**BOPCOM—13/17**

**Twenty-Sixth Meeting of the**
**IMF Committee on Balance of Payments Statistics**
**Muscat, Oman**
**October 28–30, 2013**

# Challenges with Measuring Production Abroad (Global Production)

**Prepared by**
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# Measuring Global Production and Trade

**26th Meeting of the IMF Committee on Balance of Payments Statistics**

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## I: Introduction

One of the more notable characteristics of globalization has been the rapid expansion of multinational enterprises across the globe and the resulting fragmentation of production — global production. As fragmented production expands, firms are increasingly sub-contracting (outsourcing) manufacturing work as well as increasing their engagement in global distribution channels. This involves (i) providing processing services to non-resident entities or purchasing processing services by them or (ii) distributing goods globally.

This global dispersion and specialization of production is reflected in the activities both affiliated and non-affiliated firms, seeking to take advantage of (among other things) lower production costs abroad. An important characteristic of this activity is that there may or may not be ownership change related to the goods.
This presents some new challenges to national accountants, especially in terms of measuring domestic production and associated international trade flows, in a consistent and internationally comparable fashion.

*Goods sent abroad for processing*, *merchanting as well as* the special case of *factoryless goods production*, are the main measurement challenges with reference to the updated versions on international standards — from 1993 SNA to 2008 SNA (SNA08), and from the fifth to the sixth versions of the BPM (BPM6). Implementation mainly entails a review of the data collection methods and the data analysis. It also touches on select issues associated with concepts and classifications.

This note reflects both contributions to and work of the UNECE Task Force on Global Production. It also includes initial discussions and data explorations at Statistics Canada.

## II: Basic conceptual and measurement issues

### 1. Goods for processing

Firms are increasingly sub-contracting (outsourcing) manufacturing work, by providing processing services to others and/or purchasing processing services from others. Offshoring activity is a subset of outsourcing that relates to such relationships with foreign firms — either affiliates or non-affiliates. In most cases, of processing there would likely not be ownership change related to the goods despite the international movement of these goods.

Sending production abroad is not new but it has assumed increased important in recent history, and it continues to assume greater significance. It is likely that manufacturing in many countries reflects offshoring but that this activity is not treated consistently in international trade flows. In the latter, customs based merchandise trade is focussed on the physical flow of goods; such that SNA trade in goods records the gross flows of goods in process in imports and exports. This gives rise to a number of statistical issues (that can also detract from the interpretability of the statistics):

- Manufacturing would likely report services associated with processing work;
- Imports and exports of trade in goods are overstated for processing, though the net trade in goods is not;

- As a result of the above two conditions, it is likely that supply-use (input-output) table compilers would face difficulties in balancing these tables, in particular for commodity balancing, with respect to goods under processing arrangements;
- SNA international trade in goods does not reflect ownership change, when it comes to processing;
- Trade in services is understated by the exclusion of the margin on international processing services; and,
- Overall net trade in goods and services could be overstated, to the extent that some firms may be reporting processing services in the collection vehicles for international trade in services.

For these statistical reasons, and since economic transactions should be based on ownership change, SNA08 and BPM6 recommend treating international processing activity as trade in services. This implies that trade in goods must be adjusted to remove goods under international processing arrangements; and, trade in services must be estimated to reflect the value of the service provided (essentially, equivalent to the margin on the processing).

As noted above, cross-border processing has two dimensions. Outward processing is the case where a resident firm — the principal company — sends goods abroad for processing while retaining ownership (at least economic ownership) of these goods. This can involve inventories held abroad by the principal. After processing the goods may be returned for domestic/foreign sale or that the goods are sold abroad to customers beyond the processing country. Inward processing is the case where the resident company – the processor – is engaged in the physical transformation of goods that are owned by a foreign principal firm. After processing, the goods may again follow different routes. These dimensions present measurement challenges.

## 2. Merchanting

A domestic firm engaged in international merchanting purchases goods from foreign suppliers and sells them subsequently to customers abroad. Of note is that the goods do not enter the domestic territory of the trading firm, and the trading firm does not typically carry out transformation on the goods. Arguably, this activity constitutes the provision of a service, except that the trading firm buys and sells commodities — that is, takes ownership of the goods as part of the distribution activity.

Under SNA08 and BMP6, this ownership change gives rise to transactions in goods. This implies that transactions in goods must be explicitly recorded for merchanting and that the service (essentially the margin on merchanting) be added to the value of the goods sold. It may be that distribution services are largely not measured within trade in services as the value of the associated margin is included in the value of the sale of the goods, but in the case of merchanting this is not clear.

Nevertheless, this is a large departure from current treatment. Merchanting related exports and imports (treated as negative exports) are not covered in merchandise trade statistics, since these goods do not cross the border of the firm undertaking the merchanting activity. As a result, BOP compilers have to measure negative imports and he exports as the margin on the merchanting arrangements; and, this activity can involve inventories held abroad. Further, compilers need to estimate these flows in some degree of accompanying commodity detail; and, while it may be convenient to assume that firms engaged in merchanting buy-sell the same commodities as they have traditionally sold domestically and exported there is no reason to expect that is or remains the case.

## 3. Factoryless goods production

Factoryless goods production (FGP), is a special case of manufacturing where all (or the vast majority) of the physical transformation of goods takes place in another economy. This type of globalized production is on the rise as firms, especially as multi-national enterprises (MNEs) increasingly take advantage of (among other things) lower production costs abroad. Statisticians are more than likely re-allocating FGP firms from manufacturing to distributive trades, based on the changing nature of their domestic activity. Notably, FGPs in distributive trades can also be engaged in merchanting. Sometimes, firms may be allocated to other industries, such as “Professional, scientific and technical activities”, if say research and development is the main domestic activity.

