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SERVICES INDUSTRIES IN THE BUSINESS SECTOR OF THE CANADIAN ECONOMY

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The focus of this paper is an examination of concepts and statistics necessary to support the measurement of *real output* of services industries. Although applied to the business sector of the Canadian economy, the issues raised may in fact be relevant for many other countries. The Canadian practice is judged with reference to the international guidelines and recommendations. General methodological issues of deflation are examined, particularly double deflation, extrapolation and rebasing. The perennial problems such as the deflation of imputed banking services, insurance, trade margins, etc. are analysed with a view to provide some tentative solutions thereof. Quality assessment of statistics and the criteria used for such an assessment are indicated to share our concern with the international colleagues facing similar problems.

The focus of this paper is an examination of concepts and statistics necessary to support the measurement of *real output* of services industries in the business sector of the Canadian economy. Wherever appropriate, the Canadian practice is judged with reference to the guidelines and recommendations released about ten years ago in the *Manual on National Accounts at Constant Prices* (hereafter referred in this paper as *UN Manual*). There are 34 specific business services industries delineated in the Canadian System of National Accounts (CSNA). Appendix A on Constant Price GDP Annual Benchmarks, attached to this note, provides a brief description of the type of deflators used and a judgemental indicator on the overall quality rating of GDP by Industry. For readers who wish to pursue the subject further, some of the important documents are listed at the end of this paper.

GENERAL METHODOLOGICAL ISSUES OF DEFLATION

At the outset it is important to note that measurement of real output by industry and for the total economy is essentially the construction of a model or logical abstraction of actual transactions. "Volume" or "quantum" is always estimated with reference to time and weights. As we are all familiar with the index number problems associated with changing weights and aggregation, the estimated quantum measure at any level of aggregation is not an unambiguous phenomenon even if one has the most reliable value, price and quantity statistics in detail. This nature of deflation applies to goods, services, industries, whatever

Note: An earlier draft of this paper was presented at the third meeting of the Voorburg Group on Services Statistics, held at Wiesbaden, West Germany, October 4-6, 1988. The Voorburg Group is a body of volunteer countries in association with international organizations to promote methodology and comparability in the field of service statistics.

methods are used. However, the alternative methods e.g. double or single deflation can be examined from the point of view of their effect on the measures of real output.

(i) *Double Deflation*

The Canadian practice conforms to the UN recommendation. The *UN Manual* states: "In an ideal world real product by kind of activity would always be derived from an input-output table by double deflation (p. 55)." In Canada, the Input-Output Tables form the core of the production accounts. Input-output tables in their full details are produced annually both in current and constant prices. Real output by industry is produced using the preferred double deflation approach.

In the double deflation approach, one deflates commodity outputs of an industry, its intermediate use of commodity inputs and net indirect taxes. The difference between the deflated values of outputs and the total of commodity inputs and net indirect taxes equals GDP at factor cost in constant prices. The double deflation approach satisfies the requirement of an identity between GDP income and expenditure based estimates in constant prices. However, there are certain important hazards using double deflation for deriving GDP of an industry whose value added makes a small proportion of total gross output.

For such an industry, GDP estimated by double deflation might be erratic because small shifts in the relative prices for intermediate inputs and gross output could translate into big shifts in the resultant value added at constant prices. Here the *UN Manual* guidelines are not entirely satisfactory. They state: "The solution to this problem, however, may simply be to consolidate industries with very small ratios of value added to gross output with related industries at earlier or later stages of production. In other words, the problem of instability may be solved by aggregation into larger units whose values added are large enough in relation to gross output not to be too sensitive to the effects of changes in prices or technology (p. 53)." In one year, value added in one industry may be erratic but in the next, a different industry might suffer. *Ad hoc* aggregation into large units would disturb the continuity of time series. Thus one needs additional guidelines. In the CSNA, we have resolved this problem as follows: Values added are combined as suggested by the UN. The combined value added is redistributed using gross output or any other indicator as a proxy *but* the combined value as such for a sub-aggregate remains unchanged. Without this restriction, the above noted GDP identity requirement will not be satisfied.

