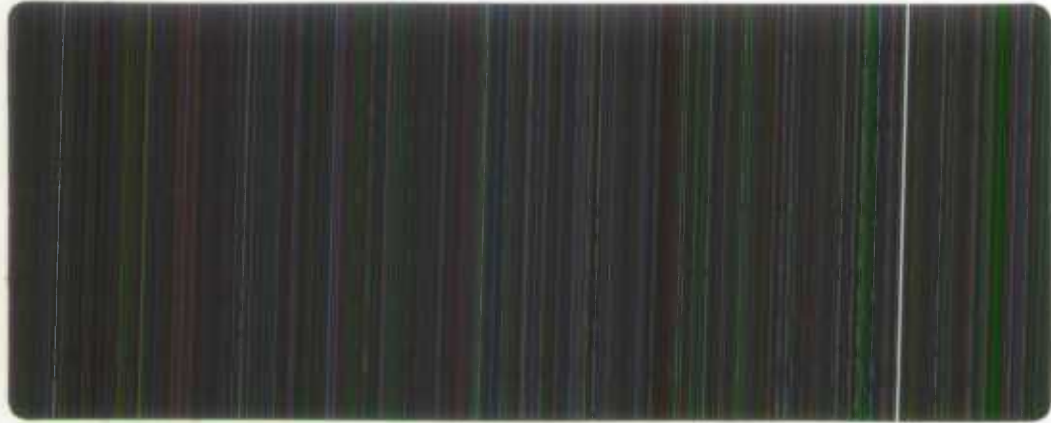


C.2 15-602E no. 61



Input-output Division

STATISTICS CANADA STATISTIQUE CANADA
APR 29 1994
LIBRARY
BIBLIOTHÈQUE



Technical Series



Input-Output Technical Series

The Input-Output Division Technical Series are intended for users interested in input-output tables and related research for analysis and applications. Readers of the series are encouraged to contact the authors with comments and suggestions. A complete list of the titles that have been released appears at the back of this paper.

Papers in the series are distributed to Statistics Canada Regional Offices and Provincial Bureaus of Statistics. The series appears in the "Listing of Supplementary Documents" (11-207). A complete set is also maintained in the Statistics Canada Library and is available for consultation.

To obtain the list of titles and/or an individual paper, please contact:

Consulting and Marketing
Input-Output Division
Statistics Canada
23rd Floor, R.H. Coats Building
Ottawa, Ontario, K1A 0T6
(613) 951-3697

**Statistics Canada
National Accounts and Analytical Studies
System of National Accounts
Input-Output Division**

**Hours Worked: A New Measure of Labour Input
for Multifactor Productivity Estimates**

by

Jean-Pierre Maynard

#61-E

February, 1993

Reprinted from

MAYNARD, Jean-Pierre, "FEATURE ARTICLE 2, Hours worked: A New Measure of Labour Input for Multifactor Productivity Estimates", *Aggregate Productivity Measures*, Ottawa, Statistics Canada, No. 15-204E, February 1993, pp.161.

FEATURE ARTICLE 2

Hours Worked: A New Measure of Labour Input for Multifactor Productivity Estimates

By Jean-Pierre Maynard¹

Introduction

Although it is preferable to base the measure of multifactor productivity on estimates of person-hours worked for reasons that will be explained below, until now, productivity estimates have been based on the number of persons at work. Estimates of person-hours worked were developed in the framework of recent research on improvements into the quality of multifactor productivity measures.

In the framework of multifactor productivity, the productivity indices are first calculated at the most disaggregated level of industries, and then aggregated to the desired level following well-established rules. Despite the fact that estimates of hours worked were produced as part of the framework of labour productivity measurement, they were available only at higher levels of aggregation and could not therefore be of use in the calculation of multifactor productivity indices. The goal of this research, the results of which are presented here, consists in the disaggregation of the existing hours data to a detailed level of industries.

Ideally, labour input should represent the quantity of effort rendered by all persons participating in the production process, irrespective of whether such effort is physical or intellectual in nature. As there is no precise measure of human effort in a work environment, approximations such as the number of employees or the number of person-hours are generally utilized.