However, FGP firms typically differ from firms in the distributive trades' industry in that they are mainly engaged in managing global production. In place of factories, they can be substantial investors in intellectual property and retain highly skilled employees. Product design and production chain management are typically the business functions carried out by factoryless goods producers in the global production chain.

The industrial classification of FGP firms plays a key role in determining the nature of their production activity, and therefore the treatment of FGPs has a substantial impact in supply-use tables. SNA08 and BPM6 developed an initial position on FGPs. This led to the ISIC Rev.4 recommendation to classify factoryless producers according to the ownership of material inputs (products produced on own account or on contract) along with the nature of the activities — more specifically, to classify a FGP under distributive trades when the FGP does not provide (or own) the material inputs subject to processing. This likely resulted in a tendency for statistical agencies classifying FGP firms to the distributive trades industry, possibly reflecting that the related activities were mostly related to the sale of final products.

***Recent developments***

This treatment has been brought into question by the UNECE Task Force on Global Production (TFGP) established in late 2011. The factors that gave rise to this were the work of the TFGP on global production related to the (i) typology of global production arrangements, (ii) economic ownership and (iii) intellectual property products. A further catalyst was that NAICS 2012 introduced additional classification criteria, including ownership of intellectual property products, control of the production process and ownership of final outputs. Arguably, a strong case can be made that these new criteria fit the FGP global production realities somewhat better.

In the case of an enterprise which offshores all of its manufacturing to a non-affiliate or affiliate, but controls the intellectual capital and production process as well as owns the final products, it can be argued that this enterprise is a manufacturer — a factoryless one that purchases manufacturing services as part of its production. With large MNE operations spread across the globe, it is likely that ownership of material inputs is not as relevant factor as it used to be in determining whether an entity is a manufacturer or not. The upshot of this reasoning is that FGPs are actually manufacturers and should be treated as such; and this, significantly changes the treatment of production measures in the supply-use tables.

The UNECE has been reviewing this issue in the context of providing practical guidance to support the implementation of SNA08 and BPM6 recommendations on processing, merchanting and FGPs. In summary, the TFGP has recommended:

- That ownership of material inputs should not be the sole determining factor in classifying an FGP. An FGP that may or may not own material inputs but controls the outcome of the production process and provides (or owns) the IPP inputs to a contract processor should be classified to manufacturing as a separate subset of existing classifications that highlights the factoryless characteristic of the firm. This view would affect the implementation of the 2008 SNA, BPM6 and implies a change in ISIC rev.4.

These TFGP recommendations have, over the last six months, received general support from national accountants in different forums. However, at this point, it is not clear that ISIC4 can or will be revised to reflect the clarification/update to SNA08 that the TF is proposing with respect to FGP. If industrial classifications do not change, this would present a significant problem for compilers in the sense of conflicting international guidance. Perhaps, more importantly, what remains to be determined is whether country compilers can actually apply these recommendations in practice.

***Some measurement challenges***

<u>Classification and FGP</u>

Typically, firms are classified according to their major activity, if they engage in more than one activity[1]. This implies that for borderline cases a careful analysis of IPP and trade related service components of value added, or net output, is required to classify expected factoryless goods producers accordingly. When the principal is considered a factoryless goods producer, its output at basic prices represents the full value of the product including the IPP service, and the enterprise could be classified in a separate category under the relevant manufacturing industry according to the type of final goods produced.

At issue in the case of global manufacturing is the fundamental question of what we are trying to measure in domestic production: Domestic activities as traditionally related to labour and capital employed; or, the global activities of MNEs that "belong" to the parent enterprise operating in the domestic economy, which may have little to do with labour and capital employed in the domestic economy. The TFGP recommendation would mean that many more business units would be classified to manufacturing that is currently the case. Some would argue that this would not be appropriate in terms of measuring domestic economic activities[2].

Further, measures related to labour productivity and capital intensity should remain as relevant as before, but FGPs would not generate employment in manufacturing nor would they have much in the way of domestic capital associated with manufacturing. On the surface, this change would have adverse impacts on the relevance of measures of labour productivity and multi-factor productivity.

Identification of FGPs in a dynamic environment

A first issue relates to incidence and whether FGP firms can be clearly and exhaustively identified, after a number of years of evolution in domestic manufacturing related to global production. Compilers will need to assess this situation carefully.

A second challenge relates to the degree of offshoring with respect to FGP. Factoryless goods producers are taken in the industrial classification standards to be those firms with 100% outsourcing/offshoring. In reality, there may be a great many factoryless producers that do not strictly fit this requirement; and it is reasonable to assume that outsourcing arrangements can be quite complex and dispersed, both domestically and internationally and with affiliates or not. This situation may leave the classification of such entities up to the individual country compilers, leading to inconsistent treatment and statistics across countries.

Identification of the principal firm is quite important in the case of FGPs. Reference to the (lasting) direct investment relationship (related to risks and rewards) – especially narrowed to majority-owned foreign affiliates – could be of substantial benefit in sorting out ownership and control of production arrangements. However, this benefit comes with a caveat. Globalized production is a reflection of the ownership structure of MNEs, and businesses adapt on an ongoing basis to maintain competitive advantages as well as to meet other corporate strategies. This change translates into evolving structures of MNEs, and is reflected in not inconsequential mergers and acquisitions activity. Therefore, an additional measurement challenge with respect to classification of factoryless producers becomes one of changing organizational structures – mergers and acquisition (M&As)[3]. This would be a major issue for compilers of supply-use tables.

