Implementing Comprehensive Revisions in the Canadian SNA: Challenges and Future Directions

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Implementing Comprehensive Revisions in the Canadian SNA:
Challenges and Future Directions

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Abstract

Following a multi-year effort spanning a range of integrated programs, the Canadian SNA has undergone a comprehensive revision, the results of which were published beginning in 2012. This was the first substantial revision to the integrated Canadian accounts since the mid 1990s. Revised SNA 2008 concepts and recommendations, such as the capitalization of R&D and the introduction of an NPISH sector were implemented, along with a range of quality improvements and a substantial overhaul and modernization of classification frameworks.

The scale of the 2012 comprehensive revision and the level of detail in the existing program necessitated important cost-benefit tradeoffs in revisions to historical data. In particular, a decision was made not to revise historical annual regional input-output and supply-use tables, the cornerstone of production estimates and a key mechanism for assuring coherence across SNA accounts and productivity estimates. Looking forward, Canada will move away from the former "big bang" approach to implementing more frequent, smaller scale revisions. This requires a rethink of our current revision policy and a new strategy for ensuring the coherence of historical data across integrated national accounts programs.

This paper will provide an overview of changes implemented in the 2012 Canadian comprehensive revision, highlighting lessons learned and plans for the future. It will also explore practical and operational challenges for a feasible ongoing strategy to assure the coherence of historical estimates in the context of more frequent comprehensive revisions.

Acknowledgements

Introduction

This paper will provide an overview of recent experience in implementing comprehensive revisions in Canada's System of National Accounts, reviewing accomplishments in the most recent "big bang" historical revision released in 2012, in addition to new issues targeted for 2015 and future directions for the Canadian macroeconomic accounts program. It will cover new SNA concepts, classifications and measurement standards introduced, along with other improvements to enhance coherence, exploit new source data and improve estimation methodologies when historical time series were open to revision.

A concluding section will cover tradeoffs, challenges and lessons learned with the 2012 comprehensive revision and the move away from "big bang" to more frequent, smaller scale historical revisions in Canada. It will describe the role of detailed regional supply and use tables in the compilation process for GDP-related programs and explore tradeoffs in determining the appropriate strategy for assuring the coherence of historical estimates moving forward.

I. Canada's recent experience with comprehensive SNA revisions

Prior to the 2012 comprehensive revision in Canada, the last such **"big bang"** undertaking was nearly 15 years previously in 1997. At that time, a number of new concepts from SNA 1993 and BPM5 were introduced across the integrated macro-economic accounts including an expansion of the asset boundary to include mineral exploration. Institutional sector boundaries were redrawn, in particular as a result of a re-examination of the public universe, resulting in important changes. The Canadian institutional sector accounts transactions were further developed, and components previously available annually were estimated quarterly in a fully integrated sequence of economic and financial accounts.

Leading up to the release of the 1997 historical revision, regular production of non-critical outputs, such as the annual national Input-Output Accounts (supply and use tables) was suspended for a period of time, as were associated benchmarking and reconciliation processes. This allowed key staff to focus on the substantial planning and development work required in the overhaul of the integrated program. Virtually all published time series were revised back to 1961.

A number of other "one-off" smaller changes were introduced in the intervening years leading up to the next comprehensive revision in 2012, at times precipitated by changes to the US national accounts, with which comparability is very important in Canada. These included changes to the treatment of public sector pension plans in 2000, the expansion of the asset boundary to include software in 2001 and the introduction of the chained Fisher measure for volume estimates of quarterly GDP expenditure based in 2001 and for real GDP by industry 2002. In 2003-04, the sector balance sheet accounts and International Investment Position were converted to a quarterly frequency and introduced market valuation for relevant assets and liabilities (the bulk of tradable securities). Also, on the international side, an outward foreign affiliates' statistics program was introduced in 2000.

In the late 1990s, significant investments were made in the regional dimensions of Canada's national accounts to satisfy important fiscal requirements. With the introduction of the Harmonized Sales Tax (HST) in 1997, statistical data would be used to allocate sales tax revenue among the federal government and the participating provinces. In an initiative known as the *Project for the Improvement of Provincial Economic Statistics (PIPES)*, important advances were made to the infrastructure and underlying source data for economic surveys to produce provincial estimates of sufficient quality for revenue allocation. The national accounts program was expanded to include annual regional supply-use tables, which would not only provide required inputs to fiscal formulas but also serve as a detailed, integrating coherence mechanism to assure data quality. The annual supply and use tables would provide an estimation framework for inter-provincial trade flows, previously modelled using experimental provincial tables estimated for selected years. This in turn allowed for the annual estimation of real GDP expenditure based by province, with trade flows estimated up to the current year using a "synthetic" supply and use projection from published benchmarks.

Since their inception for use in sales tax allocation with reference year 1997, Canada's integrated regional accounts have come to serve a variety of other uses, including expanded exploitation in the federal Equalization program, to equalize fiscal capacity among the provinces. Annual regional input-

output tables are now the basis of a widely exploited economic impact simulation service, used to simulate the impact of exogenous shocks across Canadian industries, provinces and territories.

1. Comprehensive revision 2012[1]

Some 15 years later with the approach of the 2012 revision, the complexity and detail of Canada's national accounts program had increased considerably vis-à-vis that in place at the time of the previous historical revision in 1997. The program housed fully integrated regional production accounts, including supply and use tables mirroring the same detail available nationally. New obligations for HST allocation and the federal equalization program meant that suspending production temporarily to undertake the required development work could not be considered. In addition, available resources were limited as federal government programs entered a period of fiscal restraint.

A number of important changes were nonetheless required to assure international comparability, maintain the relevance of the program and reap the benefit of ongoing quality improvements to the underlying source data. An ambitious multi-year project was planned and implemented for the redevelopment of estimates across the integrated program. It included the implementation of new concepts from SNA2008 and BPM6, an overhaul and modernization of classification frameworks and a range of statistical improvements. A Historical Revision Steering Committee was established and a series of working groups supporting it prepared documentation, assessed the feasibility of changes and took an active part in generating the new estimates. Changes implemented in the 2012 comprehensive revision will be discussed in turn in the sections to follow.

