**UNITED
NATIONS**

E

Economic and Social Council

Distr.
GENERAL

ECE/CES/GE.20/2008/18
11 April 2008

ENGLISH ONLY

ECONOMIC COMMISSION FOR EUROPE

CONFERENCE OF EUROPEAN STATISTICIANS

Joint UNECE/Eurostat/OECD Meeting on National Accounts

Ninth Meeting
Geneva, 21-24 April 2008
Items 7 and 8 of the provisional agenda

**GOODS SENT ABROAD FOR PROCESSING.
IMPLICATIONS OF THE NEW TREATMENT OF GOODS FOR PROCESSING IN
THE SUPPLY AND USE TABLES**

CHANGING THE TREATMENT OF 'GOODS SENT ABROAD FOR PROCESSING':
THE PRACTICAL AND ANALYTICAL IMPACT ON THE CANADIAN SNA
PRODUCTION ACCOUNTS

Note by Statistics Canada[1]

Summary

The Revision 1 of 1993 SNA recommends not attributing a change of ownership to goods exported for processing except under well-specified circumstances, a treatment consistent with BPM5. The paper examines this change of treatment from the vantage point of a country with a large international trade sector, where outsourcing is most likely present in both directions but difficult to measure, and where input-output tables serve both as a benchmarks to its GDP (in current and constant prices) and as the basis for widely-used analytical models, productivity measures and other structural indicators. The paper outlines the impact of the existing treatment on industry and trade statistics and how it affects the measures derived from them such as input-output models, multifactor productivity indices, and other structural indicators. Second, it presents a summary of changes that need to be implemented at both the data-collection level and statistical estimation stage. The paper also suggests some of the benefits and some of the drawbacks that can be expected for supply and use tables. Finally, the paper outlines how the new treatment impacts the analytical roles that are traditionally associated with input-output tables.

I.   INTRODUCTION

1.   A number of powerful trends such as trade liberalization and advances in production technology have spurred significant growth in 'goods sent abroad for processing' in recent years. In Canada, enterprises that process electronic components on contract for foreign firms have existed for some years, and there is anecdotal evidence that some Canadian enterprises are engaging foreign units to process their goods on a contractual basis. This trend has far-reaching implications for the pattern of international trade and production, and far-reaching impacts on statistical systems that attempt to properly capture and measure the emerging pattern. These factors also impact the configuration of domestic production and trade, but the international case is a more urgent and problematic issue, and this is why it received particular attention in the revisions recommended by the Advisory Expert Group on the update of the 1993 System of National Accounts (SNA)[2].

2.   For SNA and Balance of Payments (BPM) purposes, "goods sent abroad for processing" refers to a well specified situation, namely, when raw or semi-processed goods are sent by a (client) unit in country A to another (processing) unit in country B, where they are transformed in a substantive way and then retuned to the original unit in country A while the unit maintains legal ownership of the processed goods (see Harrison, et. al, p. 5). Other similar patterns also pose issues for SNA and BPM, but do not fall under the 'goods sent abroad for processing' definition, and are not discussed here. For instance, the unit in country A may have its goods processed by a unit in B, but then sells the goods to another unit in the same country (B) without repatriating them back to A. Similarly, if the processed goods were sold to another unit in a third country, C, without returning to country A, the practice would not fall under 'goods sent abroad for processing'.

3.   The practice of 'goods sent for processing' gives rise to two polar cases that will be dealt with separately in the paper: the client case and the processor case. In the client case in Canada, a producing unit (the client) sends goods that it owns to another unit to be processed. In the most general case, these are semi-processed goods of the client's own manufacture. Once the goods are processed, they are returned to the client unit, where they may be further processed and sold by the client in the domestic market. The client pays a fee to the processor for the services provided. In the processor case in Canada, a producing unit receives goods belonging to a client and, in return for a processing fee, transforms the goods using its own primary inputs before sending them back to the client for further processing and sale by the client.