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[1] Of course, this is under the condition that separate units for each of these activities cannot be identified which would enable establishing separate production accounts.

[2] An example might help illustrate this point. If a domestic economy compiler approached the parent company of a fashion name brand clothing company (say, in the U.S. or in Western Europe) which outsourced all of its physical production to non-affiliates (say, in Asia) and asked what business it was in, the response would likely be a manufacturer of fashion clothing. This would be in spite of the fact that the parent company unit operating in the domestic economy might only have research, management services, marketing and sales activities; and, because of these domestic activities, is not currently classified to manufacturing in domestic economy statistics. The globally consolidated parent MNE may well be a manufacturer; however, in the domestically-consolidated local economy level it performs functions quite different than physical transformation of products – it provides services to the globally-consolidated MNE.

[3] The upshot is that a factoryless manufacturer may become something else as a result of a corporate restructuring. For example, what was once a domestic parent enterprise with ownership of IIP, control over the production process and

Understanding production chains

Breaking down the various activity steps in a global production chain on a country-by-country basis would be useful in the context of measurement of global production; however, this would be a challenging undertaking. Nevertheless, it could lead to the identification of units, which are in reality fully controlled by a foreign unit, though applying the principles of economic and/or legal ownership in such cases may not be an easy task. Similar problems exist when recording the activities of MNEs on a country-by-country basis. This may require prorating of asset ownership and output and imputing transactions, which is not a desirable situation and one that can adversely affect quality.

## III: Generic approach to measurement

Challenges noted above are reflected in that fact that the majority of countries have not in their conversions to SNA08 and BPM6 (either actual or planned), adopted the recommendations for processing and merchanting.

### 1. General considerations

Phased in approach

Prior to conversion to the new standards and taking into account the complexities of measuring global production, it may be advisable to generate parallel estimates. Estimates on a new change of ownership basis, can be released as provisional estimates for a short period of time during which compilers can assess (i) the accuracy-reliability of these data and (ii) the impact(s) on the trade and production data. This would also provide some time to assess the impacts on global trade measures through bilateral data comparisons (especially with key trading partners) as well as the analysis of the effects on global imbalances.

Incidence

A first step towards measurement is to research the issue – that is, obtain a sense of the incidence of processing, merchanting and FGPs in the domestic economy, something that can vary widely from country to country. Indeed, progress to date on these two issues has largely come from jurisdictions where the incidence and impacts are quite significant – most notably, Hongkong and mainland China.

Typically, these activities are significant in specific industries and in/with select countries; and, there may be more than enough public information and economic intelligence to develop a general profile of this activity. In many economies, firms engaged in global manufacturing and merchanting will be large entities, typically represented in a "take-all" part of business surveys. In some jurisdictions, processing may be significant and merchanting insignificant. In smaller economies, or economies that are relatively specialized (in terms of having a limited number of large industries), it may be possible to obtain a very good sense of the incidence of global production activities. If the industrial structure is dominated by resources sectors or agricultural sectors, the effects of offshoring will likely be much less, than in the case an economy that is heavily engaged in manufacturing.

In addition to a priori information, using existing surveys to profile firms' activities with qualitative questions up front can be beneficial, and would shed some light on the need to modify surveys[4]. Another approach could be via a program focussed on large business units that facilitates respondent dialogue and feedback[5], where such programs exist.

It is expected that at least a partial list of major firms engaged in offshoring can be developed in most countries; and, from such economic intelligence, it may be possible to quantify the extent and nature of this activity. At the

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ownership of material inputs may end up post-M&A a subsidiary (say, engaged in research and development) in an enlarged MNE undertaking part of a global production process. This reality can translate into a significant undertaking in terms of adjusting economic flows for M&A activity.

[4] In addition, there is a fair bit of academic research related to aspects of global production (often country-specific) that would be useful to review.

[5] These programs are typically focussed on data quality issues and on the goal of reducing respondent burden.

same time, it may be possible to note the inclusion and coverage of large and complex MNEs and their components (parents or affiliates) in offshoring activities. If affiliates are significantly involved with parents in offshoring activities, establishing the geography as well as a consistent approach will be relatively easier.

With a basic understanding of incidence, country compilers can then frame the overall task and set out a work plan that reflects their particular economic reality in terms of production and trade. This can lead to a more efficient strategy towards measuring global production, by narrowing the scope of the project to (at least initially) focus on the key sectors/players. Further, compilers will be in a much better position to make some initial practical decisions with respect to contentious issues, such as ownership of inputs or control of the production process when it comes time to make decisions about the issues surrounding factoryless production.

A strategy for quality estimates

Given that merchanting and goods for processing relate to different data collection vehicles and that global production involves diverse activities of affiliated or non-affiliated firms organized and operating across different industries and jurisdictions, an integrated approach to measurement would be the ideal one.

The strategy would ideally be two-fold. First, approach this from the perspective of the need to leverage several sources of information simultaneously, including:

- ***Primary sources*** - Manufacturing surveys, merchandise trade statistics (for those countries that use a customs-based system), international trade in services surveys and distributive trades surveys
- ***Secondary sources*** - enterprise financial statistics surveys, alongside foreign direct investment surveys and foreign affiliate statistics, as well as surveys on research and development; and the use of a supply-use framework (input-output tables) to confront estimates that are generated.

Second, minimize the need for new surveys or substantially longer questionnaires, but not necessarily new activities related to existing data sources. This does not imply that new data sources/surveys will not need to be developed or, at minimum, existing sources modified. Results could then be supplemented with record linkages that could tie the sources of data together and strengthen the estimates.