The use of the number of persons at work as a labour input measure relies on the assumption that human effort is proportional to the number of workers. It is possible to refine this measure by taking into account the number of hours worked per person. The number of person-hours worked is more appropriate since it takes into account the fact that the number of hours worked per person changes over time and across industries. For example, we have observed over time a reduction in the standard work week and an increase in part-time work. Another advantage resides in the improvement of Canada-United States comparisons of multifactor productivity, given that the U.S. estimates are already based on the hours concept.

The article that follows begins with an overview of the evolution of hours worked per person in Canada since 1961, for the business sector and component industries. It is followed by a discussion of sources and methods employed to produce hours worked for the 110 industries of the multifactor productivity series.

¹ The author wishes to thank the staff from Productivity Measures that contributed to this project. In particular, the author wishes to thank Monique Larose, Sean Burrows, Vere Clarke, and Stéphane Maynard for their important contribution to the development of these estimations as well as Aldo Diaz, Marie Allard-Saulnier, and René Durand for their valuable comments on earlier drafts of this paper.

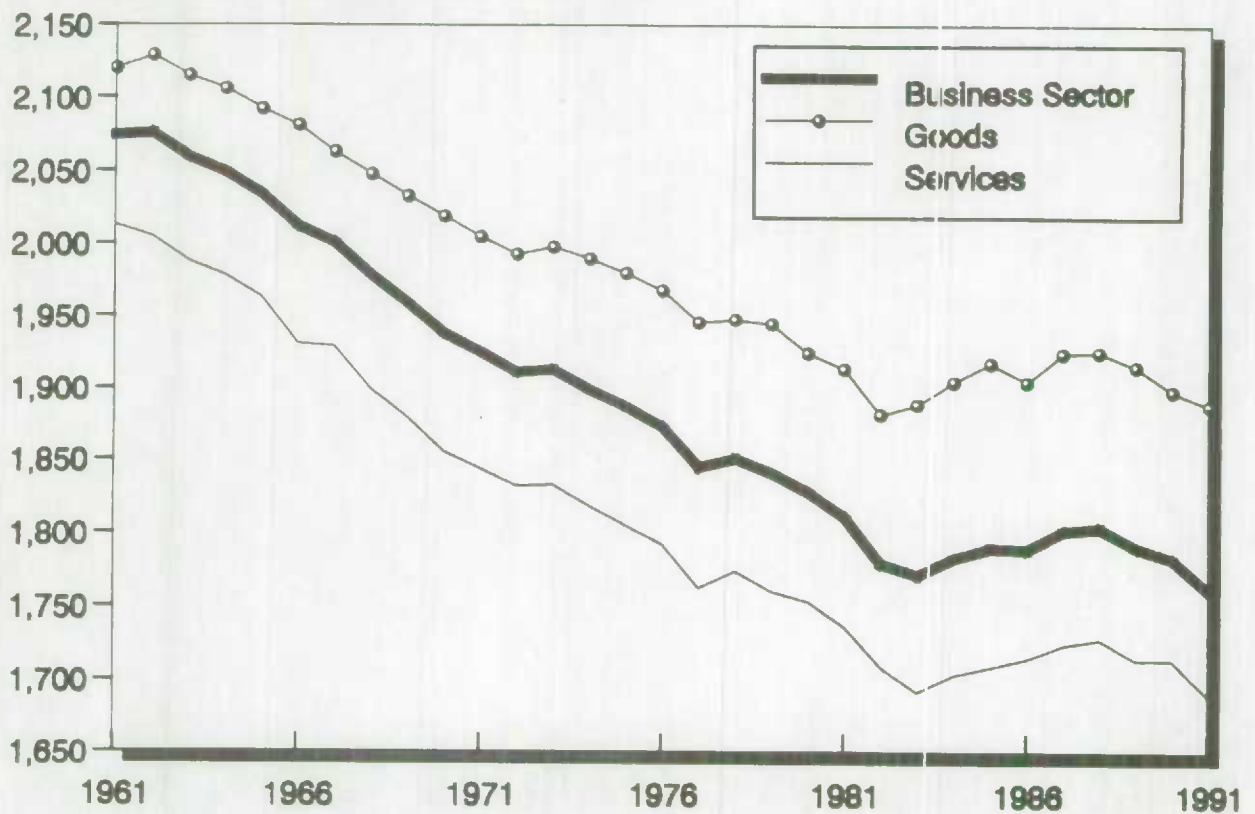
To the extent possible, the methodology is consistent with that used to produce the person-hours estimates at the aggregate level of industrial divisions for labour productivity. Finally, the article undertakes a comparison of multifactor productivity based on hours worked with those based on persons at work.