II.   BACKGROUND

4.   The revisions to the 1993 SNA and BPM revolve around the question of whether a change of ownership of the goods should be attributed to the processing unit in country B when goods move there from the unit in country A, and once again attributed to the processed goods when they are shipped back to the original unit in country A. The revisions were, at least in part,

---

[2] See "The Recommendations Made by the Advisory Expert Group for the Update of the System of National Accounts, 1993" by Intersecretariat Working Group on National Accounts, United Nations Statistical Commission, 2007

motivated by the fact that attributing change of ownership introduces inconsistencies between financial accounts which record payments for services and the BOP which records the gross flows of goods underlying those services. When SNA 1993 and BPM5 were formulated, they adopted a coordinated treatment that was appropriate at the time.[3] SNA 1993 recommended that, when processing is substantial,[4] statistical agencies attribute a change of ownership every time the goods moved across borders for processing, even though the goods always remain the legal property of the client unit. In the BoP, this would register an export of the gross value of pre-processed goods from A to B, and an import of the gross value of processed goods from B to A involving the same two economic units.

5.   It will be helpful to describe at this point how transactions recorded under the existing or "gross" treatment would appear in a statistical system such as Canada's System of National Accounts where the production accounts are fully integrated with the balance of payments account. This is outlined below separately for Canadian processor and client industries.

6.   Presently, respondents in a processing industry in Canada would report their inputs and outputs on a net basis, meaning that they report as "custom work" the processing fee they receive for processing goods coming in from abroad and report only their proper intermediate inputs, excluding those imported from the client industry abroad. At the same time, the imports of semi-processed goods and the exports of processed goods from Canada would appear in the system's input-output tables' imports and exports, consistent with the Balance of Payments data obtained from customs sources. In order to arrive at a balance between the supply and disposition of these two commodities, analysts perform a "grossing up" exercise. This amounts to replacing "custom work" with the value of gross production (equal to the export amount), and raising the industry's inputs by the value of semi-processed goods (the import amount). This exercise retains the industry's balance of outputs and inputs (since the processing fee is, in principle, equal to the difference between the two gross values) and the level of GDP while making the industry accounts compatible with the balance of payments.[5] This grossing-up procedure describes actual compilation practice in Canada when analysts have had evidence of significant cases and had sufficient data to confidently improve the quality of industry statistics.

7.   The present treatment of a client industry in Canada's SNA is less definitive than the case described above. Until now no significant case of goods sent abroad for processing has been noted in the source data, but it is possible that relatively minor cases have been inadvertently incorporated into industry statistic. The following discussion explores the impact of such cases and suggests an appropriate deliberate treatment of the Canadian client case.[6]

---

[3] Prior to 1993 SNA and BPM5, the gross flows were excluded from exports and imports when presented on a BoP basis and the difference between the gross flows shown in merchandise trade were shown as service exports by the processing country.

[4] The criterion suggested for identifying substantial processing was that the good would be reclassified at the three-digit level of CPC.

[5] When production occurs over multiple periods, inventories are also adjusted.

[6] Harrison, et. al. do present an analysis of how goods for processing would impact the production accounts (2005, pp. 11-14), however their treatment of the client industry is built on highly simplifying assumptions that the client produces one end-product (X1 in Table 5, p. 11) that is exported abroad for processing and, when imported back to the first country, immediately enters final use. Their treatment assumes that outsourcing constitutes the entire activity of the establishment in question, and conclude that for the client industry "…a somewhat strange production account might result, one where the original goods and the processing fee (imported) were combined to produce the