This strategy will be relatively easier for centralized statistical agencies, where surveys, administrative data, business registers, and national and international accounts are typically housed together. But even in these cases, accurately measuring global production will be a challenge. For jurisdictions where data production of implicated statistics is spread across two or more agencies, increased co-operation among country agencies (statistical agencies, central banks, customs agencies, etc.) will become a necessity. In concert with this, increased cooperation among compilers in various countries — especially between major trading partners — would be required.

***Some useful pre-requisites***

Business registers and industrial classification

Given the need to leverage/link enterprise and establishment surveys along with administrative data sources, integrated business registers will provide a significant advantage. In particular, it would be an useful for a centralized business register to have an international flag — an indicator of international activity. Such a flag would facilitate maintenance of international and domestic survey frames as well as enhance survey sampling, in the context of the measurement of global production in the domestic economy.

As statistical programs would likely want to identify integrated manufacturers, manufacturing service providers, and factoryless goods providers, it may also be advisable to establish an FGP flag such in order to monitor the nature of this activity in the domestic economy, monitor coverage, as well as be able to construct manufacturing aggregates with and without FGPs. Ideally, it might be advisable to treat factoryless manufacturers as a separate industry that analysts can include/exclude depending on the nature of the analysis.

A high degree of harmonization in the interpretation and use of industrial classifications is desirable in order to promote international comparability; and, where there are remaining significant differences that these be understood and taken into account — especially in country bilateral comparisons.

Commodity classification systems

Similarly, there are different commodity classifications used for different purposes across countries and economic regions. The United Nations Central Product Classification (CPC), the North American Product Classification (NAPCS), the harmonized systems common to customs-based international trade statistics (HS system) and the Input-Output Commodity Classification (IOCC) are four examples. Whatever commodity classifications are in use within and across countries it is important that differences that these be understood and taken into account. Ideally, some degree of harmonization at some level of aggregation would greatly facilitate incorporating change of ownership adjustments by commodity across international trade and production statistics. In some countries and economic regions commodity classifications are more or less harmonized[6]. For many/most countries it is expected that product classifications employed across surveys and administrative data are largely harmonized, otherwise work such as building supply-use tables from business surveys would be quite challenging.

Statistical units

In order to manage response burden we wish to leverage all possible sources of information, it will be important to have an understanding of the statistical units covered across surveys or in administrative data. Similarly, an understanding of statistical units across sources of data will be important for data confrontation purposes, as well as for undertaking the more complex work of using record linkages to derive certain statistics related to global production. Statistical units can include:

- *The establishment*. This is typically the production unit and can also be the legal entity in the case of simple corporations. However, in complex corporations – especially MNEs – it may not be able to adequately/accurately answer questions about ownership of intermediate inputs.
- *The legal entity.* This might be the production unit in the case of simple corporations. In the case of complex corporations, it likely is not the production unit and may cover several establishments. It is the unit that is reflected in taxation statistics. It may also be the equivalent of the statistical enterprise.
- *The statistical enterprise.* This unit sits atop of domestic complex corporations, as the domestic parent. It may also be the global parent, but should supply data that are domestically-consolidated as opposed to globally consolidated. More specifically, it covers domestically-booked activities and financial positions.
- *The global multinational enterprise (MNE).* This is not covered in domestic surveys or administrative data. It may be available from public sources, and might be useful in a number of cases in sorting out issues associated with global production.

## 2. Data sources and methods

### a) Manufacturing surveys

Processing services

Manufacturing surveys are typically directed at establishments of legal entities, with annual and sub-annual cycles. Keeping in mind that not all firms are engaged in international processing, there should be an assurance that (i) the survey frame is comprehensive and includes such firms and (ii) the sample size is sufficient and with an effective sampling strategy. In the case of the frame, a priori information or company profiling can be of assistance in identifying large companies engaged in processing. Such companies would ideally be in the take-all portion of the sample. At the very least, they should be in the take-all portion of the annual survey, if such a survey is used to supplement and benchmark the quarterly survey.

On manufacturing surveys, there needs to be a means to identify total revenues and expenses associated with (i) manufacturing on own account and (ii) manufacturing on behalf of others. Since outsourcing (often referred to as

[6] In Canada, for example, NAPCS used in trade statistics is to a very large extent harmonized with the IOCC used in the supply-use tables.

custom work on surveys) has been around for some time, it is likely that most manufacturing-based surveys would have this basic split. These revenues-expenses represent the margins of the associated with the inward-outward processing. It is important to ensure that the manufacturing survey covers all custom work activity, whether purchased or sold by the manufacturer, such that the international portion of outsourcing is included. While this is likely to be the case, it can be that the wording associated with custom work is cumbersome and possibly not clear to respondents and might benefit from a review.

If we assume that overall definition of processing activities is not an issue, the next priority is to ensure that on both revenues and expenses associated with the international portion outsourcing can be identified. This provides the basic total measure of such activities, for both acquired and supplied processing services. Identification of the international portion of custom work is likely to be absent in the case of a number of current manufacturing surveys in various countries, suggesting that content reviews may be required. In addition to the questions related to international processing, it is advisable to add a question on inventories of material inputs or unfinished goods held abroad (opening and closing balances) to cover the instance where processing extends over more than one time period. Manufacturers may already be including these inventories in response to what national accounts' compilers interpret as domestic inventories. Lastly, on outward processing, it may be necessary to add question on (i) purchases of inputs from abroad for foreign processing and (ii) final sales (exports) of goods that do not return post-processing.