The Evolution of Hours Worked During the Last Thirty Years

Since the beginning of the 1960's, there has been an increase in leisure time as part of the general rise in living standards. Working conditions over the last thirty years improved considerably when measured in terms of number of hours worked per person. This reduction in hours per person is the result of gains in social benefits obtained by the work force such as increases in the length of vacation time, additional holidays, increases in paid leave for reasons of sickness or for personal reasons, or simply due to a generalized reduction in the standard work week. Figure 1 shows the downward trend in annual hours worked per person in the business sector as well as in the goods and services industries of the business sector.

Figure 1

Evolution of annual hours worked per person since 1961



It is of interest to note that the rate at which annual hours per person decreases has slowed considerably at the beginning of the 1980's. This observation is confirmed by the comparison of growth rates for different sub-periods presented in Text table 1. In fact, beginning with the 1982 recession, the decline in hours per person stops, and in fact increases between 1983 and 1988, only to decline starting in 1989. The reduction in the number of hours per person observed between recessions (1982 and 1990-1991) compensates for the rise which took place during the years of expansion (1983 to 1988).

Text table 1

Hours worked per person per year between 1961 and 1991 and selected sub-periods

Period	Business Sector	Business Sector Goods	Business Sector Services
1961-1975	-0.7%	-0.5%	-0.8%
1975-1982	-0.8%	-0.7%	-0.8%
1982-1991	-0.1%	0.0%	-0.1%
1961-1991	-0.5%	-0.4%	-0.6%

Annual hours worked per person show a net tendency to decline during the period of study, indicating that multifactor productivity estimates would be sensitive to the use of person-hours as labour input.

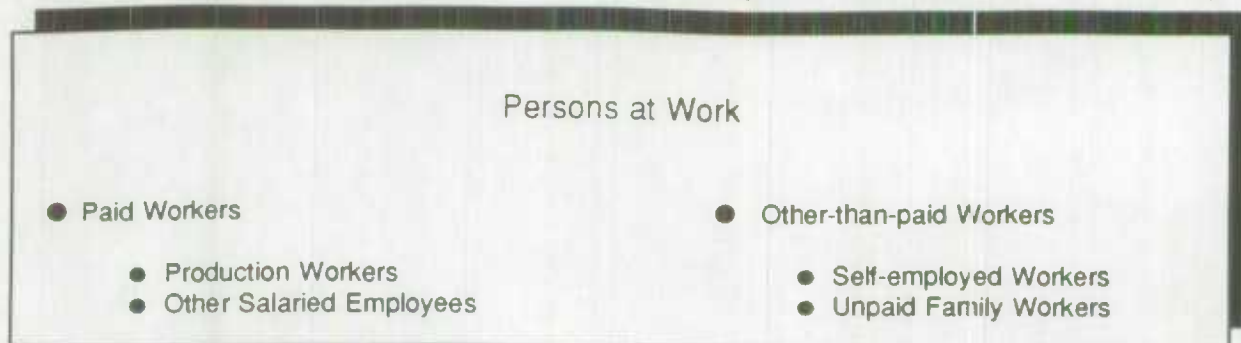
Concepts and Definitions

The concept of hours worked that is of interest to us represents the total number of hours that a person devotes to work, whether these hours are paid or not. Generally, this includes normal hours plus overtime, including coffee breaks, on-the-job training as well as time lost due to unanticipated interruptions in production. Time lost due to strikes or lockouts, to statutory holidays, vacations, illness, maternity leave or personal reasons is not included in hours worked.