8.   When a Canadian producer sends some goods of its own manufacture in a semi-processed state to be further processed abroad, it will likely report them as addition to inventory while it awaits their return. It would report the processing fee paid to the foreign unit as an intermediate expense. It would also report a withdrawal from inventories when the processed goods are imported back to Canada to be used in its own production process or sold by the firm. The addition to inventory would be recorded as an output of the industry and match, in principle, the amount of exports in customs statistics. If the withdrawal from inventories is recorded during the same accounting period, exports would exceed domestic production and imports would exceed domestic disposition of the goods involved. Assuming that these transactions are relatively small compared to the larger industry and go unnoticed by analysts, a number of adjustments will be required when input-output tables are compiled. Depending on the perceived quality of the various data sources, supply and disposition of goods will be brought into balance by adjusting the data on exports, imports, production or intermediate use of both goods, but the most likely outcome is an adjustment to inventories. It is unlikely that the value of processing services is removed from the Canadian industry's costs. If additions to and withdrawals from inventories are made in different accounting periods, distortions caused by balancing adjustments would span more than one year as excess demand and supply will occur in different periods.

9.   In the most general case, a Canadian firm sends semi-processed goods of its own manufacture abroad to be processed and uses the processed imports to produce an end-product in the same or a different accounting period. One approach that would appropriately treat the client case of goods sent abroad for processing is to use a processing adjusting entry for the goods that are exported abroad and those that are imported. This option permits a consistent treatment for the most general case of goods for processing.

10.   Under the new treatment, no change of ownership is attributed to the goods being processed.[7] In line with the actual transaction, SNA and BoP will show no flows of goods or funds relate to them, but instead will show flows of processing services from the unit in country B to the unit in country A. In the processing country, the supply and use tables will show the industry transforming primary inputs (as well as the intermediate inputs purchased by the processor) into a service that appears in exports of commercial services.[8] For consistency, the services output of the processor (captured through an industry survey or an administrative data source) should be identical to what is captured in the survey of international transactions in commercial services. Furthermore, gross exports and imports of goods sent abroad for processing must be identified and removed from international trade flows shown in the balance of payments.

---

finished goods without the use of either labour or capital, so with no value added" (2005, p. 9, par. 34). Under these assumptions, one cannot see how the flow of goods would affect the accounts of the industry where they are typically both produced and used as intermediate goods.

[7] This treatment is consistent with another recommendation adopted by the Commission as part of the same Revision 1 of the SNA and BPM5, namely, the concept of change of economic ownership. See Recommendation 38a in UN Statistical Commission (2007).

[8] The net treatment can, under certain assumptions, lead to production of goods without the use of any primary inputs. See Harrison, et. al. (2005, p. 9, par. 34).

11.   In principle, the existing and the proposed treatment under SNA 1993 Revision 1 lead to exactly the same GDP for the industry and for the economy. In practice, differences may arise for many reasons, including inconsistent reporting between the gross flows obtained from customs sources and the service flows obtained from a survey of goods producing industries or a survey of international transactions in commercial services.

III. ANALYTICAL ISSUES

12.   The existing treatment calls for reflecting gross values of imports and exports when goods are sent abroad for processing. The most clear and intuitive drawback of this treatment is that it exaggerates the highly visible and widely used measures of import intensity and export performance for goods producing industries generally and for the individual manufacturing industries in particular. Trade ratios such as exports/gross output and imports/production overstate true export and import intensities and make the industry appear more financially vulnerable to external trade. In addition, by subsuming the value of processing services in the gross values of traded goods, the treatment understates the values of international trade in services. To get a better sense of how much exports really matter to the economy's GDP, studies often net out the import content of exports (or vice versa) in order to correct the exaggerated effect of outsourcing, including the cases of 'goods sent abroad for processing'. Such overstated ratios in turn embellish the influence of factors such as exchange rates and the strength of foreign demand for exports on the domestic economy generally and goods producing industries in particular.