Manufacturers tend to specialize in specific commodities, and it may be possible to estimate reasonably accurately the product details (at some aggregate level of classification, at least) that are associated with offshoring without materially increasing response burden. Further, companies that generate certain products may have an activity code on a centralized business register, which could be of assistance.

These steps will ensure collection of the basic information with respect to total international processing activities arising from the survey data; and, that we have these estimates by establishment or legal entity, depending on the basis of the unit of measurement in the survey. The commodity detail noted in the paragraph above is required to link to the international trade in goods (adjusted merchandise trade data) and services data for basic measures of cross-border processing, as well as to other information in more complex cases.

The above approach for cross-border processing in the manufacturing sector can supply total transactions and likely some degree of the goods details. It also supplies some elementary information associated with the more complex cases involving offshoring. These data, however, need to be reconciled with the merchandise trade data in all cases, and with other datasets in the more complex cases.

Factoryless goods producers

In the case of factoryless goods producers (FGPs), it may also be necessary to add qualitative questions to manufacturing surveys on any or all of the following:

- Outward processing (expenses) - Does your firm own the material inputs on goods sent abroad for processing
- Outward processing (expenses) - Does your firm (i) control the production process, and/or (ii) own the intellectual property products in use, and/or (iii) own the final output associated with goods sent abroad for processing, or (iv) all of the above
- Outward processing (expenses) - Is this processing with affiliated companies
- Inward processing (revenues) - Does your firm own the material inputs on goods sent to it for processing
- Inward processing (revenues) - Does your firm (i) control the production process, and/or (ii) own the intellectual property products in use, and/or (iii) own the final output associated with goods sent abroad for processing, or (iv) all of the above
- Inward processing (revenues) - Is this processing with affiliated companies

There are challenges with these questions, however. Given that the manufacturing survey most likely covers establishments or legal entities as statistical units, and that these are typically part of a larger domestic enterprise, the respondents may not know the answer to some, most, or all of these qualitative questions. Further, given that

the respondent firms may be undertaking processing arrangements with foreign affiliates that are part of a larger MNE, they may not be in a position to respond accurately. An undesirable situation would be one where a significant number of inaccurate responses from respondents to these qualitative questions are used as the basis to classify FGPs. The upshot of this is that it may be preferable to use enterprise surveys for these questions or employ some other means of determining ownership and control of production arrangements that involve cross-border processing.

### b) Wholesale/retail trade surveys

Merchanting activities may be relatively small in some economies and/or focussed in specific businesses – typically, establishments or legal entities – and on specific commodities. As a first step, it may be advisable to profile the wholesalers or distributors in distributive trades surveys (DTS) that are engaged in the 'buying and selling foreign goods abroad' type of business activities. After an idea of the incidence is established, any survey issues, especially related to coverage can be addressed.

With respect to coverage, merchanting may or may not be captured in DTS annual / sub-annual surveys. It may be that respondents are asked to report total sales, and that they include sales from goods purchased abroad or from inventories held abroad; or, it may be that collection vehicles specify sales of domestically produced goods. In either case, merchanting activities may or may not be included in total revenues.

The business surveys for companies in the wholesale and retail trade section are usually designed to measure the turnover from distributive trade, as well as purchases of goods which are subject to distributive trade. This information will allow compilers to estimate the trade margins of wholesale and retail trade as the difference between purchases and sales.

DTS surveys would likely have to be adjusted to specifically capture merchanting activities. In particular, these surveys (establishments or legal entities) would require some additional questions in order to ensure measurement of total income as well as to be able to make additional balance of payments trade in goods adjustments to imports and exports. Such questions could be aggregate questions — that is, with no commodity detail — related to the value sources and dispositions of goods sold:

Goods purchased domestically included in:
- domestic sales
- sales abroad

Goods purchased from abroad for:
- domestic sales
- sales abroad

A further challenge is how to reflect the inventories of firms engaged in merchanting that are stored abroad, when foreign acquisitions and foreign sales take place in different accounting periods. As with sales, such inventories may or may not be accounted for. In order to compile this information, a few further aggregate questions could be added along the lines of:

Inventories of goods held abroad
- opening balance
- closing balance

Commodity details would likely have to be inferred or estimated separately.

### c) International trade in services surveys

Processing and merchanting

International trade in commercial services surveys are typically enterprise-based surveys, with details by industry and by geography (countries and regions). Coverage can be a challenge for such surveys, as firms engaged in international service transactions are not easy to identify, and because surveys associated with international trade

in commercial services (SITCS) are smaller in terms of coverage that other business surveys that cover total domestic activity. Links to a centralized business register with a flag for international activity, or the profiling activity used in other surveys, can help to keep the SITCS survey frame up to date and assist with the sampling strategy. A quarterly survey may be supplemented with a more detailed (in particular for geography) annual survey, which may be used to benchmark the sub-annual surveys.

For the most part, it is likely safe to assume that current international trade in commercial services surveys in most countries are not geared to measure certain aspects of global production. The challenge when it comes to global production is to ensure that such surveys adequately cover firms engaged in goods processing as well as merchanting. It may be necessary to plan an upgrade of the SITCS survey frame, sampling methodology and content. In doing so, it will be essential to ensure adequate coverage of both service and goods producing industries as both can be engaged in international processing and merchanting. Any profiling related to the cross-border dimension undertaken in the case of the manufacturing surveys and distributive trade's surveys as well as their survey frames would be useful in this regard. So would the existence of an international flag on a centralized business register.