(ii) *Extrapolation of the Base Year Value Added*

The *UN Manual* deals essentially with the problem of "extrapolation" of the base year value added by industry. One can extrapolate value added using constant price gross output, physical quantities of gross output, constant price intermediate inputs, employment etc. Should one prefer deflated output over physical quantities of gross output as a projector of base year value added? The *UN Manual* recommendation is: "The value at constant prices of the goods available in both years should be obtained by deflating the current year value by

a price index, rather than by extrapolating the base year value by a volume index .... The justification for this recommendation is that price relatives generally display less variation than quantity relatives. The range of variation of quantity relatives may be anywhere from zero to infinity whereas that for price relatives is much narrower (pp. 46-47)."

If in both the base year and the current year (a) the values of all relevant transactions, (b) the quantities of all goods and services and (c) the prices of all goods and services are recorded, then both choices give the same results and one need not worry about which method one uses. In reality, such a complete recording does not exist i.e. a statistician usually faces the problem of incomplete price and quantity information. Statisticians may still prefer quantities over prices if in their judgement the quantity information is less incomplete than price information.

(iii) *Rebasing*

It is self evident that the more remote the base year becomes, the less relevant are its prices for purposes of deflating the value of current flows of goods and services. (In the Canadian System of National Accounts, the base year is changed every ten years. However, we are analyzing the need to shift to a five year frequency. Our latest base year is 1981).

When the base year is changed, there are two ways in which it may be done in practice. The first method is to revalue not only all years subsequent to the new base year at the new prices, but also all the years preceding the new base year in order to have an unbroken series extending on either side of the new base year. The second method is to leave the data for all years up to and including the new base year unchanged and simply to use the new base year prices for valuing all flows of goods and services from the new base year onwards.

CSNA rejects the first method in favour of the second on conceptual grounds. One requires a new base year because the old one is not relevant anymore. Thus one can't honestly argue for the first method. But the *UN Manual* recommends the first method: "It is also recommended that the second method of rebasing should be replaced by the first method whenever resources make it possible (p. 18)." CSNA is fully aware that the conceptual argument becomes rather weak at the boundary. For example, the 1981 base year may be more relevant for 1980 than the 1971 base year. However, for operational reasons and convenience, the boundary period is not handled differently.

CSNA, for example, preserved the original growth rates of both total GDP and all the published sub-aggregates for the periods 1961-71 and 1971-81 when the base was shifted to 1981during the last historical revisions completed in 1986. All the details and totals were rescaled to 1981 base without disturbing the original growth rates. Components do not add to totals, but history is not rewritten everytime the base year is changed. This issue needs to be re-addressed.

Conceptually Satisfactory

Our understanding and appreciation of problems surrounding the measurement of real output of services industries would be enhanced if country practices

in this area were internationally known. This and the following sections detail our practices and our judgements in some of the most important areas of the economy.

Four industries (i, Monetary and Financial Institution: ii, Insurance; iii, Data Processing Services; and iv, Lotteries and Race Tracks) are considered conceptually unsatisfactory and reasons for their being judged so are detailed in a later section called *Conceptually Unsatisfactory.* All other industries are considered conceptually satisfactory. Though the two trade industries (Wholesale Trade and Retail Trade) whose principal output is trade margins, are considered conceptually satisfactory, a nagging feeling of uneasiness remains. Deflation of trade margins has not been resolved internationally or in the CSNA to our entire satisfaction. However, the CSNA approach is worth sharing with others.

Trade Margins

In the CSNA, both the Make Matrix and the Use Matrix of the Annual Input-output accounts are in the preferred approximate basic values as defined in the UN SNA (1968). Approximate basic values are usually recorded for Make Matrix, but rarely for Use Matrix. The Use Matrix records values at purchaser prices which are equal to approximate basic values plus, where applicable, trade, transport and tax margins. Each recorded purchaser price value has to be disaggregated into its component of approximate basic value and the margins, all delineated separately. The matrix for each margin has the same dimension as the Use Matrix. The trade and transport margins remain part of the intermediate matrix, but the tax margins get shifted to the primary inputs matrix to get GDP at market prices. The estimation of margins is made for the current price annual Input-output program of CSNA. Indirect taxes are universally deflated using the base year's rates and the transport margins are usually deflated using base year's rate per ton kilometre. However, there are no internationally accepted guidelines for deflating trade margins. The Canadian experience is interesting in the light of the *UN Manual* statement: "There seems to be no practical or operational way in which the amount of services per unit of goods can be quantified and measured, and it is not possible to make specific recommendations on this point (p. 88)."