13.   A second type of impact relates to input-output models constructed from industry data based on the existing treatment. Open output-determination models, such as those estimated from the Canadian input-output tables, depend critically on market shares and input cost shares of goods and services to compute the impact of an exogenous change or "shock" to a system of inter-industry linkages beginning from an equilibrium position. To the extent that an industry uses the outputs of other industries as its intermediate use it has a backward linkage to all those industries. And, to the extent that a given industry supplies the intermediate inputs of others through its own production it has a forward linkage to those industries. When the chain of inter-industry commodity flows is interrupted because products are imported from abroad, there is a "leakage" from the domestic economy. A larger leakage (a larger proportion of the supply of a commodity coming from imports) implies a smaller feedback from a demand shock on the production of the rest of the system. Under the existing treatment, the import coefficient of a processor industry is larger than under a net treatment because intermediate inputs include the gross value of goods received from the client for processing. The larger import coefficient leads to an understatement in impact coefficients of the output-determination model, thereby understating the total impact of any exogenous change on domestic production not necessarily in terms of value added.

14.   Finally, the implications of the increasing prevalence of 'goods for processing' for productivity deserve a mention when a goods producing industry consists of one segment that operates on a traditional business plan and another segment that uses contract processing. When processing goods for a client becomes more prevalent in a given industry over the traditional own-account processing, the industry's measured GDP (and GDP growth) remains unaffected (under both the net and the gross treatments). It is clear in this case that the industry's productivity growth measured as the difference between real GDP growth and the growth in an

index of primary inputs remains unaffected, as the same real GDP is produced with the same set of primary factors of production.

15.   Looking at the client side, when more producers in an industry make use of contract processing abroad in place of own-account goods processing, the overall industry's productivity growth would increase. Under a net treatment, the measured input and output sets of the industry will not change as a result of the use of contract processing. However, when producers find it cost effective to send goods abroad for processing, the implication is clear that it leads to a reduction in unit costs of output compared to a traditional arrangement of production. Under competitive conditions, this means that, in real terms, more outputs are produced per combined unit of inputs for the producer in question. In nominal terms, while it is clear that contract processing abroad lead to greater profits for the industry, this may or may not be offset by the lower wage costs under contract processing so that it is not clear whether nominal GDP will be higher or lower.

IV.   DATA COLLECTION ISSUES

16.   The current treatment leads to a number of data collection issues that affect mainly the accuracy of statistics and measures derived from them. The following discussion looks at these issues from the vantage point of the Canadian System of National Accounts. Certain features of the Canadian SNA and Statistics Canada data collection programs that support it are outlined below to provide some context for the discussion that follows.

17.   Canada's SNA is a fully integrated system that consists of an income and expenditure account, an input-output (IO) account, a financial flows account, a balance sheets account as well as a balance of payments (BoP) account. Income-based and expenditure-based GDP are articulated in the income and expenditure accounts where the latter is shown for many classes of personal expenditure, fixed capital formation, government expenditure, inventories as well as global values for exports and imports.

18.   Input-output tables provide benchmarks for GDP in both current and constant prices. In addition, they are the sole source of data on gross output and GDP by industry in both price bases. The supply and use tables of the IO accounts have a rectangular format, providing for many outputs per industry. For each commodity (good or service) articulated in the IO accounts, the supply from domestic production and imports are balanced with disposition. The latter consist of intermediate use, final domestic use (e.g., consumption, investment, and government expenditure), inventory change and exports. Elements that make up this commodity-balance are estimated within a framework where, in addition to equating supply and disposition, outputs of industries are equated with their total inputs with GDP as the balancing item. Imports and exports data used to construct this commodity balance originate from the system's balance of payments. For goods, the balance of payments depends on merchandise trade data obtained from customs, adjusted to accord with BoP concepts and classification. For services, the data is obtained from the annual survey of International Transactions in Commercial Services. The latter encompasses some 3,200 firms, mostly large corporations, with significant involvement in imports or exports of services. The survey covers the entire spectrum of internationally traded services including "contract production abroad".