Statistics Canada's Input-Output Division currently maintains a detailed database of employment statistics which distinguishes between paid workers and other-than-paid workers. Some surveys collecting data on employment usually differentiate between production and other salaried employees (administrative personnel, office workers, sales representatives, etc.). The other-than-paid workers class can also be broken down into two types: self-employed workers, including working owners and active associates, and unpaid family workers. The latter type is mostly found in industries where family businesses are prevalent, such as the agriculture industry and the retail trade industry. Text table 2 shows the classes of workers used in this study.

Text table 2

Diagram of classes of workers used to estimate labour input for the calculation of productivity



For the purposes of this project, estimates of person-hours worked were produced for the relevant classes of workers from 1961 to the present and for 110 industries. The person-hours worked concept can be visualized as the product of hours worked per person as defined above, and the average number of persons at work. As the number of persons at work is already available in a database, the project consisted of producing estimates of annual hours worked per person which would be representative of all classes of workers in each industry.

Description of Sources and Methods

At Statistics Canada, there is no single source of information which would allow the estimation of hours worked per person for all industries and for the full period under consideration. Time series on annual hours worked per person were therefore constructed from four main sources:

- 1) the Annual Survey of Manufactures
- 2) the Labour Force Survey
- 3) the Census of Mines
- 4) the Annual Survey of Working Conditions

For most industries, more than one source is available. Notwithstanding the fact that the data must be compatible with the concept of hours worked used for multifactor productivity, we privileged data sources that: 1) were considered to be the most reliable; 2) were available for the entire period; 3) were already used in the employment estimates.

1 - Manufacturing Industries

In the case of manufacturing industries, the main source for person-hours worked was the Annual Survey of Manufacturing². In 1989, these data were collected annually using three different methods. All large establishments including head offices are surveyed by means of a fully detailed questionnaire. Small establishments are surveyed on a rotating basis by means of a simplified questionnaire and by means of

² For more information concerning this survey, see *Manufacturing Industries of Canada: national and provincial areas*, Statistics Canada, catalogue no. 31-203 annual.

administrative records. Only large establishments are asked specific questions on hours paid and hours worked and this, only for production workers. This questionnaire also included additional questions on the hourly wage rate, on the normal number of hours worked, as well as on the annual average number of paid holidays for total paid workers. This survey uses the additional information obtained on the number of paid holidays and hours paid data to derive the number of hours at work. However, data on normal hours for other salaried employees were not collected prior to 1983.

As for the complement of small establishments, person-hours are estimated from declared wages and salaries. Paid person-hours are then obtained by dividing wages and salaries by average hourly earnings estimated from the data on large establishments in the same industry. The number of person-hours worked is calculated by the ratio of person-hours worked to person-hours paid for a given industry. The estimates of hours worked for small establishments are of a lower quality; however, these establishments only accounted for a small proportion of the total shipments of manufacturing industries in 1989³.

The Annual Survey of Manufactures provides the necessary hours worked information at the detailed level in the case of production workers⁴. Data on person-hours worked at the major group level (level "PM")⁵ for the four classes of workers are already produced in the framework of the labour productivity program. Annual hours worked per person for other salaried employees, self-employed and unpaid family workers were available only at the PM level for the entire period. Estimates of hours worked for these three groups at the detailed PL level were produced on the assumption that within each PM group, all employees worked the same number of hours on average. This means that differences found in the number of hours worked per person at the PL level within manufacturing strictly reflect differences in the hours worked by production workers⁶.

2 - Non-Manufacturing Industries

For non-manufacturing industries, the number of hours worked per person are taken at least in part from the Labour Force Survey. As in the case of manufacturing, the estimates are constructed separately for paid workers and other-than-paid workers, that is, self-employed workers and unpaid family workers. Statistics on hours worked for the two classes of workers and for most of the 110 industries at the PL level are available starting in 1975, when the survey underwent a major redesign. Previously, the industrial coding of this survey was limited to industrial divisions (PS level). Another source was used for the years 1961 to 1975 for most industries.

The definition of five of the 110 industries coincide with the industrial divisions for which estimates of hours worked are produced in the framework of the labour productivity measures. These industries are: Agricultural and Related Services, Fishing and Trapping, Logging and Forestry, Construction, and Finance, Insurance and Real Estate. Therefore, the time series on hours worked for these industries are taken directly from the labour productivity program.