Ideally, constant price trade margins should be derived from the difference between the constant price sales of commodities and the constant price cost of these commodities for the trader. However, the array of price indexes required include buying and selling price indices by both wholesale and retail trade, by commodity, and these are not compiled.

Calculating margins in constant prices as the product of the margin rate in the base year and the volume of the commodity being traded in subsequent years was rejected on conceptual grounds. Constant margin rates imply constant proportionality between the volume of a commodity being sold and the quantity of trade margin or service being attached to that good. Observation of the market place in action suggests that this is not a good assumption. Marketing techniques change and the quantity of distribution service appears to decrease. Service

stations require drivers to pump their own gasoline; free delivery is being discontinued; packaging and display are "economized" to reduce costs.

Another approach tried was to use the margin rates for each year from the current price tables. This approach was used for the 1960s. During this period, the range of variation of price relatives was quite narrow. This approach worked quite well and the results were judged quite satisfactory. The above technique was originally carried into the 1970s with less satisfactory results. The use of current year trade margin rates exacerbated the effects of rapidly changing prices. The next step was to emulate Golidlocks and the Three Bears in search of some formula that seemed "just right." The closest to this proved to be using a margin rate calculated as the average of the given year's rates and the base year's rates from the current price tables. The two principal criteria by which different approaches were evaluated were reasonable output measures for the trade industries and an implicit price at purchasers' values that most closely approximated observed purchasers' prices.

The implicit price at purchasers' value is calculated in the CSNA Input-Output Tables as follows: (i) approximate basic values are deflated using product price index; (ii) constant price transport and tax margins are calculated using base year's rates; (iii) trade margins are deflated using the average of the current year's and base year's rates; (iv) sum the above three components to arrive at deflated purchaser price value; (v) divide current price counterpart of the above by (iv), which gives implicit purchaser price; (vi) compare this with recorded purchaser price index such as Consumer Price Index. If the implicit purchaser price approximates the recorded purchaser price, we feel just as happy as Goldilocks was.

The above method of using the average of the two rates has been used for most of the commodities in the Input-Output Tables since 1971. The results are embedded in our published series. Still there is a nagging feeling of uneasiness. This is one area which needs to be further investigated both nationally and internationally, all the more so because trade industries contribute a rather significant part of total GDP. One fourth of GDP within the business services sector of the Canadian economy is contributed by the trade industries and their share may be similar in other internationally advanced economies.

Conceptually Unsatisfactory

In the case of an individual good or service, value is expressed as the product of price multiplied by quantity. Quantities are measured in physical units. The quantities may be expressed simply in numbers of items or in graduated units of length, volume or weight. "*It is imperative that the physical unit should be identifiable.* Otherwise, the concept of price is meaningless (*UN Manual*, p. 12)." However, there are several rather important industries in the business services sector which do not possess a clearly identifiable physical unit. These include Finance, Insurance industries, rental of data processing and activities connected with gambling (such as lotteries and race tracks).

(i) *Monetary and Financial Institutions*

Monetary and financial institutions provide a variety of services some of which are specifically charged. They include commissions, charges on cheques, etc. There is a fee and the current revenues are estimated based on transactions which involve a number of physical units. The concept of output is clear and in principle output is deflatable. At times these services are bundled into a single product which has no identifiable measure of physical units. Moreover, the gross output of banks as defined in the SNA also includes imputed services which are not directly charged. These equal revenues from interest received from loans less interest paid on deposits. Accordingly, the SNA defined current price GDP of banks (with the above imputation for gross output) remains the same as recorded in the bank books. However, the issue is how to deflate such services when there is no identifiable unit of measurement.