New Concepts and Valuation

Capitalization of Research and Development

With the 2012 comprehensive revision, purchased and own-account research and development was capitalized throughout the integrated macroeconomic accounts program. This included the quarterly sector accounts and estimates of GDP income and expenditure based, supply and use tables, GDP by industry and the productivity accounts. New estimates in the core accounts drew on pioneering work undertaken in a Research and Development Satellite Account released in 2008.

Estimates were built using a variety of data sources including annual surveys of gross expenditures on research and development by both market and nonmarket units. As these surveys were not designed with national accounts requirements in mind, their exploitation in core SNA estimates came with a number of measurement challenges. These included the separate identification of software investment to avoid double-counting, as software was already capitalized in the Canadian SNA. Available data sources also lacked some essential detail required for building industry accounts estimates, such as revenue from sales and breakdowns identifying primary income variables. Working with enterprise-based surveys also presented an important challenge from an industry perspective.

In Statistics Canada's detailed annual supply and use tables, two new commodities were added (purchased and own account R&D) and an industry was created to which all R&D production was

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[1] See Statistics Canada 2012, *Revisions Analysis – Canadian System of National Accounts 2012*.

attributed. A variety of adjustments to previously published outputs, inputs and final demand were required across a range of industries, products and sectors. There were corresponding impacts on the quarterly sector accounts and estimates of GDP income and expenditure based, and real GDP by industry.

The capitalization of research and development had a relatively small impact on the level of overall GDP in Canada but a large impact on investment by universities, classified to the government sector, and on overall levels of machinery and equipment investment, redefined to include a subcomponent of intellectual property products including R&D, software and mineral exploration.

Capitalization of military weapons systems

Prior to the 2012 comprehensive revision some defense spending was capitalized in Canadian SNA including expenditures on non-residential structures and engineering (for example, military bases and airports). Expenditures on military weapon systems including vehicles and other equipment such as warships, submarines, military aircrafts, tanks, missile carriers and launchers were treated as current expenditures. The SNA2008 recommends that military weapon systems be capitalized and that single-use weapons (e.g., ammunition, missiles, rockets, bombs) be treated as inventories. With the 2012 historical revision military weapons systems were capitalized but, due to data limitations, expenditures on single-use weapons continue to be treated as current expenditures.

Defence- related investment in non-residential and residential structures and military weapons systems were grouped into a single investment 'defense' category. The change increased GDP by the amount of capital consumption of weapons systems, with an offsetting change between government current and capital expenditure.

Consumption of fixed capital

Before the 2012 comprehensive revision the consumption of fixed capital was estimated using differing rates of depreciation, and portions of the capital stock were valued at historical cost and at replacement cost. Specifically, the consumption of fixed capital for corporations, unincorporated businesses and government business entreprises was estimated on a historical cost basis using a linear depreciation method, while that of the government sector was estimated on a replacement cost basis using a linear depreciation method. The depreciation of residential structures and farms was estimated on a replacement cost basis using a geometric depreciation method and the depreciation of facilities for rent was on a historical cost basis.

In accordance with SNA 2008 recommendations, with the release of the 2012 comprehensive revision, the Canadian SNA moved to value CCA on a replacement cost basis using a geometric depreciation method for all sectors. The move to the new method in the corporate sector did not impact GDP, as changes were offset in other components of surplus. Given the cost valuation of the government sector, the new method had the effect of increasing levels of capital consumption, government output, surplus and GDP. Growth patterns were not significantly affected.

Valuation of assets and liabilities

While SNA2008 and BPM6 indicate that assets and liabilities be recorded at market value, the valuation of equity in both the National Balance Sheet Account and the International Investment Position in

Canada were a mix of market and book value prior to the 2012 comprehensive revision. More specifically, the equity of publicly traded companies treated as portfolio investment was at market value while the balance of equity was at book value. With the release of the comprehensive revision in 2012, unlisted and intercompany investment was revalued to market prices, resulting in all components of equity consistently valued in the National Balance Sheet Accounts and International Investment position.

Following accepted international standards, the market capitalization approach was used, applying capitalization ratios (market value over book value) derived from listed companies and to the book value equity estimates of unlisted companies to estimate a market valuation. Exceptions were made in specific cases (e. g., small companies, specific sectors). Moving all equity to a market value provides a more accurate picture of the value of assets and liabilities across all sectors and increased the net worth of the household sector, where the bulk of this equity is ultimately held.

New Classification Frameworks

As part of the 2012 comprehensive revision, a range of updated and modernized classifications were implemented across the components of the Canadian SNA. These are summarized below:

Modernized Industry and Commodity Classifications [2]

A new industry classification referred to as the Input-Output Industry Classification (IOIC) was introduced, reflecting a special aggregation of the North American Industry Classification System (NAICS). The modernization and streamlining of the Input-Output accounts resulted in a reduction in the number of industries to 241 from approximately 300 at the most detailed level. The new NAICS-based classification eliminated obsolete detail in manufacturing and expanded the number of service-producing industries, in line with their growing importance in the Canadian economy. New detail was introduced for retail and wholesale trade in particular, as well as professional services and new industries were introduced for oil and gas extraction, to reflect the split of conventional and non-conventional activity.

A new commodity classification was similarly introduced, referred to as the Input-Output Commodity Classification (IOCC),   a special aggregation of the North American Product Classification System (NAPCS). As part of the modernization and streamlining process, the overall number of commodities was reduced significantly from 727 to 488, by applying a size criterion to eliminate obsolete detail in manufacturing. The number of service-related commodities was increased from 147 to 173, with expansions occurring in information services, finance and insurance, arts, entertainment and recreation services and professional services.

Estimates of international trade in goods and investment were also aligned to the IOCC. Increased detail was introduced in a number of areas, for example international trade detail in the quarterly Income and Expenditure Accounts was increased from 12 to 30 commodity groups.

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[2] See Statistics Canada 2013, *Modernization of the Input-Output Tables*.

A new classification of household expenditures by purpose was implemented, based on the international Classification of Individual Consumption according to Purpose (COICOP). The new, better harmonized classification has 107 categories, with reduced detail for purchases of goods and an increased number of services categories.