³ According to detailed information from the 1989 Annual Survey of Manufactures large establishments represented 90% or more of the industry shipments in 48 of the 83 groups. In addition, this number reached 77 (93%) when we consider establishments representing at least 70%. Only six industries had a share of small establishments that was greater than 30%.

⁴ The 1986-1987 growth rate of Labour Force Survey data was used to estimate the level of paid workers in manufacturing for 1987, the data on hours worked from the 1987 Annual Survey of Manufactures having not been edited.

⁵ For more information on industrial aggregates as defined in the multifactor productivity measures, see Appendix 3 in Part 2 of this publication.

⁶ For more information on the methodology used to estimate hours for other salaried employees and other-than-paid workers, see Appendix 2 in Part 1 of this publication.

Statistics on hours collected by the Labour force survey refer to a specific week in each month; usually the week of the 15th of the month. This survey includes a series of questions on the number of hours worked which are asked to any respondent having worked during the reference week. These questions pertain to usual hours, overtime, hours actually worked, as well as hours lost and reasons for absences from work. This information facilitates the verification of each element of information on hours worked for consistency and allows the estimation of the total annual number of hours worked. As the statistics from this survey pertain to a specific week of the month, the annual data only represent the twelve weeks of the year that were surveyed. In order to produce annual data that would be representative of the hours actually worked during all weeks of the year, the Productivity Measures Section developed a methodology. The purpose of this methodology is to adjust the hours actually worked as reported by the survey to account for two random factors; the statutory holidays that may or may not fall in the reference weeks in a given year and the impact of days lost due to labour disputes⁷.

The method used to produce the annual estimates of hours worked from Labour Force Survey data can be summarized in four steps⁸.

- 1 - The first consists of adding to the estimates of hours worked for the survey week, the hours lost due to a statutory holiday or to a labour dispute. The result is therefore an estimate of hours worked under the assumption of no statutory holidays or labour disputes. These data are then interpolated between the survey weeks in order to produce the estimates for the fifty-two weeks of the year.
- 2 - The second step consists of adjusting, if necessary, the hours worked in the year for time lost due to statutory holidays. When the holidays are in the survey week, the estimates for hours worked are taken directly from the survey data, otherwise, they are estimated using the following method. The main statutory holidays in Canada were identified and classified in three categories: (1) Major (Christmas Day, New Year's Day, Good Friday, Canada Day, Labour Day, and Thanksgiving); (2) Major-Minor (Victoria Day, Boxing Day); and (3) Minor (Easter Monday, St-Jean Baptiste, August Civic Holiday, and Remembrance Day)⁹. This classification reflects the fact that most employees are entitled to the major holidays whereas a smaller proportion are granted the other holidays. The number of working hours lost for the three categories of holidays is estimated from the hours lost in survey weeks for the corresponding category of holidays.
- 3 - Thirdly, all hours lost due to labour disputes are removed from the estimates of hours worked.¹⁰ Only the hours worked by paid workers are adjusted for this type of absence.
- 4 - Finally, annual hours worked per person per week are calculated as the average of the weekly values adjusted for strikes and holidays. The number of hours worked per year is simply the weekly average multiplied by the number of weeks in the year. The number of weeks in the year is not taken as constant, but reflects the variations in the calendar. A calendar year

⁷ The employment concept of the Labour Force Survey includes as employees, any respondents that did not work during survey week due to labour disputes.

⁸ For a complete description of this methodology, see Maryanne Webber, "Estimating Total Annual Hours Worked from the Canadian Labour Force Survey", Input-Output Division, Technical Series number 51, April 1983.

⁹ The classification of statutory holidays in order of importance comes from data collected by the Pay Research Bureau, a service of the Public Service Staff Relations Board of the Federal Public Service.

¹⁰ For more information concerning this survey, refer to *Collective Bargaining Review*, Labour Canada, monthly.

includes 52 complete weeks plus one day (two in leap years). If these extra days fall on a normal day of rest, the year is considered to have 52 weeks even. If not, the number of weeks is greater. Calendar year variations account for up to 0.4% in the year-to-year change in hours worked.