In view of the indirect charging for (imputed) services and the bundling of services, it is sometimes suggested that the best way to obtain information on the content of bundles and to delineate additional product detail is to examine the cost structure of the industry. This should help to compute relative prices and detailed weights for some such services. The forthcoming UN commodity classification, called Central Product Classification (CPC) has listed several financial intermediation services. If current revenues and expenses broken down by each of the CPC categories could be collected and the relative prices computed, it might be possible to approximate a measure of real output. However, the success of this approach depends on solving the conceptual problem of how to allocate profits to each of the many services provided by banks. Without allocation of profit, the components of gross output are not exhausted.

The *UN Manual* (p. 92) recommended another approach to improve upon the input measures: "Although it may not be possible to obtain a sufficiently comprehensive range of indicators to give an adequate coverage of the entire field of banking, selective and detailed case studies of labour productivity in certain areas of banking seem a promising line of investigation and to offer the prospect of improving on input measures which make no allowance whatsoever for increased productivity." The UN suggestion has not been followed in the CSNA work program primarily because such detailed and selective studies of labour productivity are time consuming, costly and very problematic. The *UN Manual* makes an identical suggestion for insurance output and it has not been followed for the same reasons as those for banking.

It is quite possible and appropriate that we collectively (i.e. all participating organizations/countries of the Voorburg Group) formulate terms of reference of selective studies for both banking and insurance industries and then distribute them by organization/country. We are aware that another country's productivity study may be inappropriate for incorporation into the national program. However, out of this might emerge a common approach which is cost effective and which adds to our knowledge of this important, growing and increasingly internationalized sector of our economies.

The Canadian SNA practice to deflate imputed bank services for the annual program is to obtain details on various kinds of loans and on their respective interest rates as well as details on the various kinds of deposits and on their

interest rates. This is followed by an attempt to match as closely as possible each category of loan with a "corresponding" deposit category. The difference between the deposit rates and the loan rate is estimated to be the margin that the financial institutions charge and in principle these should be equal to the measurement of imputed services of banks. For current years the base year margin rates are applied to the corresponding volume of loans by category to measure the deflated output of imputed services. The uneasiness with this practice derives from the fact that the calculated labour productivity measures are volatile. Sometimes they do not correspond to common sense observations in the market.

(ii) *Insurance Industries*

Insurance industries share some of the same problems as financial institutions. The current SNA convention is to set the value of the service produced for property and casualty insurance as the difference between claims and premiums. However, the level of premiums is probably established so as to take into account the investment income earned on the policy reserves of the insurer. Moreover, the present SNA defined value of insurance output does not have an identifiable unit of measurement.

The CSNA practice is to deflate both the premium income of life insurance and the premium income of property and automobile insurance by the Consumer Price Index (CPI) and to extrapolate the base premium income of accident and sickness insurance by the number of persons covered. The labour productivity measures resulting from the above calculations are as volatile as those calculated for the finance industries.

(iii) *Data Processing Services*

Data processing services, similar to banking services are sold as "bundles" or "packages" without identifiable physical units of measurement. The underlying services are changing rapidly and are not amenable to an easy solution. In areas of data processing services, we have simply calculated implicit index of inputs with all the weaknesses embedded into them.

(iv) *Lotteries and Race Tracks*

The output of lottery business is measured as the difference between sales of lottery tickets and the prizes. It has no physical unit of measurement. In the CSNA, the output is deflated by the overall CPI for goods and services.

Industries which are deflated by conceptually unsatisfactory methods make up about 15 percent of GDP of business services sector of the Canadian economy, or about 6 percent of total GDP in Canada. They are primarily in the finance and insurance sector of the economy.

Overall Quality Assessment

The conceptual foundation for output measures of individual industries may be sound or weak, the statistical foundation of such measures may be good or weak, yet the national accounts must be comprehensive. An estimate must be

made for each item that appears in an accounting system. The system of national accounts could not be established in practice if it were restricted to those components which were soundly based on accurately recorded facts. Inevitably, published statistics will include estimates for which evidence is relatively weak. However, even a relatively weak series is strengthened after it is analysed, adjusted and generally put through the checks and balances of the national accounts. It is, nonetheless, the duty of statisticians to warn users of the weaknesses of the underlying statistics. After all, the users must not (except at their own risk) draw substantial conclusions about the economy from differences between components, or differences in the size of a given component between one period and another if such differences may be due wholly or mainly to errors of measurement.