Assets and liabilities

The classification of assets and liabilities in the Financial Flow Accounts, National Balance Sheet Accounts, Balance of International Payments and International Investment Position were better aligned to international standards. Separate asset classes within produced assets were added for intellectual property products and defence, as well as limited derivatives details were added as a distinct component of financial assets. Corporate and government claims, asset and liability categories that represent aggregated intra-corporate loans, and equity holdings were split into underlying asset classes.

Institutional sectors

Prior to the comprehensive revision in 2012, there were three main resident institutional sectors with respect to incomes, outlays and saving: the persons and unincorporated businesses sector, the corporate sector, and the government sector. The persons and unincorporated business sector included non-profit institutions serving households, credit unions, life insurance companies, fraternal organizations and collective investment schemes such as pension plans and mutual funds. Separate non-financial and financial corporation sectors were not articulated for incomes and outlays.

With the 2012 comprehensive revision, the Canadian SNA adopted the basic SNA institutional sectoring detail throughout the sequence of integrated accounts. The persons and unincorporated business sector was split between households and non-profit institutions serving households. The current account for credit unions, life insurance companies, collective investment schemes and fraternal organizations were moved to the financial corporation sector to match the transactions in the financial accounts. The incomes and outlays of non-financial corporations were identified separately from financial corporations. This allowed for a better aggregation of financial accounts institutional sectors (about 30) to the current accounts sectoring.

Non-profit institutions serving households

Work to build the NPISH sector began with the creation of a more broadly defined satellite account of non-profit institutions and volunteering, first released in 2004. The non profit institutions serving households portion of this broader non-profit sector was implemented in the core SNA with the 2012 comprehensive revision. Estimates were built from a variety of sources including administrative files on registered charities and other non profit institutions. A range of statistical improvements to better define the universe and account for measurement deficiencies were undertaken in addition to the sectoring changes. These included delineating the purchases of households from the NPISH sector. Revised industry and final demand estimates were correspondingly introduced in the supply-use framework of the Input-Output Accounts.

The creation of a true household sector is an important step forward for the Canadian SNA. By "purifying" measures of household incomes and outlays, saving and disposable income, international comparability is increased and better linkages to household survey information are enabled, allowing for a clearer reconciliation between distributional information and macroeconomic estimates.

<u>Aboriginal general government</u>

Despite significant data gaps and after extensive consultation, a separate sub-sector for aboriginal general government was created and released as part of the 2012 revision. Activities of aboriginal government entities were formerly included in the "persons and unincorporated business" sector, consolidated with the activities of non profit institutions. This treatment was not ideal, but a compromise necessitated by data limitations. Source data to build the new estimates was drawn from publicly available financial statements of aboriginal government entities, the federal public accounts, administrative sources and specific industry detail for investment and labour components.

Quality Improvements

In addition to revised concepts and classification changes, a number of important statistical improvements were introduced in the 2012 comprehensive revision to revamp estimation methodologies or incorporate source data not previously available. These included revisions to compensation of employees and mixed income to incorporate improved tax data along with a range of improvements to estimation methodologies for household consumption expenditure. New benchmarks were introduced for purchases of tobacco, new and used motor vehicles, charitable gaming, travel expenditures and FISIM. Purchases from non-profit institutions serving households were better delineated in the process of estimating a separate NPISH sector. Revisions were made to estimates of taxes less subsidies on production and products, mostly as a result of re-examining their treatment and reclassifying certain fees from sales of goods and services to taxes and vice versa.

Dividend receipts of the household sector were revised up considerably in the recent period following a special study that found them to be underestimated. Previously, dividends received by households were derived residually by deducting receipts from other sectors from totals declared. Research was undertaken to build alternate estimates directly from a variety of administrative sources. It indicated that the level of property income was underestimated beginning around the year 2000, largely due to a misallocation of investment flows associated with income trusts.

Revisions to the International Accounts

The international component of Canada's macroeconomic accounts program was revised in 2012 to reflect conceptual and presentational changes as per BPM6. The revisions also included classification changes and statistical revisions, and most were carried back to 1981.

For the Balance of Payments current account, trade in goods adopted the North American Product Classification System, including a major change to reclassify maintenance and repairs from trade in

goods to trade in services. For trade in services, postal and courier services were reclassified from commercial services to transportation.

Important statistical improvements were introduced to trade in commercial services in the 2012 comprehensive revision. A project was undertaken in 2006 to compare all available data sources, taking advantage of work in course to link the Balance of Payments survey frame and Statistics Canada's Business Register. The population of enterprises engaging in trade in commercial services was better identified and a specific module was added to Statistics Canada's Unified Enterprise Survey with an increased sample and improved survey methodology. As a result of this effort, estimates were revised back to 1997 and corresponding changes were introduced across the Macroeconomic Accounts program.

A change in treatment was introduced to recognize resident/non-resident income of compensation of employees, whereas previously these were treated as services trade. Investment income components were aligned more closely with assets and liabilities in the BOP financial account and the International Investment position.

Another change in treatment was introduced to treat changes in financial claims and liabilities arising from the change in residence of individuals as other changes in the volume of assets and not as transactions in the Balance of Payments. The capital and financial accounts were both revised to exclude such flows.

For the financial account, components were modified by renaming and restructuring the classification of assets and liabilities, affecting the functional breakdowns of direct investment, portfolio investment, reserves and other investment to align with recommended changes in BPM6. New aggregates were introduced, notably foreign direct investment on an industry (NAICS) basis, and terminology was updated. A notable change was made to the sign convention in the financial accounts, which as per BPM6 reverses a longstanding traditional presentation of the BOP.

The above-noted changes to the BOP financial account were carried through to the International Investment Position. In addition revisions specific to the IIP were introduced, including an improved treatment of multilateral loans, and improvements to the geographical breakdown of portfolio equity liabilities. The largest change to the IIP resulted from estimating market values for foreign direct investment positions, previously recorded at book value, as noted above.

New presentation for the quarterly national accounts [3]

When Canada implemented the SNA1993 and BPM5 in 1997, the suggested articulation of accounts was only partially adopted. The new Canadian presentation published in October 2012 is more in line with the international "sequence of accounts" presentation, aligning terminology and concepts from

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[3] See Statistics Canada 2012. *A New Presentation for the Quarterly National Accounts*

SNA2008 and BPM6. As previously noted, sector detail was expanded to include NPISHs, Aboriginal governments, and complete detail for financial and non-financial corporations throughout the sequence of accounts. The new terminology and presentation represented a substantial change for the Canadian user community and necessitated a substantial communication effort, including documentation describing the nature of the changes and face-to-face presentations and workshops for a range of user groups.