19.   In the context of the system described above, it is easy to see that the existing treatment leads to a number of inconsistencies between industry data and trade data. Goods sent abroad for processing, if accurately known and correctly declared, would appear on customs declarations and ultimately appear in the balance of payments. When exports and imports are taken from this source, it is crucial that these flows appear in outputs and inputs of the industries involved. However, contract processing businesses do not report as a cost (or input) the materials that they receive from clients since they are not cost items and they have no legal title to them. Similarly, the processing unit would not report the value of the goods shipped back to the client. In fact, the processing unit is often not in a position to know the market value of the processed goods, and is typically instructed to report the value of "custom work" it performs for the client, i.e., its gross receipts from processing services. In these situations, a set of adjustments are needed to ensure that the import and export data in the balance of payments are consistent with the supply and disposition of goods used to construct industry accounts. This "grossing up" adjustment consists of adding the value of processed goods to the output side, and the value of goods received for processing to the input side of the processing industry. In the absence of these adjustments, there will be an excess demand (shortage of supply) of the processed good in the processing country, leading to an understatement on the disposition side of the commodity balance. As well, there will be an excess supply (coming from imports) of the semi-processed goods in the processing country that would lead to an overstatement on the disposition side of that good's commodity balance.

20.   A similar problem arises for a client unit since it reports on a net basis, showing only production of the final product as its output and the cost of processing services obtained from abroad as intermediate inputs. To ensure that the supply and disposition of goods are balanced (for both the semi-processed and processed goods) in the supply and use tables, it is necessary that the outputs, inputs, or inventories are adjusted to attain a balance with import and export values that make up the balance of payments. At the same time, the cost of processing services should be removed from the client industry to avoid double-counting.

21.   Experience at the Canadian SNA shows that making these adjustments on a consistent basis is a very difficult task since it can only be done when the case has a sufficiently large profile that it would be specially treated by statisticians. Cases and producers of lower visibility will inevitably be missed as there are no data collection or detection systems in place that would ensure complete coverage. A fully successful grossing up exercise would require that the value of goods sent abroad for processing that appear in the export data are allocated to those industries which produce them, and that those appearing in the import data are allocated to the using (client) industries. For processing industries, imports of semi-processed goods must be allocated to inputs and exports of processed goods added to their exports. In both instances, individual client and processing establishments must be identified and their reported use (client firms) and production (processing forms) adjusted to remove the cost of, or revenues from, goods processing. To ensure consistency, the values in the grossing up process must match those of the processing service removed from industries. Clearly, this requires a great deal of coordination among statistical programs involved in profiling of firms, construction of survey frames, sampling, as well as estimation. For instance, to ensure that the gross-up adjustments added to the system are equal to the (net) service values removed from the system, the sampling and imputation process must ensure that estimates properly represent the universe of contract processors within each industry affected by the adjustment process.

22.   Finally, the existing treatment exposes the data collection process to a sampling problem when it treats contract processors and other (traditional) processors which make up the majority of units in an industry class as homogeneous. Surveys proceed by identifying a "take-all" portion of the industry's universe—those which are either multinational or account for a large proportion of the industry's shipments. Other smaller establishments (the "take-some" portion) are sampled and used in an estimation procedure that infers values for non-sampled units from those that were selected to be in the sample. When units are not classified to different industries or treated as units of different sampling strata, they share the same probability of being selected to represent units with similar statistical attributes. This may lead to a situation where contract processing units are selected for a sample and their production statistics are used to make inferences about traditional units in the sample (and vice versa). A sampling error may arise when contract processors report their statistics in net terms (they produce a service), whereas traditional establishments report their gross production and gross intermediate cost values. Estimates for some periods would overestimate, and others underestimate, the true values depending on which type of manufacturing unit is actually sampled. This introduces excess variability into time-series of basic industry statistics even when a simple random sampling procedure is used.

V.   IMPLEMENTING THE NEW TREATMENT

23.   The Advisory Expert Group on National Accounts recommended that no change of ownership be attributed to goods when they meet the definition set out in 'goods sent abroad for processing' (Harrison et al 2005, p.5). The recommendation calls for two changes to the way data appear in the SNA and BOP in Canada. These are discussed in turn.