SNA estimates are synthetic. They use series based on random samples, universe collection, projections based on circumstantial evidence plus adjustment for undercoverage, all constrained by the checks and balances of the system. To date, we have not found a way of summarizing the quality attributes of the basic data and the quality of the resulting SNA estimates in an objective manner. It is, however, possible from knowledge of the data and concepts to form very rough and partly subjective judgements about the range of reasonable doubt that should be attached to such estimates. Such quality ratings are included in the appendix.

On a scale of 1 to 3, rating of 1 is most reliable. All service industries whose output measures are conceptually unsatisfactory carry a rating of 3. In addition, all service industries for which there is no substantial annual data carry the rating 3. This sub-set includes industries which are not surveyed on a regular basis even quinquennially. A rating of 1 is attached to those industries where the undercoverage is minimal; very good commodity output detail exists; and the intermediate inputs are well specified. Furthermore, to stay within the rating of 1, the deflators of the main outputs or inputs of an industry are based on price indices of commodities directly covered in a price survey or the deflators are constructed from data on quantities and values from production surveys or other records in which the information is adequate in coverage and detail. In between the two ratings are all other industries. These carry the rating 2.

Concluding Remarks

We have listed four industries whose output measures are conceptually deficient. An additional four industries are listed which have a poor statistical base for the annual measures. These eight industries are: SNA Industry Code 137 Banks, Credit Unions and Other Deposit Institutions; 139 Insurance Industries; 142 Other Business Services Industries (Including Data Processing); 150 Other Amusement and Recreational Services (Including Lotteries and Race Tracks); 124 Taxicab Industry; 126 Highway and Bridge Maintenance; 141 Owner-Occupied Dwellings; and 145 Educational Service Industries. The first four are conceptually deficient and the last four are statistically deficient. Other countries with similar structure to Canada may have an almost identical list.

Trade industries are also deficient in many countries, but the Canadian practice may contribute to an improvement on the current condition. Issues relating to rebasing and double deflation need to be readdressed and again here the Canadian practice might be worth considering. The Canadian practice for deflating banking imputed services, though deficient, might be an improvement over the recommendations included in the 1979 *UN Manual.*

APPENDIX A

CONSTANT PRICE GDP FOR ANNUAL BENCHMARKS, BUSINESS SERVICES INDUSTRIES, CANADA

(Double deflation is the method used throughout)

CSNA Industry Code	CSNA Industry Title	Brief Description of Principal Deflators	Overall Quality Assessment
118	Air Transport & Services	Passenger Kilometres by class	1
	Incidental		
119	Railway Transport & Rel. Services		2
	Passengers	Consumer Price Index	
	Freight	Rate per ton kilometre	
120	Water Transport & Rel. Services		2
	Freight	Freight rate indexes	
	Incidental Services	Base Year rates	
121	Truck Transport Industries		2
	Freight	Rate per ton kilometre	
122	Urban Transit System Industry	Consumer Price Index	1
123	Interurban & Rural Transit Systems	Consumer Price Index	2
124	Taxicab Industry	Consumer Price Index	3
125	Other Transport & Serv. To Transp.		2
	Other Transport		
	School Bus	Consumer Price Index	
	Chartered Buses	Consumer Price Index	
	Services Incidental		
	Parking	Consumer Price Index	
	Travel Agencies	Consumer Price Index	
	Freight Forwarders	Truck Transportation Deflator	
126	Highway & Bridge Maintenance Ind.	Truck Transport Price Index	3
127	Pipeline Transport Industries	Volume Indexes of Goods Transported & Base Year Rate	2
128	Storage & Warehousing Industries		2
	Storage	Volume Indexes by Type of Grain and Type of Elevator & Base Year Rates	
	Warehousing	Rent Deflator	
129	Telecommunication Broadcasting Ind.		2
	Advertising	Rates for Prime Time Advertising	
	Cable	Consumer Price Index	