 While most components are now fully developed, selected gaps still exist to articulate the full recommended sequence of accounts. These are on the agenda for future development and will be discussed further below. They include a full production account by SNA sector and the articulation of financial transactions into revaluations and other volume changes.

Summary/conclusion

The 2012 comprehensive revision was an ambitious multi-year undertaking and, as discussed, introduced important updates and improvements, to concepts, classifications, and data quality throughout integrated Canadian macroeconomic accounts programs. Terminology and presentation were better-aligned to international standards.

In terms of quantitative impacts, the level of overall gross domestic product and its growth patterns were not substantially altered by the changes. As highlighted throughout the preceding sections, however, revisions to specific details were at times quite significant.

2. Issues targeted for Comprehensive Revision 2015 and other forthcoming changes

Government Financial Statistics

Statistics Canada has a long history of publishing government finance statistics, including both public finance and public sector employment. The program measures the dimensions of the Canadian public sector, covering revenues, expenditures and surplus or deficit, along with assets, liabilities and net worth or net debt position for the federal, provincial-territorial and municipal subsectors. Since government financial statements are based on the organizational structures and accounting practices of individual governments, there is a lack of consistency across jurisdictions and over time that must be accounted for in comprehensive official statistics.

In recent years, Canadian government reporting has moved from modified-cash accounting to an accrual- based accounting system. As such, the statistical system underlying government finance statistics was in need of revision to reflect these changes. To ensure international comparability, Statistics Canada is moving towards reporting on a Government Finance Statistics (GFS) 2001 basis. In contrast to prior reporting practices in place, the GFS has the advantage of being fully integrated with SNA2008, enabling improved measures and greater coherence among the components of the Canadian macroeconomic accounts program.

In order to incorporate specific Canadian realities, adaptation of the IMF standard is required in select instances. The resulting Canadian GFS standard (CGFS) will be the basis of forthcoming estimates starting with fiscal year 2008/9.

Along with the CGFS estimates, Statistics Canada has been developing the corresponding Canadian variant of the functional Classification of Outlays of Functions of Government (COFOG), which will soon be published for fiscal years 2008/9 through 2013/14. At the first release, COFOG detail will be published for the 12 major groups only. Sub-detail will be developed over time, the first areas of emphasis being health and justice.

Actuarial measurement of defined benefit pension plans

The SNA2008 puts forward the notion of *pension entitlements* to refer to pension obligations arising from defined benefit or defined contribution plans. These entitlements may be built up by employer or employee contributions. The SNA2008 recommends that estimates of household wealth for defined benefit pensions plans be based on the actuarial liability for future benefits rather than on the value of pension plan assets, which is currently the case in the Canadian SNA.

Consequently it is planned that, beginning in 2015, household compensation income for defined benefit pension plans will be measured on an accrual basis. The accrual estimate represents the portion of the present value of future pension obligations attributable to a specific year. In SNA terms, this will be articulated as the sum of actual and imputed contributions to pension plans. Imputed contributions represent the actuarial deficit or surplus in employer actual contributions due to employees for current period employment, including administrative expenses.

Annual benchmarks for the accrual estimate will be derived from Statistics Canada's Pension Plans in Canada program's estimate of "employer contributions for current service required" and administrative data from the quarterly Survey of Trusteed Pension Funds. Data will be confronted with pension expense indicators from business financial surveys, in particular the Quarterly Survey of Financial Statements, and adjusted as required to assure coherence in the estimates.

The accrual measure avoids volatility in compensation income when employers make sporadic cash payments into pension plans to account for actuarial deficits, or take contribution "holidays" in the case of a surplus. For the government sector, where GDP is measured by the sum of costs, the volatility in cash pension contributions can affect the growth nominal GDP and lead to distortions in the GDP deflator, particularly at the provincial level. For the business sector, the cash treatment of pensions in labour compensation may result in inconsistencies with how businesses expense these amounts and consequently with surplus estimates derived from economic surveys by industry and by province.

Household property income for defined benefit plans will also be revised to an accrual basis. Income receipts on pension assets will be the sum of the monetary (cash) interest and dividends received by the plan and imputed interest for underfunded or overfunded actuarial liabilities.

Sectored quarterly natural resource wealth

Canada has significant endowments of natural resources, including oil and gas, minerals and timber. Currently, standard quarterly estimates from Canada's National Balance Sheet Account (NBSA) lack a full accounting for natural resource assets. While extensive work has been undertaken to develop annual estimates and assess their impact on national wealth, they have up to now not been included in the more timely quarterly accounts framework by institutional sector.

Non-financial assets currently recorded in the sectored NBSA include only land and produced assets. The exclusion of natural resources is a significant data gap that results in a misalignment measures of corporate equity at market value and corporate sector net asset value (total corporate assets less liabilities).

A project has been undertaken to develop a conceptual approach, data sources and methodology to integrate natural resource wealth into standard quarterly estimates in the National Balance Sheet Accounts. The approach derives from an interpretation of both SNA2008 and SEEA with a focus on economic ownership appropriate in the Canadian context. Institutional sectors can have claims on (corporations) or associated with (governments) natural resources that are based on the benefits to those sectors accruing from extraction. These claims are viewed as intangible assets.

In terms of the estimation methodology, starting from existing data from Statistics Canada's natural resource stock accounts in physical volume terms, estimates of quarterly natural resource wealth values are constructed using sales revenue and extraction costs indicators. Royalty to rent ratios are applied to partition natural resource wealth between the corporate sector (the principal economic owner) and the government sector (the legal owner in Canada).

The project will result in a significant increase in the coverage and level of net worth by sector. Findings from provisional estimates show that most of the natural resource wealth is allocated to the corporate sector and the remainder to the provincial, territorial and federal government sectors. These new assets, and associated measures of net worth by sector, fluctuate in tandem with resource prices.

Full integration of quarterly sectored natural resource wealth is targeted for publication with the December 2015 release of the National Balance Sheet Accounts.

