 4 months of 1995 shipments are kept.

The 8 months of shipments from 1994 (\$17 358 330) are removed from the 1995 reported total shipments value (\$26 037 495) for these establishments. They are replaced with the 8 months of shipments from 1995 that are reported in the 1996 shipments figures (\$19 885 800; 8/12\*75.9%\*\$39 300 000).

*NET ADJUSTMENT*

\$26 037 495
- \$17 358 330
<u>+ \$19 885 800</u>
\$28 564 965

The total shipments value from establishments whose financial year ends on April 30, 1995 (\$26 037 495) is replaced with \$28 564 965. From this adjustment, total 1995 SIC 3913 shipments increases as follows:

\$34 305 000
- \$26 037 495
<u>+ \$28 564 965</u>

\$36 832 470 which is a 7.4% increase in the reported 1995 total shipments for SIC 3913.

Similar adjustments are made for the remaining 24.1% of shipments.

The only time period that would not be adjusted would be the one whose reporting period is January 1 to December 31

As a result, making adjustments for time periods will have the largest effect if a large percentage of shipments are from outside the year in question and, since these shipments are being replaced by shipments from the following and preceding years, if there is a large increase in shipments from the year in question to the following year and a large increase in shipments from the year in question to the preceding year.

On the following page is an example of how the time period adjustments were calculated.

Freight was removed from exports using data from ITD.

Sales of goods of own manufacture (shipments) from wholesalers were obtained from trade groups that most closely matched the industry class from which the HS commodity code is derived. These shipments were proportionally added to the HS commodity code.

It is most feasible to make the above adjustments on a per commodity basis for two reasons. First, the adjustments can vary considerably depending on the commodity. Secondly, the adjustments are computationally intensive. In particular, due to data limitations, the small establishments, time periods, and wholesaling manufacturing shipments adjustments involve making adjustments to SIC industry classes first and then allocating shipments proportionally to the more specific HS commodity codes. Since the shipments classified into each HS commodity code can be derived from several different industry classes it would be extremely computationally intense to make adjustments to all the HS commodity codes. It is more feasible to make adjustments on a per commodity basis as required.

**DATA SUMMARY: SIC 3092  
1995 ASM**

Assume equal proportion of shipments per month																
FOR FISCAL	# OF	# OF	# OF	%	%	%	% OF	TAKE %	% OF	REMOVE %	ADD %	% OF	REMOVE %	ADD %		
YEAR	% OF	MONTH	MONTH	MONTH	OF	OF	OF	SHPMNT	FROM	SHPMNT	FROM	1995	FROM	SHPMNT	FROM	
ENDING	SHPMNT	IN 1995	IN 1994	IN 1996	YEAR	YEAR	YEAR	FROM	1995	FROM	ASMs	\$392	ASMs	FROM	ASMs	
					FROM	FROM	FROM	FROM	ASMs	FROM	(millions)	(millions)	(millions)	FROM	FROM	
					1995	1994	1996	1995	\$2,392	1994				\$392	\$349	
									(millions)		(millions)	(millions)		(millions)	(millions)	
Dec. 31, 1995	63.8	12	0	0	100.00	0.00	0.00	63.80	249.84	0.00		0.00	0.00	0.00	0.00	0.00
Nov. 31, 1995	7.59	11	1	0	91.67	8.33	0.00	6.96	27.25	0.63		2.48	2.80	0.00	0.00	0.00
Oct. 31, 1995	3.36	10	2	0	83.33	16.67	0.00	2.80	10.96	0.56		2.19	2.48	0.00	0.00	0.00
Jan. 31, 1996	1.12	11	0	1	91.67	0.00	8.33	1.03	4.02	0.00		0.00	0.00	0.09	0.37	0.33
Feb. 28, 1996	0.8	10	0	2	83.33	0.00	16.67	0.67	2.61	0.00		0.00	0.00	0.13	0.52	0.46
Mar. 31, 1996	0.78	9	0	3	75.00	0.00	25.00	0.59	2.29	0.00		0.00	0.00	0.20	0.76	0.68
Apr. 30, 1995	2.83	4	8	0	33.33	66.67	0.00	0.94	3.69	1.89		7.39	8.35	0.00	0.00	0.00
May. 31, 1995	0.82	5	7	0	41.67	58.33	0.00	0.34	1.34	0.48		1.87	2.12	0.00	0.00	0.00
June 31, 1995	6.17	6	6	0	50.00	50.00	0.00	3.09	12.08	3.09		12.08	13.65	0.00	0.00	0.00
July. 31, 1995	3.43	7	5	0	58.33	41.67	0.00	2.00	7.84	1.43		5.60	6.32	0.00	0.00	0.00
Aug. 31, 1995	2.71	8	4	0	66.67	33.33	0.00	1.81	7.07	0.90		3.54	4.00	0.00	0.00	0.00
Sep. 31, 1995	6.58	9	3	0	75.00	25.00	0.00	4.94	19.33	1.65		6.44	7.28	0.00	0.00	0.00
SUM	99.99				850	300	50	88.95		10.62				0.42		
							99.99		348.32			-41.59	46.99		-1.65	1.47

DATA SUMMARY:

ADJUSTED 1995 ASM	396.78	39160.00	
SHIPMENTS:			
% INCREASE:	1.32	0.00	391.56

The following adjustments were made:

The shipments from the 1995 ASMs that were derived from time that fell in 1994 were replaced  
With the corresponding shipments from the 1996 ASMs.