In terms of content, the SITCS questionnaire content would have to cover both merchanting and processing services. In the case of goods processing if this cannot be accomplished without response burden concerns, then this component of trade in services may have to rely on manufacturing surveys and/or adjustments to merchandise trade data to estimate these components of global production. Similarly in the case of merchanting, the industries (wholesale and retail trade) where merchanting is prevalent are likely to have a low coverage on SITCS surveys. In this instance trades surveys may have to be relied upon to generate merchanting estimates.

Content may also have to be expanded to cover processing with affiliates, information which is not common to other surveys. This information can be useful in terms of determining ownership in the more complex cases associated with processing, such as factoryless goods producers if a general set of rules is used. However, activities with affiliates may be available from other sources.

Factoryless goods producers

In the case of factoryless goods producers (FGPs), it may also be necessary to add qualitative questions on any or all of the following in the case of processing services such as discussed above under manufacturing surveys. As an enterprise survey SITCS might be better placed to provide more accurate results to these qualitative questions. However, if coverage of processing remains a major challenge in SITCS, this would not be worth the effort. That said, except for a question on processing with affiliates, it might be best to leave the qualitative questions to the manufacturing surveys as noted above.

In the case of the question on processing activities with affiliates, it might be useful to request some quantitative information tied to basic geographical breakdowns — that is, with respect to key trading partner countries or economic regions.

### d) Merchandise trade statistics

Ultimately the collection of offshore processing and other global activities will be of limited use unless they can be effectively tied to merchandise trade data, so as to properly adjust for global production in the national accounts and international accounts. Trade in goods is fundamentally based on merchandise trade statistics. Merchandise trade statistics measure cross-border flows on the basis of the physical flow of goods, and follow the manual *International Merchandise Trade Statistics: Concepts and Definitions*. The main feature of this system is that it records all goods crossing the border whether they are domestic purposes or for re-export. Given this focus on physical flow, merchandise trade statistics are somewhat narrow in scope.

At present, in many countries, customs information[7] that form the basis of merchandise trade statistics are adjusted to standard SNA-BOP concepts when estimating trade in goods in the national accounts and international accounts. These adjustments, sometimes referred to as national accounts or BOP adjustments, can include coverage, timing, valuation and country attribution (origin-shipment) adjustments. The change of ownership basis for goods under processing arrangements would become a further (BPM6) adjustment to convert merchandise trade statistics to SNA-BOP trade in goods. However, in almost all countries, merchandise crossing the border related to the demand or supply of processing services is still included in trade in goods.

The objective is to remove the grossed up international merchandise trade flows (imports and exports) and replace these with the net flow of international trade in services associated with cross-border processing for national accounts' purposes. More generically, the goal is to measure trade in goods on a change of ownership basis; and ideally, this would dovetail with the approach outlined above for business surveys. This would "correct" SNA trade in goods to align with manufacturing surveys that provide a key data source for use in input-output tables. The challenge is how to do this.

Additional customs detail

Merchandise can cross the borders for reasons other than trade, including trade shows, repairs and processing. Some or many of this merchandise may qualify for exemptions from normal customs duties (exempt or partially exempt[8]). Under these circumstances, it is expected that customs' records would identify such merchandise. For example, re-exports may be widely available in the customs information. It is quite possible in some countries that available customs information is not fully utilized in the merchandise trade statistics. Some of this information may already exist on available customs fields that are not fully captured or ignored for merchandise trade purposes; and, other information may be captured and analyzed by the agency responsible for customs data.

In other words, existing but non-tabulated/analysed fields might be able to provide important information for adjustment purposes. This might involve additional efforts by compilers as well as negotiations with customs agencies for access to additional/all records on customs documents.

The desired additional information from customs records would include:

- the values and commodity codes of the merchandise that is determined to have been sent abroad for processing services, the processing fees paid on these goods, and where the work is undertaken and where the processed goods are destined, etc.
- the values and commodity codes of goods sent for repairs as well as the fees paid for this service, and where the work is undertaken
- the values and commodity codes of other merchandise crossing the border on a temporary basis, with a breakdown of the purposes of these flows to ensure complete coverage items with no ownership change
- the dates of departure and return of all temporarily shipped merchandise

The commodity detail that would be associated with any of these categories of temporarily shipped merchandise would then form the basis of a SNA-BOP change in ownership adjustment for trade in goods. Some detail will be discarded from estimates of trade in goods (e.g., merchandise shipped for trade show purposes) and some would be adjusted out of trade in goods (e.g., merchandise crossing the border for processing services).

In the basic example of processing, exports related to outward processing would have to be removed in the period in which they were sent abroad as well as for the period in which they returned; and, the difference in the values of this merchandise would be the foreign margin on processing services (to be treated as an import of services). Similarly, imports related to inward processing would have to be removed in the period in which they were sent to the domestic economy as well as for the period in which they returned to the foreign economy; and, the difference

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7 Data developed from custom administrative records are typically referred to as customs-based trade statistics.

8 For example, exempt on the original goods value, but are required to pay duties on the value added i.e. processing fee component.

in the values of this merchandise would be the domestic margin on processing services (to be treated as an export of services). This information could be confronted with estimates from manufacturing surveys.

These adjusted out items would form the basis of other SNA-BOP adjustments. As noted above, they could form the source information of net additions to imports and exports of *International trade in services, goods processing*, if SITCS are unable to capture this activity. Alternatively, they could be used for data confrontation/imputation purposes. For example, even if processing is incorporated in trade in services surveys, it is likely that the coverage of this activity in merchandise trade statistics would be superior to that of services surveys. In addition, the net amounts, should tie into the revenues and expenses from cross-border manufacturing surveys in any given period. The commodity detail associated with these adjustments would be essential to balancing commodities in the input-output tables, and for this some degree of harmonization across commodity classifications would be desirable.