International accounts convergence to international standards

A number of revisions are planned to improve detail in the Balance of Payments and International Investment Position and better align them with international standards and recent changes in the U.S. Conceptually, these include changes to the presentation of foreign direct investment to show an asset/liability presentation rather than netting claims of affiliates against their parent firms. In addition, FDI will be broken down by equity and debt components, and improvements will be made to the instrument breakdown of reserve assets and the other investment functional category. A number of statistical revisions are also planned, notably a review of estimates of international travel spending.

Increased detail for principal trading partners

Work has been undertaken to substantially expand the geographical detail in Balance of Payments - based trade in goods. Estimates will be introduced at the end of 2014. While significant country detail is available in customs-based estimates of merchandise trade, Balance of Payments estimates have up to now been prepared for only a limited number of trading partners, including the United States, United Kingdom, Japan and 3 regions (other European Union, other OECD and other countries). This detail will now be expanded to include 27 principal trading partners on a quarterly basis, to reflect changes in the global landscape and the recent evolution of patterns of trade.

Since Balance of Payments estimates of imports reflect country of export (a proxy for ownership change) rather than country of origin, the new estimates will result in a significantly different view of Canadian trade balances with countries. For example, since a large share of imports enter Canada via the US, Balance of Payments imports from China will be significantly lower than customs imports, and country trade balances will reflect this view. An effective communication strategy has been implemented to explain the differences. The new estimates will be better integrated with other macroeconomic aggregates, will result in reduced trade asymmetries and will better enable the construction of global input-output tables and estimates of Trade in Value Added (TiVA).

Expanded foreign affiliates statistics

Work is underway towards increasing the details published for Canadian affiliates operating abroad. At the same time, new estimates of inward foreign affiliate statistics are being developed using a record linkage approach. It is expected that official estimates will be released in 2015. It is further expected that these will be useful in the future generation of global production and trade estimates (discussed below).

Modernization of capital stock

Estimates of Canada's stock of residential and non-residential produced assets (building and engineering construction, machinery and equipment and intellectual property products) are prepared annually according to the perpetual inventory method using the Capital and Repair Expenditures Survey (CAPEX) as a primary data source. Planned improvements to the estimation system will ensure that estimates are better-integrated with SNA industry and asset detail contained in the Input-Output Accounts, both in nominal and in real terms.

 Updated service lives and depreciation profiles will be introduced, likely resulting in downward revisions, primarily due to lower surveyed service lives for non-residential buildings. Estimates will be released in 2014 and integrated into the core SNA the following year. A reconciliation table will articulate differences between capital flows from survey results and adjusted SNA estimates.

3. Issues targeted for Comprehensive Revision 2018

Financial services

It was originally hoped to introduce refinements in the 2012 comprehensive revision to align Financial Intermediation Services Indirectly Measured (FISIM) an insurance services to SNA 2008 concepts and measurement . A subsequent decision delayed implementation to ensure convergence with international measurement practice in light of the findings of the ISWGNA FISIM task force and planned revisions at the Bureau of Economic Analysis in the United States.

Changes are now targeted for 2018 in tandem with a more comprehensive statistical review to improve data quality and coverage for selected financial industries, including holding companies, sales and business financing companies, trust and mortgage loan companies, credit unions and securities dealers and brokerages. The review will also include a re-examination of the treatment of quasi-corporations in the Canadian SNA.

For the measurement of FISIM, key recommendations considered in Canada include the following:

- Total borrower and depositor services should equal the net interest income less an adjustment for own funds. Indirect charges for interest apply only to loans and deposits.
- The use of a weighted average of the endogenous interest rates on loans and deposits to determine a weighted mid-point reference rate.
- Excluding credit default risk in the calculation of FISIM.
- Estimation of international flows distinctly for domestic and foreign currency.
- Volume measures generated using a deflated stocks approach with a general price deflator (CPI) and domestic price indexes used for exports and appropriate country prices for imports.
- Coverage to be expanded to include securitization activities, the Central Bank and a number of Government Business Enterprises not previously included.

Concerning the treatment of insurance, changes are planned to adopt the use of the expected claims rather than actual claims in the valuation of output, household consumption expenditures and intermediate purchases by the business sector as per SNA2008. This will better represent the risk-pooling activity of insurance companies and avoid distortionary price impacts at times of natural disasters or catastrophic events.

Head office industry

Currently in Canada's Industry Accounts head office activity is included in the industry of the establishments it supports and not in a separate industry as per North American Industry Classification System (NAICS) and ISIC conventions. While previously Statistics Canada's Unified Enterprise Survey did not cover all head office units, coverage was expanded to be comprehensive starting with reference year 2010. A feasibility study has been undertaken to assess operational requirements to create a new industry. It involves the elimination of double-counting across industry data sources and the assessment of quantitative impacts and potential time series breaks. The availability of new, comprehensive data on

head office inputs and outputs may result in statistical revisions in addition to the required classification changes.

While the creation of a head office industry is targeted for 2018, time frames may be re-examined when the study is concluded and quantitative impacts across the integrated industry program, including timely monthly measures of real GDP by industry, are better understood.

Household actual final consumption

The availability of COFOG detail will allow the refinement and integration of household actual final consumption in the Canadian SNA. Limited data are compiled for health and education for the purposes of international submissions, but have to date not been part of the regular quarterly accounts program. The estimates have been developed for the government sector only and have excluded individual consumption of goods and services provided by the NPISH sector.

New estimates of household actual consumption and corresponding actual disposable income are targeted for publication within the next couple of years. While publication detail has not yet been determined, it's hoped that quarterly estimates for major categories will be produced, including both government and NPISH individual consumption expenditures. Estimates by province and territory will be prepared on an annual basis.

Quarterly production account by sector

While Canada's benchmark production accounts, the annual Supply and Use Tables, distinguish business and non-business industries, a production account according to standard SNA sectors has up to now not been presented as a component of the flow of accounts in the quarterly institutional sector accounts. Work is in course to develop quarterly production accounts according to the broad SNA sectors (Households and unincorporated business, NPISHs, financial and non-financial corporations and governments). Estimates will be produced in nominal terms back to reference year 2007 and will be fully aligned with published aggregates. Release is targeted within the next couple of years, but timeframes may be reassessed as the work proceeds.