Similarly, the shipments from the 1995 ASMs that were derived from time that fell in 1996 were  
Replaced with the corresponding shipments from the 1994 ASMs.

As a result of the above adjustments, 1995 total shipments for SIC 3092 increase by 1.32 percent.

This increase was applied to the portion of shipments from the HS commodity codes that were derived from SIC 3092 shipments.

**Applying the Adjustments:**

The adjustments were applied to the following commodities for the 1996 year: HS 8479, HS 8481, and HS 8702.

Exports are greater than shipments for all three codes in each year from 1992 to 1996.

HS 8479 includes machines and mechanical appliances having individual functions, not elsewhere specified. The average exports to shipments ratio for this code over the 1992 to 1996 period is 130%.

The following summarizes the results of the adjustments made on this code:

HS		1996			
<b>8479</b>		(\$000 000)			
<b>Before Adjustments</b>					
Total exports	Shipments	Exports/Shipments (%)			
609	485	126			
<b>Adjustments</b>					
<u>Exports adjustments</u>					
Total exports	(-) Re-exports	(-) Freight	(=) Adjusted Exports		
609	46	3	560		
<u>Shipments Adjustments</u>					
Shipments	(+) Re-imports	(+) Small establishment	(+) Time period	(+) Wholesale Manufacturing	(=) Adjusted Shipments
485	2	89	2	18	595
<b>After Adjustments</b>					
Total exports	Shipments	Exports/Shipments (%)			
560	595	94			
<b>The exports to shipments ratio falls from 126% to 94%</b>					

The calculations for the small establishments and time periods adjustments are described as follows:

HS8479 (\$000 000)				SMALL EST.	TIME PERIOD	TIME PERIOD
<u>SIC</u>	<u>VALUE</u>	<u>TOTAL LONG</u>	<u>TOTAL SMALL</u>	<u>ADJUSTMENT</u>	<u>ADJUSTMENT</u>	<u>ADJUSTMENT</u>
		<u>SIC SHIPMENTS</u>	<u>SIC SHIPMENTS</u>	<u>ADD TO HS 8479</u>	<u>TO SIC (%)</u>	<u>ADD TO HS 8479</u>
1599	0.4	1747.0	224.2	0.1	0.8	0.0
1699	0.9	4658.9	869.0	0.2	1.7	0.0
3021	2.3	453.4	82.7	0.4	0.6	0.0
3022	0.6	239.7	44.1	0.1	1.6	0.0
3039	1.2	731.2	157.3	0.3	2.1	0.0
3049	2.0	2191.7	462.6	0.4	0.9	0.0
3062	15.5	1359.9	304.5	3.5	0.7	0.1
3071	0.6	572.5	105.0	0.1	0.2	0.0
3081	23.1	2157.4	534.0	5.7	1.7	0.4
3092	0.7	395.6	46.8	0.1	1.3	0.0
3099	2.6	1505.6	322.3	0.6	0.5	0.0
3111	2.3	1803.8	226.8	0.3	0.9	0.0
3121	4.1	447.9	87.3	0.8	1.3	0.1
3191	15.8	1041.7	119.6	1.8	1.5	0.2
3192	12.8	3671.6	734.4	2.6	0.8	0.1
3199	355.5	5056.7	979.7	68.9	0.3	1.1
3211	0.2	7768.8	294.9	0.0	2.0	0.0
3259	0.2	6967.7	486.2	0.0	0.3	0.0
3281	4.1	426.8	50.1	0.5	1.1	0.0
3311	0.9	374.6	48.4	0.1	1.7	0.0
3321	32.9	861.7	31.9	1.2	-0.5	-0.2
3352	0.1	5342.8	384.6	0.0	1.6	0.0
3379	0.1	822.5	162.9	0.0	0.5	0.0
3399	0.3	679.7	90.6	0.0	2.4	0.0
3549	0.2	377.1	81.0	0.0	-0.4	0.0
3699	0.1	399.7	33.1	0.0	1.3	0.0
3912	4.5	1126.1	201.7	0.8	1.2	0.1
3991	0.7	107.5	13.8	0.1	1.1	0.0
TOTAL	485			89		2

The small establishments' adjustment was calculated by multiplying the total small establishments' shipments value for an industry by the proportion of the large establishments' shipments value that was allocated to the HS commodity code. That is, the same proportion of the large establishments' shipments value that was allocated to the HS commodity code was taken from the small establishments' shipments value and allocated to the HS commodity code.

After applying the adjustments to the 1996 data, the exports to shipments ratio for this code falls from 126% to 94%.

HS 8481 includes taps, cocks, valves and similar appliances for pipes, boiler shells, tanks, vats or similar. The average exports to shipments ratio for this code over the 1992 to 1996 period is 118%.