All of this could be enhanced with the existence of importer-exporter registers associated with merchandise trade statistics. This would facilitate data confrontation with other surveys.

Importer-exporter registers

Importer-exporter registers allow for the identification of detailed commodity trade back to the trading establishments. Some countries have developed importer-exporter registers, which link the merchandise trade by commodity to the firms engaged in this activity. Further, in some cases, the importer-exporter registers are linked to a centralized business register. The names of the importer-exporter firms can be invaluable in terms of linking trade to the related business surveys — especially manufacturing surveys and trade in services surveys, in the case of cross-border processing activity. Tying the aforementioned merchandise trade adjustments to firms in manufacturing via record linkages as well as commodities can increase the accuracy and data confrontation usefulness of the adjustments.

In the basic goods for processing model, the net revenue from such processing should be equivalent to the net processing service exports and the net expense should be equal to the net processing imports, in any given period. This relationship allows for data confrontation on processing trade margins associated with these two data sources. In the case of international trade in services surveys, an exact link between trade and manufacturing would allow for more precise goods for processing adjustment by industry. In addition, the commodity detail by firm would likely also prove useful.

### e) Foreign direct investment surveys

Foreign direct investment (FDI) surveys of inward and outward cross-border inter-company investment are enterprise-based or legal entity-based, and typically have adequate coverage. In addition, the surveys usually collect (supplemented with other sources) information on multinational enterprises' ownership structures. For both inward and outward FDI, it is typically possible to identify and isolate majority owned affiliates by industry. In fact, majority-owned foreign affiliates are the basis for foreign affiliate statistics.

As an alternative to asking questions on the ownership of material inputs or the other criteria for establishing factoryless goods producers (FGPs), it may be simpler (in the sense of low response burden) and more accurate (than direct questions on activity surveys) to adopt a set of rules based on ownership and control of the elements of global production. If cross-border processing involves majority-owned foreign affiliates and a principal parent with no physical manufacturing in the economy in which it resides, then compilers can assume that the parent controls the production process, directly or indirectly owns the material inputs, likely owns the associated intellectual property, and will take ownership of the final products. In this sense, it is clear that the parent company of majority-owned foreign affiliates assumes the bulk of the risks and rewards via its *lasting interest* investment.

Tying the FDI ownership structures into manufacturing surveys and/or merchandise trade data will likely necessitate the use of record linkages. In this context it is ideal if the FDI frame is hooked to a centralized business register.

### f) Foreign affiliate statistics

Foreign affiliate statistics (FAS) also referred to as foreign affiliate trade statistics (FATS) make use of the FDI survey frame to identify majority-owned foreign affiliates, and may even be integrated with FDI surveys. FATS cover activities of majority-owned affiliates associated with both inward FDI (i.e., inward FATS) and outward FDI (i.e., outward FATS). These surveys try to get at the fundamental question of what is the impact on the domestic economy of FDI relationships; and while FATS data are not fully standardized internationally in terms of variables, in most countries these programs tends to measure employment, sales, financial variables, etc.

Sales of foreign affiliates typically cover foreign portion (exports) and often asks for sales back to country of the parent enterprise, including sales back to the parent enterprise and/or other affiliates enterprises. Sales are not typically broken down between final sales and goods under processing arrangements, but such detail could be added; and, given the fragmentation of global production across affiliated entities, this is arguably an ideal place to seek this information. In other words, it is possible to directly collect information on total processing revenues and expenses, or net revenues, with majority-owned foreign affiliates. Assuming adequate coverage in FATS, this source would also provide some degree of geographical (countries and economic regions) detail which would be useful for further data confrontation purposes.

In terms of tying this to factoryless producers, there are two possible approaches: Assume that the parent of the majority owned affiliates is the controlling principal, as it the case in the FDI section above; or, ask some specific questions on ownership and control of the production process as articulated in the section on manufacturing surveys. In either case, once a reasonably good control total for processing with majority-owned affiliates is established, record linkages can tie this back this to manufacturing and merchandise trade data, as a means to establish factoryless goods producers involved in processing versus other firms involved in processing.

### g) Enterprise financial statistics

For countries that have them, surveys that collect domestic enterprise financial statistics — income statements and balance sheets — can also be of use in measuring global production. These surveys cover both financial and non-financial industries. The approach would typically be a stratified survey[9], and these types of enterprise surveys are often benchmarked to administrative data (taxation statistics) in order to estimate a universe.

In most economies, globalized production would largely take place among the larger enterprises, covered in the take-all strata. As an alternative to the FDI and FATS approaches, this provides an opportunity ask both qualitative and quantitative questions about global production, including ownership questions. However, given the relationship with and the profiling on manufacturing surveys, it might be advisable to make these questions an insert (e.g., additional schedule) for a select group (target group) of multinational corporations; and, this could also provide a control total for processing. If the enterprise program has an ownership and control corporate structure associated (perhaps as part of a centralized business register) then assumptions with respect to ownership and control of production processes similar to the FDI approach[10] can be made.

This work would be more efficient if the enterprise survey was linked to a centralized business register with international activities' flag. First, the link to the business register including ownership structures would allow for a tie in to the establishment based surveys discussed above, which would be important for ensuring data quality and data confrontation purposes. Enterprise surveys could then be used to assess coverage or benchmark variables

[9] As with many surveys, including a take-all, take-some (sample) and take-none strata.
[10] Notably, however, the results might differ somewhat from those in the FDI statistics.

such as revenue from providing processing services to non-residents or expenses associated with purchasing processing services from non-residents. Second, the centralized business register's international activities flag would facilitate (in terms of managing response burden) the targeting of key enterprises for additional questions.