4. Future Directions

Outstanding issues for G20 Data Gaps and SDDS Plus

The Global Financial Crisis revealed significant data gaps in countries' domestic and international financial information systems and frameworks. While Statistics Canada is well-positioned to respond to the majority of issues identified in the G20 Data Gaps initiative, a number of specific gaps remain requiring additional development. These also tie into the potential sign-on to the Special Data Dissemination Standard Plus (SDDS Plus), to create the required core set of data necessary for financial stability analysis. These gaps include distributional measures of household wealth and understanding the role of revaluations in household net worth, particularly with respect to residential real estate prices. In addition, while the Financial Flow Accounts and National Balance Sheets provide detail on each sector's assets and liabilities, they lack sufficient information to analyze the risks associated with sector holdings (counterpart data, maturity, etc). Lastly, the timeliness and frequency of credit market information is not sufficient to enable financial monitoring.

Required investments to close these data gaps include the following:

- Development of an Other Change in Assets Account
- Distributional information on household wealth collected via regular iterations of the Survey of Financial Security
- Residential Real Estate Price Index
- Enhancement of securities database
- To Whom From Whom Matrix
- Some potential investments in basic data collection on financial surveys.

Global production and trade

As in many other countries, Canada is assessing impacts and data requirements for SNA2008 and BPM6 recommendations on goods sent abroad for processing and merchanting activities as well as the related challenges associated with factoryless goods production. As a result, implementation is a longer- term goal. A committee of senior management has been struck including representatives from across implicated areas of the organization, including SNA programs, analytical studies and economic surveys. Its activities have so far included input to international guidelines, assessment of data requirements and gaps and participation in preliminary discussions with US partners on these challenges as well as on the classification of Factoryless Goods Producers in the North American Industry Classification System.

Production-based estimates in the Canadian SNA are anchored on detailed annual regional Supply and Use Tables. Initial analysis indicates that, in practice, implementation of international standards for GSAP and the classification of factoryless goods producers may have profound impacts on the both their construction and interpretation. Further study and discussion is required to ensure guidelines are interpreted appropriately and impacts are well-understood prior to implementation.

While it has not yet been feasible to undertake a systematic quantitative assessment, depending on the interpretation of the economic ownership principle, required adjustments to gross trade flows to implement the recommended treatments may be important. It will be imperative to coordinate with key trading partners, the US in particular, to assure symmetric treatment.   Basic data gaps are being identified and a statistical approach has been mapped out, with a view to minimize any increase in survey response burden and optimally exploit administrative data. The approach will include record linkages, benefiting from a common business register, as a data confrontation and validation tool.

Other topics on the research agenda

In addition to the specific plans and commitments outlined above there are a number of other topics on the longer term research agenda at Statistics Canada relating to the macroeconomic accounts program.

Real output of the public sector

Experimental measures of productivity growth for the non-business sector have been developed and released as analytical studies by Statistics Canada. At present, for official estimates, the output of the non-business sector is generally measured with inputs and deflated with input costs, precluding meaningful productivity measurement. In light of the scale of the public sector in Canada, this results in incomplete coverage of economic activity in standard measures. To date, research has focused on health and education. Experimental measures of output and productivity have been developed for the education sector, hospitals, residential care facilities and physicians paid under the fee-for-service model.[4]

Gross Domestic Product for metropolitan areas

To respond to increasing interest in the role of cities, urbanization and growth, experimental work has been undertaken to estimate GDP by city. This work leverages a range detailed administrative files by geographic location and applies national accounts methodologies, controlling to published industry value added by province from the Provincial Input-Output Accounts. It is expected that experimental estimates will be released in the form of research paper in 2014.

Quarterly provincial GDP by Industry

While up to now provincial macroeconomic aggregates have been published annually by Statistics Canada, there is demand for sub-annual estimates and a number of provincial jurisdictions undertake their own projections with available indicators. A study is in course to assess the feasibility of producing quarterly provincial gross domestic product by industry. The work will involve an evaluating the quality and stability of potential sub-annual indicators and will be undertaken in consultation with provincial partners.

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[4] See Baldwin and Gu 2013, Gu and Li 2014, Gu and Morin 2014 and Gu and Wong 2012.

II. Challenges and Strategies moving forward

Recent challenges

As discussed earlier, the scope of the last "big bang" comprehensive revision in 2012 was ambitious and available resources were constrained. Given a similar revision had not occurred since 1997, a broad range of conceptual, classification and statistical updates were in scope for implementation across the integrated Canadian macroeconomic accounts program. Meanwhile, the breadth and complexity of the program had increased considerably, with significant investments in integrated regional accounts, much of which are built with detailed bottom-up compilation and reconciliation processes. In addition to the obvious substantive complexity, the managerial and operational dimensions of the 2012 comprehensive revision project were not without considerable challenges. Examples include controlling the scope of the revision to align it with available capacity, identifying impacts and dependencies among integrated programs, ensuring effective governance and decision-making and the need for sustained internal communication to ensure project any changes in strategy are well-understood by all implicated players. Substantial flexibility was required on the part of both staff and the user community, as changes in scope and direction were necessary as the project proceeded through the development and implementation phases. These adjustments resulted both from internal feasibility constraints and feedback from key users to optimize the timing of releases and thus facilitate their adaptation to the new macroeconomic accounts database.

Assuring access to human resources with the required knowledge and expertise to undertake the needed development work was an important element of the revision project. Since experienced SNA analysts are heavily engaged in ongoing production of current estimates, management of the additional workload resulting from the 2012 comprehensive revision was, in practice, a very significant challenge. While financial resources were available to fund the development effort and hire additional staff, the substantial learning curve to become a productive national accounts compiler meant that integration of new employees required sustained effort. In addition, natural staff turnover, demographics and retirements of key players resulted in a generally lower overall experience level of staff than was the case during the previous comprehensive revision in 1997.

Another important challenge related to reaching the full user community and ensuring all users were aware of and prepared for the upcoming changes. Mechanisms for engaging known key users were well-established and exploited, such as national advisory committees and bilateral mechanisms with key policy partners like the federal finance department, provincial government officials and the central bank. Reaching the full range of users of the macroeconomic accounts database was challenging, however, and required a range of additional communications initiatives.