Using this method, estimates of hours worked per person were produced for paid workers, except for Mining Industries and Manufacturing Industries, and for other-than-paid workers for all industries with the exception of Manufacturing.

As mentioned, the data on hours actually worked from the Labour Force Survey did not exist prior to 1975 at the level of aggregation needed. For the years prior to 1976, data from the Survey on Working Conditions¹¹ were used. This survey, cancelled in 1984, was an annual survey which covered all establishments of twenty or more employees in Canada with the exception of the Agricultural and Related Services Industries, Fishing and Trapping, and Construction. The purpose of this survey was to collect information on the working conditions in establishments. The survey collected, among other things, information of normal work hours, paid statutory holidays, annual leave, and sick leave. This information was produced for most industries that were needed and distinguished between production workers ("non-office employees") and other salaried employees ("office employees").

From this information, annual data on normal working hours were derived, from which hours paid for statutory holidays and annual leave were deducted. Data on working conditions for paid annual leave were shown according to specific eligibility criteria. For example, for a given industry, the statistics were tabulated by the number of years of service required to be eligible for three weeks instead of two weeks of annual leave. In order to produce estimates of average hours on holidays for each industry, this information was combined with the estimates of job tenure from the Labour Force Survey¹².

Since the estimates of hours worked per person by paid workers were obtained from the Labour Force Survey starting in 1976 and from the Survey of Working Conditions up to 1975, the two time series had to be linked together. The series originating in the latter survey was multiplied by the average of the difference between the two series for the years 1975 to 1978. Then, since the hours obtained from the Survey of Working Conditions did not correspond exactly to our concept of hours worked¹³, they were linked to the corresponding estimates for paid workers at the industry division level (PS) that are presently used in the calculation of labour productivity estimates.

The data on hours worked for each of the four mining industries were produced using a different methodology. The total person-hours worked for the Mining (including milling), Quarrying and Oil Well Industries used in labour productivity was allocated to the four industries according to the distribution of hours paid from the Census of Mines. These statistics cover the entire period but represent only production workers. Since these are estimates of hours paid, paid holidays (statutory and annual leave) estimated from the Survey of Working Conditions were subtracted from them. This survey having been cancelled in 1984, the estimates of paid holidays were extrapolated along a linear trend until 1989. In order to reflect all paid workers in this industry, the total person-hours for this division was used as a benchmark for the entire period and distributed according to the value share of each component estimated from the person-hours of the Census of Mines.

¹¹ For more information on this survey, see the technical notes in annual reports from *Working Conditions in Canadian Industry*, Labour Canada, 1961-1984.

¹² For further details on the "job tenure" variable, see *User's Guide to the Labour Force Survey Data*, catalogue no. 71-528, Statistics Canada, 1992, pp. 13 and 36.

¹³ In contrast with the Labour Force Survey which is a household survey, most establishment surveys only collect information on standard working hours for the non-production classes of workers.

For the paid workers of the Pipeline Transport Industry, the Educational Services and Other Health Services industries, there was simply no data before 1976. We therefore used the growth of hours per person from industries exhibiting similar trends from 1976 to 1991. In the case of Pipeline Transport, hours worked per person from the Crude Petroleum and Natural Gas Industries were used. The hours worked per person in Hospitals were used to estimate the two other industries.