A.   Trade Data

24.   To implement the new treatment, merchandise exports and imports must be adjusted for the value of 'goods for processing' when they are estimated on a balance of payments basis. In the supply and use tables, industry variables such as operating surplus, inventories and ultimately GDP-by-industry are estimated jointly with exports and imports within a framework that balances supply with disposition and industry outputs with inputs. To ensure proper statistical estimation of these industry data, it is essential that the trade data correctly excludes the values of goods sent abroad for processing.

25.   One possible approach to removing these values from merchandise trade is to identify goods that are declared as "for processing" when they are clearing customs and use the tagged information to adjust merchandise trade when it is estimated on BoP basis. Goods going into Free Trade Zones (FTZ), and those originating from them back into Canada, can be easily documented and tagged for treatment. Specific measures must be taken to distinguish the qualified goods—those which go into FTZ's and come back to the same unit in Canada—from other goods. For goods processed outside these zones—as is the case in Canada's contract processing industry—this requires international agreements between customs authorities of major trading partners that specifically deal with the terms and conditions of identification, evaluation and reporting of 'goods for processing'. The tagged information on exports and imports must be collected at the lowest level of the Harmonized System of commodity classification in order to make it possible to link them with industry categories of the supply and use tables. This will allow analysts to compare the net values of tagged exports and imports with

processing costs from client units and revenue data from processing units obtained from industry sources.

26.   Given the difficulties that can be foreseen in obtaining satisfactory data from this source, existing industry surveys can be used as a second and complementary source to obtain estimates of exports and imports of "for processing" goods. For a client unit, new questions in the Annual Survey of Manufacturers can ask for information on the value of goods of own manufacture that are sent abroad for processing, the post-processing value upon return to the unit, and the fees paid to foreign processors that, adjusted for timing and transaction costs, would make up the difference between the two values.   The two gross values, summed across all industries, can be compared with the tagged data obtained from customs sources to enhance data quality and consistency of a given class of goods.

27.   For processing units located in Canada, data collection presents difficult if not prohibitive challenges. In particular, the processor may not be in a position to know or to estimate the fair market values of the semi-processed goods they receive from abroad. For instance, a contract manufacturer who assembles electronic components into a finished (or semi-finished) product for a fee may know the cost of nearly all components used in the assembly process, but there are often parts supplied by the client that are newly developed patent-protected components whose value depend on competitive conditions and marketing expenditures that are only known to the client. A similar example can be found in the pharmaceutical industry where the value of a key patent-protected ingredient supplied to the dosage manufacturer is only known to the unit that develops and markets the final product. Clearly, respondents in this case may not be in possession of the information on the value of processed goods. However, they can be relied on to provide data on the cost of the processing services provided and the classification of the goods involved. As this information is only available with a high degree of confidence from the client unit located abroad, processing revenue data collected from Canadian industry surveys can be used merely to verify the gross trade data obtained from customs.

B.   Processing Service Data

28.   The second element required for implementing the new treatment is data on costs of processing services when goods are processed abroad, and the revenues earned by Canadian processors from foreign clients. For client units located in Canada, revenues earned from processing client goods are presently reported as a separate item in the Annual Survey of Manufacturers. The survey does not specify, however, whether the client is a foreign resident affiliate or subsidiary of the same enterprise or whether the goods are returned to the client after processing or shipped to a third party or country. A more specific wording and a separate question that allows a separate estimate for 'goods for processing' from other outsourcing costs needs to be added to the existing survey. Once a specific estimate is obtained from this survey, the costs of 'goods for processing' can be compared to the net value of gross trade data for this activity from customs sources to ensure data quality and consistency.

29.   Processing units in Canada similarly report their gross income from contracting fees to the Annual Survey of Manufacturers as revenues from "custom work". Once again, the reported revenue would include processing for domestic and foreign clients and include processing that meet the conditions of 'goods for processing' as well as other activities. More specific wording and a separate question in this survey will be needed in order to isolate incomes from 'goods in

processing' for foreign clients in order to allow comparison with the net values of trade data obtained from customs.