Operational constraints precluded the implementation of the 2012 comprehensive revision for the entire historical macroeconomic accounts database at the same time. While many revisions (for example, the quarterly sector accounts, supply use tables in nominal terms and the international accounts) were released simultaneously back to 1981 for the current period, others (supply and use tables in real terms, IO models and derived analytical products, current estimates of real GDP by

industry and productivity measures) were released in subsequent phases. Revised provincial estimates generally lagged the release of national data and back-casted historical estimates were also generally released in subsequent phases. With a few specific exceptions, the full release process across all national account products spanned a period of over a year from the initial release in October 2012. While the only feasible scenario, this staggered release schedule resulted in a lack of coherence among national accounts products over the transition period and presented challenges for the user community.

The considerations outlined above, along with other factors, such as the US revision policy, led Canada towards a strategy of more frequent, smaller scale comprehensive revisions moving forward. In implementing this new strategy, efforts are being made to account for lessons learned from in the last "Big Bang" revision in 2012 and develop a systematic and sustainable approach. They include the establishment of ongoing governance mechanisms, project management tools and processes, expanded outreach and training and development initiatives to increase the knowledge base of staff and data providers and to engage partners and the user community.

The new revision strategy must allow the Canadian Macroeconomic Accounts program to evolve effectively to maintain relevance and international comparability. It must, at the same time, consider user needs for coherence and time series continuity, along with their capacity to understand and adapt to the required changes. Finally, it must be justifiable from a cost-benefit perspective and in line with the financial and human resources that can be secured. This will help ensure its feasibility from a workload and operational point of view, in light of ongoing production commitments.

Supply-Use tables as an integrating mechanism

As discussed earlier, for the Canadian Input-Output Accounts, a cost-benefit decision was made early in the process not to undertake a full recompilation of the tables for the historical period back to 1997. Instead, the revised, modernized tables would only be released for the current year (reference year 2009) and efforts would be made to back-cast prior years using a modeled approach as time and capacity permitted. This posed certain (non-quantifiable) quality and coherence risks, as the tables play an important role in ensuring the alignment of a range of SNA programs.

The Canadian Input-Output Accounts are detailed regional tables that are rectangular in design, covering both inter-industry relationships and commodity supply and use. After the recent streamlining and modernization at their most detailed level they cover 235 industry groups, based on the North American Industry Classification System (NAICS) and 481 products, based on the North American Product Classification (NAPCS). National tables have been produced annually since 1961 while annual regional tables were introduced in 1997 as part of an initiative to improve provincial economic statistics for use in fiscal formulas.

Canadian Input-Output Accounts
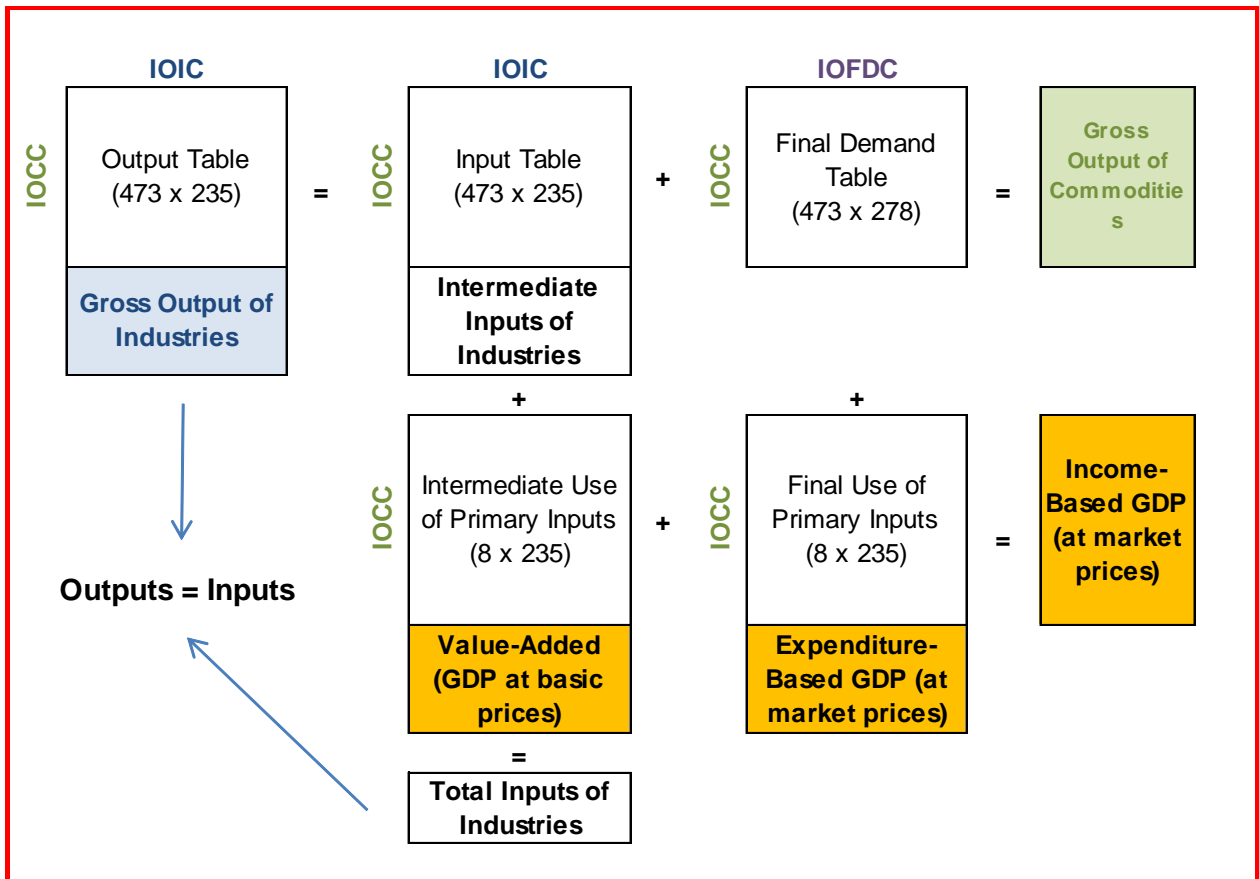
As illustrated by the diagram above, the IO accounts provide the comprehensive accounting framework to assure the coherence of all production variables. As such, they play and important role in quality assurance of estimates across the GDP elements of the integrated macroeconomic program. Via detailed annual revision and reconciliation processes, they serve as annual benchmarks for a range of other products in the macroeconomic statistics program. They provide the basis for monthly and provincial estimates of real GDP by industry, projected using partial information (e.g. gross output). They are fully reconciled with quarterly and provincial estimates of income and expenditure based GDP as part of the annual revision and compilation process. Their commodity supply and use dimension serves as the estimation framework for provincial trade flows in the provincial economic accounts, allowing for the estimation of provincial gross domestic product expenditure-based. They provide essential ingredients for the construction of labour and multifactor productivity and the KLEMS database, drawing on industry gross output and value added and purchases of energy, materials and services. Finally, they underlie a range of satellite accounts and other national accounts extensions, including, for example, tourism and culture and IO based environment accounts and models (such as GHG emissions and energy use).