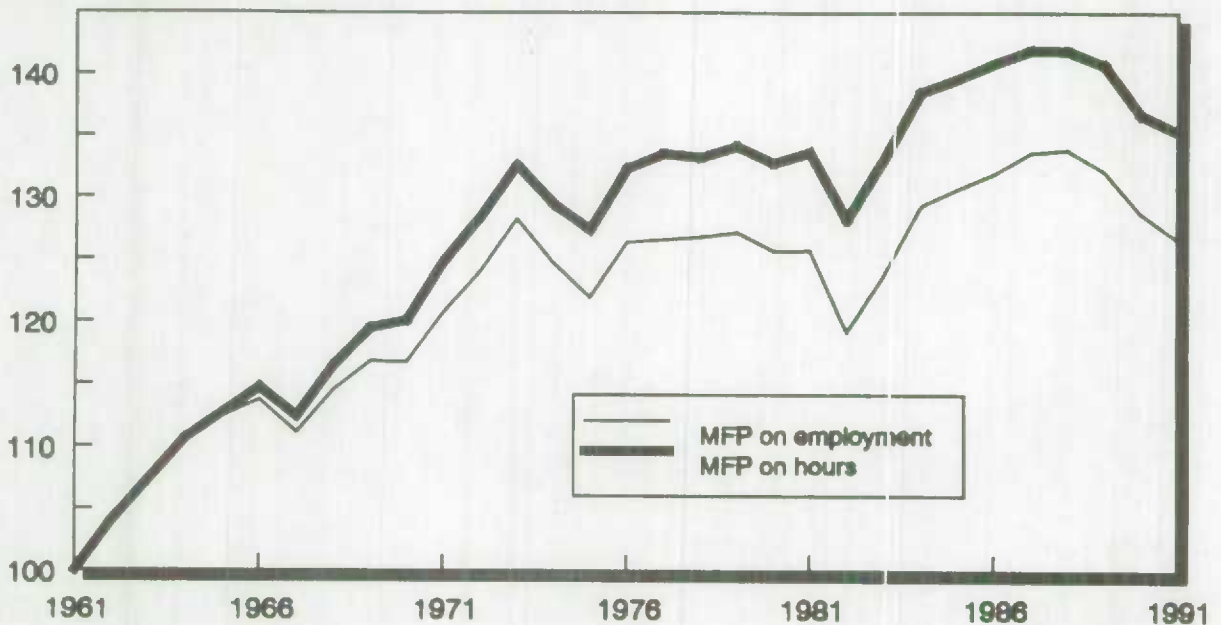
Since the Labour Force Survey is the only source available to produce estimates on other types of workers for all non-manufacturing industries, there are no detailed data prior to 1976. The share of hours worked to self-employed and unpaid family workers were therefore estimated for each industry using backward linear extrapolation of the Labour Force Survey data from 1976 to 1991. The results obtained were then reconciled with the person-hours estimates at the corresponding industry division level (PS).

The use of aggregate data (PS level) for person-hours from the labour productivity measures program also allows us to ensure the consistency of the results from the various productivity measures produced.

Impact of Hours Worked on the Measurement of Multifactor Productivity

Figure 2

Comparison between multifactor productivity indices based on person-hours worked and persons at work, business sector, 1961-1991



The use of hours worked instead of persons at work as the measure of labour input has the effect of increasing multifactor productivity based on value-added for the business sector by an average of 0.2% per year during the 1961-1991 period (see Figure 2). In other words, the use of hours worked increases multifactor productivity growth by about 30% over the three decades. However, the impact of person-hours worked on productivity estimates changes considerably from period to period and across industries.

Estimates of productivity growth rates¹⁴ corresponding to person-hours worked and to persons at work are shown in Text table 3 for different sub-periods determined by the cyclical troughs of the multifactor productivity index for the business sector. The use of the number of persons as labour input instead of the more precise person-hours measure is shown to have the effect of underestimating business sector multifactor productivity growth by 0.2% between 1961 and 1967 and by 0.4% between 1967 and 1982. It should be noted that the negative performance observed when persons is used between 1975 and 1982 turns to a slightly positive growth with the use of hours worked. As expected, given little change in hours worked per person during the 1982-1991 cycle, multifactor productivity based on hours worked is exhibiting a slightly lower growth rate compared to the rate based on persons at work during the period. In fact, as Figure 3 shows, the growth rate of multifactor productivity based on hours worked was lower than that on persons at work in six out of the last ten years. The same phenomenon occurred just three times between 1962 and 1982: in 1962, 1973, and 1978.

Text table 3

Comparison between multifactor productivity growth rates based on person-hours worked and persons at work, business sector, 1961-1991

Period	Persons at work	Person-hours worked	Differences
1961-1991	0.8%	1.0%	0.2
1961-1967	1.8%	2.0%	0.2
1967-1975	1.2%	1.6%	0.4
1975-1982	-0.3%	0.1%	0.4
1982-1991	0.7%	0.6%	-0.1

Figure 4 shows a very different impact across industrial divisions when hours worked are used instead of persons at work. With the exception of the Finance, Insurance and Real Estate Industry, all service industries show an increase in productivity larger than 0.1% when calculated on hours worked, with Retail Trade showing the largest impact. At lower aggregation levels, the Railway Transportation Industry, Road, Highway and Bridge Maintenance Industry, Pipeline Transportation, and the Telecommunications Industry show little productivity improvements when calculated on hours worked.