30.   An alternative data source for both client units and processor units in Canada is to refine and improve the existing survey of International Transaction on Commercial Services. This survey is used to provide data on the services components of imports and exports in the balance of payments. At the present time, a major redesign project is in progress at Statistics Canada that will see the survey frames of the latter survey revamped and linked to the Agency's Business Register—the most comprehensive list of businesses in Canada from which samples are obtained for Statistics Canada's business surveys. A complete link between the two frames will allow data collected through this survey to be used in conjunction with the Annual Survey of Manufacturers which is the principal source of data on inputs and outputs of goods producing industries. The survey presently collects data on contract production services from large Canadian enterprises that export and import commercial services. Further refinements to the questionnaire would permit an estimate of 'goods for processing' from other contract processing originating from or destined for abroad. Revenues and expenses related to 'goods for processing' from this source would then be used as a check on the difference between the gross values of exports and imports of goods identified in merchandise trade that meet the definition of goods sent abroad for processing.

VI.   IMPACT ON SUPPLY AND USE TABLES

31.   This Section takes a closer look at how the new treatment impacts the supply and use or input-output tables. Specifically, the Section focuses on whether changing the treatment of goods for processing from gross to net leads to a fundamental change in the organization of data in supply and use tables so as to change the role that it has traditionally played. The actual recording of goods for processing transactions is a mixture of net and gross treatments (Harrison, et. al, P. 2).

32.   In Canada, the roles that the supply and use (or the IO) tables play within the broader statistical system are generally three fold. These are 1) the sole mechanism for statistical estimation of industry-commodity data within an integrated framework, 2) the derivation of gross domestic product and the application of double-deflation to obtain constant price GDP by industry, and 3) the database for the derivation of structural measures. The latter includes input-output models, IPPI basket weights, productivity measures, satellite accounts and other types of focussed research on structural linkages among industries and between industries and final demand categories.

33.   Supply and use tables are the only statistical framework that explicitly shows the combination of goods and services that enter into the production of other goods and services. How this relationship or 'production technology' is represented is critically important to the types of questions that supply and use tables can accommodate and the kind of answers they would provide. It is important to ask whether the new 'net' representation of production technology—compared to one that is gross of inputs not owned by the producer—is capable of addressing questions traditionally dealt with by input-output tables and whether the answers will be different in some way.

34.   The proposed text of the Revision 1 of 1993 SNA recognize that:

"Measuring goods for processing by the processing fee instead of by the full value of the processed goods changes the nature of input-output coefficients. They no longer represent the technological structures of an industrial process, but an economic process … the consequences for supply and use tables and input-output tables are extremely significant and change many of the traditional perceptions about what information is conveyed in these tables" (1993 SNA Revision 1, Paragraph 14.2).

35.   A significant analytical disadvantage posed by the net treatment is that supply and use tables would no longer serve as the data source for exports and imports of goods that have been involved in the goods for processing phenomenon. Under a gross treatment, on the other hand, supply and use tables facilitate the analysis of a variety of outsourcing questions by preserving the link between commodity flows, their producing industries as well as intermediate and final users.

36.   One such significant consequence is that the forward and backward linkages articulated under the existing treatment for processing industries would disappear under the new treatment. In particular, when studies look at the linkage of goods with other goods used to produce them, the processing units will be absent since the processed goods will not appear in the inputs or outputs of the industries concerned. For instance, if we need to answer a question, such as how much upstream production or employment is associated with petroleum by-products, input-output tables can address this question when they have linkages between upstream and downstream industries: chemical manufacturers producing petroleum by-products, petroleum refiners, and crude petroleum extraction. However if, in a hypothetical situation, the refining of petroleum was done by a contract processor whose output in the system appears as 'refining services', input-output linkages between upstream and downstream processes would be severed, preventing such a calculation.[9]