The following summarizes the results of the adjustments made on this code:

<b>HS 8481</b>		<b>1996</b>	
(\$000 000)			
<b>Before Adjustments</b>			
Total exports		Shipments	Exports/Shipments (%)
629		461	137
<b>Adjustments</b>			
<u>Exports Adjustments</u>			
Total exports	(-)	Re-exports	(-) Freight (=) Adjusted exports
629		56	6 568
<u>Shipments Adjustments</u>			
Shipments	(+)	Re-imports	Small Establishments (+) Time Period (+) Wholesale Manufacturing (=) Adjusted Shipments
461		6	67 6 64 603
<b>After Adjustments</b>			
Total exports		Shipments	Exports/Shipments (%)
568		603	94
<b>The exports to shipments ratio falls from 137% to 94%</b>			

The calculations for the small establishments and time periods adjustments are described as follows:

**HS8481** (\$000 000)

	HS8481	TOTAL LONG	TOTAL SMALL	SMALL EST. ADJUSTMENT	TIME PERIOD ADJUSTMEN T	TIME PERIOD ADJUSTMENT
SIC	VALUE	SIC SHIPMENTS	SIC SHIPMENTS	ADD TO HS 8481	TO SIC (%)	ADD TO HS 8481
1599	0.7	1747.0	224.2	0.1	0.8	0.0
1621	1.2	623.1	88.0	0.2	1.5	0.0
1699	8.8	4658.9	869.0	1.6	1.7	0.2
2941	6.4	914.1	136.5	1.0	-0.8	-0.1
3049	0.3	2191.7	462.6	0.1	0.9	0.0
3062	0.3	1359.9	304.5	0.1	0.7	0.0
3081	16.5	2157.4	534.0	4.1	1.7	0.3
3091	59.2	199.8	51.6	15.3	1.0	0.6
3092	342.5	395.6	46.8	40.6	1.3	4.5
3099	5.9	1505.6	322.3	1.3	0.5	0.0
3191	6.6	1041.7	119.6	0.8	1.5	0.1
3192	8.4	3671.6	734.4	1.7	0.8	0.1
3199	0.5	5056.7	979.7	0.1	0.3	0.0
3211	1.0	7768.8	294.9	0.0	2.0	0.0
3359	1.3	2689.8	313.5	0.2	1.4	0.0
3372	0.6	816.9	154.5	0.1	0.9	0.0
3911	0.5	1093.1	214.4	0.1	0.8	0.0
TOTAL	461			67		6

The small establishments' adjustment was calculated by multiplying the total small establishments' shipments value for an industry by the proportion of the large establishments' shipments value that was allocated to the HS commodity code. That is, the same proportion of the large establishments' shipments value that was allocated to the HS commodity code was taken from the small establishments' shipments value and allocated to the HS commodity code.

After applying the adjustments to the 1996 data, the exports to shipments ratio for this code falls from 137% to 94%.



HS 8702 includes public transport type passenger motor vehicles. The average exports to shipments ratio for this code over the 1992 to 1996 period is 186%.

The following summarizes the results of the adjustments made on this code:

HS		1996			
<b>8702</b>		(\$000 000)			
<b>Before Adjustments</b>					
Total exports	Shipments	Exports/Shipments (%)			
1010	1004	101			
<b>Adjustments</b>					
<u>Exports adjustments</u>					
Total exports	(-) Re-exports	(-) Freight	(=) Adjusted Exports		
1010	1	6	1003		
<u>Shipments Adjustments</u>					
Shipments	(+) Re-imports	(+) Small establishment	(+) Time period	(+) Wholesale Manufacturing	(=) Adjusted Shipments
1004	1	0	-4	23	1025
<b>After Adjustments</b>					
Total exports	Shipments	Exports/Shipments (%)			
1003	1025	98			
<b>The exports to shipments ratio falls from 101% to 98%</b>					

The calculations for the small establishments and time periods adjustments are described as follows:

**HS8702** (\$000 000)

<u>SIC</u>	<u>HS8702 VALUE</u>	<u>TOTAL LONG SIC SHIPMENTS</u>	<u>TOTAL SMALL SIC SHIPMENTS</u>	<u>SMALL EST. ADJUSTMENT ADD TO HS 8702</u>	<u>TIME PERIOD ADJUSTMENT TO SIC (%)</u>	<u>TIME PERIOD ADJUSTMENT ADD TO HS 8702</u>
3231	1004.5	47902.0	0.0	0.0	-0.4	-3.9
<b>TOTAL</b>	1004			0		-4

The small establishments' adjustment was calculated by multiplying the total small establishments' shipments value for an industry by the proportion of the large establishments' shipments value that was allocated to the HS commodity code. That is, the same proportion of the large establishments' shipments value that was allocated to the HS commodity code was taken from the small establishments' shipments value and allocated to the HS commodity code.

After applying the adjustments to the 1996 data, the exports to shipments ratio for this code falls from 101% to 98%.

In all three cases, after the adjustments shipments are larger than exports, as it should be. This indicates that with certain adjustments it is possible to accurately integrate shipments and trade data.