APPENDIX A—continued

CSNA Industry Code	CSNA Industry Title	Brief Description of Principal Deflators	Overall Quality Assessment
130	Telecommunication Carriers & Other	Volume Indicators	2
131	Postal Service Industry	Volume Indicators	2
135	Wholesale Trade Industries		2
	Margins	Average of Base and Current Year Rates	
136	Retail Trade Industries		2
	Margins	Average of Base and Current Year Rates	
	Automobile Repairs	Consumer Price Index	
137	Banks, Credit Union & Oth. Dep. Inst.		3
	Banks	Deflated Bank Loans & Base Year Gross Margin Rate by Category	
	Credit Unions, etc.	Bank Deflator	
138	Trust, Other Finance & Real Estate		2
	Imputed Interest—Non-Banks	Bank Deflator	
	Stock and Bond Commissions	Base Year Commission Rates & Deflated Value of Stocks Traded	
	Real Estate Commissions	Base Year Commission Rate & Deflated Sales	
	Rents—Residential and Other	Base Year Rent & Index of Stock of Dwellings	
139	Insurance Industries		3
	Life	Deflated Premium Income—CPI	
	Non-Life		
	Property and Automobile	Deflated Premium Income—CPI	
	Accident and Sickness	Number of Persons Covered	
140	Govt. Royalties On Nat. Resources	Base Year Rate & Deflated Gross Output	2
141	Owner-Occupied Dwellings	Index of Stock of Dwellings and Base Year Imputed Rent	3
142	Other Business Service Industries		3
	Rental of Data Processing Equip.	Implicit Price Index of Inputs	
	Miscellaneous Business Services	Index of Average Weekly Earnings	
143	Professional Business Services		2
	Legal	Output Activities & Base Year Fees	
	Accountants	Index of Average Weekly Earnings	
	Architects	Index of Average Weekly Earnings	
	Engineers	Index of Average Weekly Earnings	
144	Advertising Services		2
	Print Media	Advertising Rates Per Line	
	Radio and Television	Prime Time Rates	

APPENDIX A—continued

CSNA Industry Code	CSNA Industry Title	Brief Description of Principal Deflators	Overall Quality Assessment
145	Educational Service Industries		3
	Private Schools	Implicit Price Index of Operating Expenditures of Universities	
	Other Education and Cultural Services	Consumer Price Index	
146	Hospitals	Index of Employment	2
147	Other Health Services		2
	Doctors	Index of Provincial Government Renumeration Rates	
	Dentists	Consumer Price Index	
	Special Care Facilities	Index of Employment Applied to Hospital Labour Income	
	Other Health Care	Consumer Price Index	
148	Accommodation & Food Service Ind.		2
	Accommodation	Consumer Price Index	
	Meals	Consumer Price Index	
	Service Margin on Alcoholic Beverages	Index of Deflated Sales to Restaurants and Hotels & Base Year Margin	
149	Motion Picture & Video Industries		2
	Exhibition	Consumer Price Index	
	Production and Distribution	Consumer Price Index	
150	Other Amusement & Recreational Serv.		3
	Theatre	Consumer Price Index	
	Sports and Recreation	Consumer Price Index	
	Race Track and Gambling	Attendance	
	Lotteries	Adjusted Consumer Price Index	
151	Laundries & Cleaners	Consumer Price Index	2
152	Other Personal Services		
	Barbers and Beauty Salons	Consumer Price Index	2
	Funeral Services	Implicit Price Index for Inputs	
	Day Care Centres	Consumer Price Index	
153	Photographers	Index of Average Weekly Earnings	2
154	Misc. Service Industries		2
	Repair Services	Consumer Price Indexes and Indexes of Average Weekly Earnings	
	Rental of Office Equipment	Price Index for Machinery and Equipment for Commercial Sector	
	Services to Building and Dwellings	Index of Average Weekly Earnings of Janitors	
	Rental of Automobiles and Trucks	Consumer Price Index	
	Rental of Other Machinery and Equipment	Machinery and Equipment Price Index	

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