37.   A key implication of the impact of the net treatment on input-output linkages discussed above is for multi-regional supply and use tables, such as the Canadian interprovincial input-output tables. In such an integrated national-regional table, linkages between goods and services exist not only across production processes in different industries, but also across regions (Canadian provinces). The Canadian tables show the linkages between processes in different regions through an inter-regional trade flow matrix. These regional tables are routinely used to assess the upstream or downstream values related to a given commodity or industry across all regions of the domestic economy. However, this is subject to an important exception in the case of goods sent for processing. Since surveys of Canadian goods processing industries ask for the income and the cost related to contract processing or "custom work", a net treatment is built into the compilation of regional supply and use tables. As in the petroleum example presented above, application of the net treatment would result in severing linkages when goods are sent to other regions for processing, thus limiting the ability of input-output tables in documenting and analysing technological dependencies between industries and between regions.   In this particular

---

[9] If only a fraction of petroleum processing is done by contract processors and the rest retain the traditional pattern of production, the new treatment would result in an understatement of the values calculated.

case, an imputation was made and added to the interprovincial tables to effectively permit the technological linkages to be maintained for petroleum products.

38.   A second and closely related impact of the new treatment relates to the role of input-output tables in evaluating the net importance of trade in nominal GDP. With the increased significance of both outsourcing and off-shoring to many trading economies such as Canada's, it is often desirable to calculate total exports for an economy net of goods and services that were imported from abroad for their production process. In such an exercise, input-output tables are used to compute all of the imports that are directly and indirectly associated with exports of a particular commodity. These calculations include both imports with ownership transfer and those that come into the country for processing (without ownership transfer) and then become part of exports. Under the new treatment, only net imports and exports of services would be recorded in the final demand table of input-output tables. As a result, the analysis would produce a lower estimate of imports associated with (or used in the production of) exports because it would be restricted to imports with ownership transfer. In this case, the new treatment effectively alters the answer that the analyst would receive from performing a common input-output inquiry and it would be important to clearly explain to clients how the new treatment affects the conclusions reached in the analysis.

VII. CONCLUDING COMMENTS

39.   Shown in this paper that the existing treatment of 'goods sent abroad for processing' poses important analytical and data-collection disadvantages for the Canadian CSNA.

40.   In examining the impact of the existing treatment, and that recommended by Revision 1 of the 1993 SNA, the paper has shown that the new treatment poses certain disadvantages for supply and use tables. The organization of data required for the new treatment limits the structural relationships that are shown within a supply and use table. Without structural linkages, the tables cannot be effectively used, for instance, to study of the outsourcing phenomenon. This is a key feature of supply and use tables and has often been their raison d'être. In addition, implementing the new treatment presents considerable data-collection challenges. The conclusion suggested by this analysis is that both the 'gross' and the 'net' treatments should be maintained to ensure the traditional usefulness of supply and use tables. Compiling and presenting the data on both bases and appropriately informing data users can, however, preserve the advantages of both treatments without taking away the well-established and traditional application of supply and use tables.

REFERENCES

IMF Statistics Department "Goods for Processing: An issue Paper Prepared for the December 2004 Meeting of the Advisory Expert Group on National Accounts" International Monetary Fund Monogram SNA/M2.04/24, 2004

Harrison, Anne, Dippelsman, R., and Havinga, I "Goods Sent Abroad for Processing" AEG Issue Paper No. 40; BOPTEG Issue Paper No. 14B, prepared for the Third Meeting of the AEG on the Update of the 1993 SNA, July 18-25, 2005, Bangkok and the 18th Meeting of the IMF Committee on Balance of Payments Statistics, Washington, D.C., June 27 – July 1, 2005, International Monetary Fund Monogram SNA/M1.05/16; BOPCOM-5/21A, 2005

Ridgeway, Art "Data issues on the Integrative Trade Between Canada and the Us—Measurement Issues for Supply Chains" Paper presented to the CTPL Conference *Integrative Trade Between Canada and United States—Policy Implications* December 6, 2006

* * * * *