Lastly, the results from the enterprise survey can be used in record linkages to tie back to manufacturing and merchandise trade data, as a means to establish factoryless goods producers involved in processing versus other firms involved in processing. These results can also be linked to cross-border enterprise surveys, including trade in services, foreign direct investment and foreign affiliate statistics.

#### h) Surveys of intellectual property products

Many countries would by now have instituted a survey (typically, and enterprise or legal entity survey) to measure research and development and intellectual property products. These are designed in part to meet the need to capitalize research and development in the national accounts, and can be linked to international trade in services and other surveys.

Ideally, these surveys would cover questions on revenues (sales and property income) and expenses (purchases and fees) associated with IPPs by type of IPP and with a cross-border dimension (including minimum geographical detail), control of IPPs (business decisions on IPPs owned), and links to foreign affiliates and non-affiliates. Supplementary questions could be added on control of the production process associated with the IPPs and ownership of the final output associated with the IPPs, but these might best be derived from record linkages with other surveys.

## 3. Data confrontation

There are two challenges to measuring global production symmetrically – that is domestic production and production abroad. The first is with respect to adopting the same concepts and classifications worldwide; and the second relates to a need for data confrontation.

#### a) National data confrontation

Compilers will first have to ensure that new estimates are consistent across surveys, adjusted trade international estimates as well as in the components of the national accounts. For example, the net of import-export adjustments from merchandise trade should be equivalent to the net of cross-border processing services. It is expected that countries will differ in their approaches to measuring processing and merchanting, partly based on availability of data. In addition, some exercises, such as record linkages and some data sources, may only be available on an annual basis; and this situation would necessitate the development of sub-annual projectors.

As noted above the full measurement of economic flows on a change of ownership basis will improve commodity balancing in the supply-use tables, by eliminating a series of adjustments[11] based on partial information. This balancing process can serve as a test of the accuracy-reliability of the new estimates.

Improved balancing in supply-use tables may lead to reduced measurement error in the national accounts and more accurate estimates of annual and quarterly GDP and balance of payments. In doing so it would bring the BOP-SNA trade in goods estimates in line with survey results in manufacturing and service industries; and there could be a full accounting of the differences (deduction for goods under processing arrangements and additions for goods under merchanting) between trade in goods and merchandise trade statistics for transparency purposes. In addition, the size and coverage of trade in services would increase from the inclusion of processing. All of these revisions can and should be cross-referenced with each other.

[11] What SNA08 refers to as imputed ownership change adjustments

Data confrontation between compiling agencies within countries would seem to be a best practice.

### b) International data confrontation

National data confrontation would normally take place, and it is expected that most countries will be able to assess and improve the quality of their new estimates related to global production. International data confrontation — or more precisely — bilateral / multilateral country data confrontations are more challenging. However, given the changes to the nature of trade in goods and services resulting from the implementation of the ownership principle as well as any changes to the delineation of industries, international data confrontation will likely be important to ensure international consistency in trade (and production) estimates for both domestic measures and measures of these activities abroad. Agreement on trade adjustments and on the industrial classification of large firms engaged in aspects of global production would go a long way towards achieving international consistency.

Bilateral data confrontation is increasingly viewed as a best statistical practise that would typically focus on major trading partners. It would also ideally include countries where the purchase or sale of processing services is significant and/or expanding at a fast pace. Data confrontations do not have to take place annually to be effective. One obstacle to this effort is willingness of partner countries to undertake bilateral comparisons

Restrictions can be one impediment to willingness. Legislation may exist in some jurisdictions which constrain the amount of information that can be exchanged with compilers in other countries. This most often applies to discussions of statistics that are best confronted with micro data from large transactors, which are covered by confidentiality rules. Nevertheless, some progress can be made in these cases. For example, while it may not be possible to compare data for individual countries, it may be acceptable to discuss in which industries certain major players (say in processing services) are classified between two countries. This in turn sheds light on the statistical treatment of transactions and can lead to more consistent international data. This can also be supplemented by (i) detailed comparisons and discussions of industry estimates and (ii) trade in goods and/or merchanting adjustments.

Given the nature of global production and the difficulties in adapting statistical systems to it, it may be necessary to conduct multilateral data confrontations. In this sense, such data confrontations are also costly, with travel involved and implication of more than a few staff. Given the cost of such an investment, the expectation is that it should generate benefits to both parties. That said often the major trading partner for one country is not a major trading partner from another country's perspective. When this situation arises, the return on data confrontation investment is obvious for one of the partners and not for the other.

One way to deal with the challenges associated with international data confrontations is for international agencies to support bilateral data confrontations. As an example, statisticians regularly incur the cost of attending meetings at the OECD and this provides an opportunity to facilitate data confrontation (say by something as simple as supplying some small meeting rooms over a few days to facilitate this process). For countries, staying on for an extra days to meet 2-4 key partner countries (arranged in advance) is an efficient method of data confrontation. This would serve the needs of those countries as well as those of the international agencies, in terms of better quality data.

## IV: Summary-conclusion

Country compilers will likely adopt global production measures and adjustments to trade flows by using a mix of the above-noted sources and approaches. This mix will largely reflect data availability in those countries. In the end, country compilers will have to make pragmatic decisions on how to adjust their measures as well as how far to go towards the new standards, especially with respect to factoryless goods production. In this regard, the sharing of experiences will be a useful addition to international data confrontation efforts.

Lastly, it will be desirable to harmonize to the extent possible countries' implementation plans (timetables) in adopting the SNA08 and BPM6 recommendations related to global production and trade, given that international comparability of data is an important issue.