Strategies to generate consistent historical estimates

Since the release of the results of the 2012 comprehensive revision, a number of alternate strategies have been employed to revise macroeconomic accounts products historically to ensure time series consistency. In many cases, these consisted of independent back-casting and linking exercises since a ground-up re-compilation of new supply-use benchmarks was not undertaken.

Income and Expenditure Accounts

While revised estimates for the quarterly Income and Expenditure Accounts have been released back to 1981, work to extend the consistent time series back to 1961 has been undertaken and is targeted for publication in the fall of 2014. Prior vintages of the data extend further back, to 1947 on a quarterly basis and 1926 annually, and will be maintained on Statistics Canada's publically-accessible dissemination database.

Real GDP by industry and productivity measures

For historically revised estimates of real GDP by industry, new benchmarks in volume terms were built back to the current reference year (2007), and a linking methodology was employed to generate results in the historical period. This methodology re-concorded previously published estimates to the modernized industry classification and accounted for major conceptual changes, such as the capitalization of research and development and military capital, in revised growth patterns for affected industries. Since new nominal value added benchmarks had not been estimated, it did not explicitly incorporate all statistical improvements introduced in other SNA products. Comparative analysis was undertaken with quarterly and provincial GDP income and expenditure-based to identify any important discrepancies in new published growth rates. A similar linking approach was subsequently undertaken for labour and multifactor productivity measures.[5]

Supply and use tables

Back-casted, revised IO tables have been published for reference years 2007 and 2008, estimated using a modeled approach.[6] The methodology follows a sequence of steps, first re-concording previously published estimates to the modernized classification, going back to source data for additional splits as needed. Adjustments for conceptual changes, by industry and commodity, are then layered on the re-concorded tables. Adjustments are subsequently made to align primary income and final demand with revised aggregates incorporated the 2012 revision changes to provincial GDP income and expenditure based. Finally, the tables are rebalanced, with large imbalances resolved on a case by case basis and the remainder eliminated using a mechanized algorithm.

The main purpose of the back-casted tables is to provide continuity for their analytical use. While sufficient for this purpose, since approximate modelling techniques have been applied in their re-estimation, their quality is not equivalent to ongoing estimates generated via direct compilation.

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[5] See Baldwin, Gu, MacDonald, Wang and Yan 2014.
[6] See Statistics Canada 2014, *Methodology for Back-casting Revisions to the 2007 and 2008 Input-Output Tables*.

<u>Provincial Long-run Analysis Dataset</u>

Analytical work has been undertaken to develop a long-run research database of selected provincial variables to study issues such as structural change, convergence/divergence, trend-cycle decompositions or the effect of infrequent events such as commodity cycles or recessions. The underlying dataset is constructed from a combination of current, official data and a variety of 'instrumental variables' that are used to estimate historical values, and thus greatly extend the span of time series available for analysis. The instrumental variables are drawn from a number of sources, including past vintages of official data, academic research and various types of regression-based projectors developed for the project. The historical data are estimated in such a fashion that constraints, such as additivity across units, are imposed while maintaining time series properties of the series, such as the trend-cycle aspects. While these estimates will not be characterized as official statistics, there are plans to release them publicly as an analysis dataset beginning in 2014.

The need for an ongoing integration strategy for the GDP program

As discussed earlier, plans are in place to undertake smaller scale comprehensive revisions where a predefined subset of changes will be adopted in 2015 and three years later in 2018. In some cases where new products are introduced, dependencies with other programs are minimal or have been accounted for in the development. Examples of this scenario include the quarterly production account or new estimates introduced for actual final consumption. These are less complicated from an integration perspective and release targets are more flexible.

In other cases, where important conceptual or measurement changes are introduced, implementation must be coordinated across a series of products and their coherence must be assured. Examples of these include GFS implementation, or revised estimates of FISIM and insurance to align with SNA2008 and BPM6 recommendations. As noted, this coherence of production variables in the current compilation period is assured via the supply and use framework. It is not feasible operationally, however, to recompile the detailed regional supply use tables historically each time a change is introduced, nor is it justifiable from a cost-benefit perspective. Consequently, there is a need for an ongoing, systematic strategy to ensure the coherence of historical estimates in the context of these more frequent, smaller scale revisions.

A project is underway to identify alternatives and evaluate the pros and cons of each from both a substantive and an operational cost-benefit perspective. Results and recommendations of the evaluation will be available over the coming year. A range of options are under consideration, including developing an aggregate "integration database" with specific commodity and industry detail that satisfies essential requirements for internal reconciliation and principal user needs.

Consultations and key user requirements

While essential detail required for internal reconciliation purposes for GDP-related programs is being evaluated and documented, a number of targeted external consultations have also been undertaken. These include presentations to a national accounts advisory committee, provincial government officials and bilateral discussions with selected policy partners. Since the most prevalent analytical use of the Input-Output accounts involves modeling economic impact, with a few rare exceptions, the absence of a historically consistent series of IO tables did not pose a major problem for most applications, provided a reasonable, historically-consistent industry database was available.

Next steps

While the ongoing compilation of Canadian national accounts estimates continues to be undertaken via integrated processes, the optimal systematic approach to maintaining coherence of production variables in the historical period as new revisions are regularly introduced continues to be developed. In addition to assessing options in light of local information requirements, lessons from international experience will be examined in the development of an ongoing strategy.

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