¹⁴ Given the methodology to estimate multifactor productivity, the labour input measure which should be used in analysis is not the sum of hours or employment but rather the weighted average of hours or employment calculated using the Törnqvist index number formula.

Among the goods-producing industries of the business sector, Agriculture, Fishing and Trapping as well as Logging and Forestry show a net productivity improvement when based on hours. Few improvements were recorded in the Mining Industries, in Total Manufacturing, and in the Construction Industry. In addition, a detailed analysis of individual manufacturing industries shows significant long term differences in only 13 of 83 cases. In all other manufacturing industries, the impact was less than 0.1%, whether negative or positive. Nine of the industries for which the impact was significant exhibited a substantial improvement in productivity. This is the case in the following industries:

- Construction, Shipbuilding and Repair Industry;
- Aircraft and Aircraft Parts Industry;
- Wool Yarn and Woven Cloth Industry;
- Clay Products Industry;
- Cement Industry;
- Non-Ferrous Smelting and Refining;
- Carpet, Mat and Rug Industry and;
- Other Electrical and Electronic Products.

Otherwise, the other four industries exhibit a deterioration in multifactor productivity growth. This occurred in Office, Store and Business Machines, Platemaking, Typesetting and Bindery, Iron Foundries and Record Players, Radio and T.V. Receivers.

Figure 3

Annual growth of multifactor productivity for the business sector

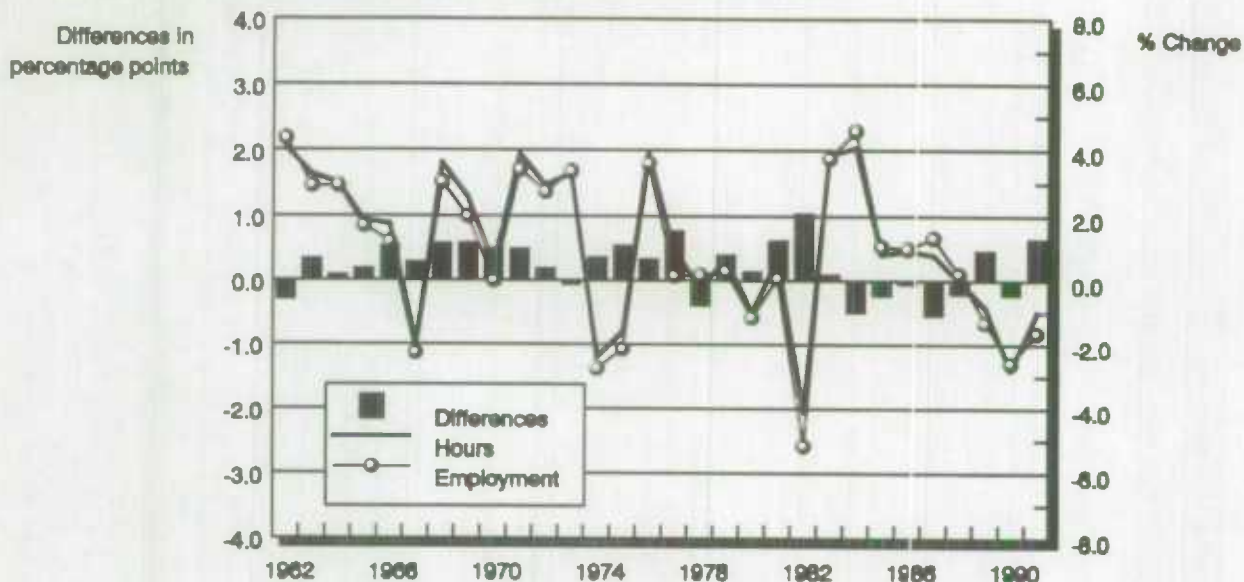
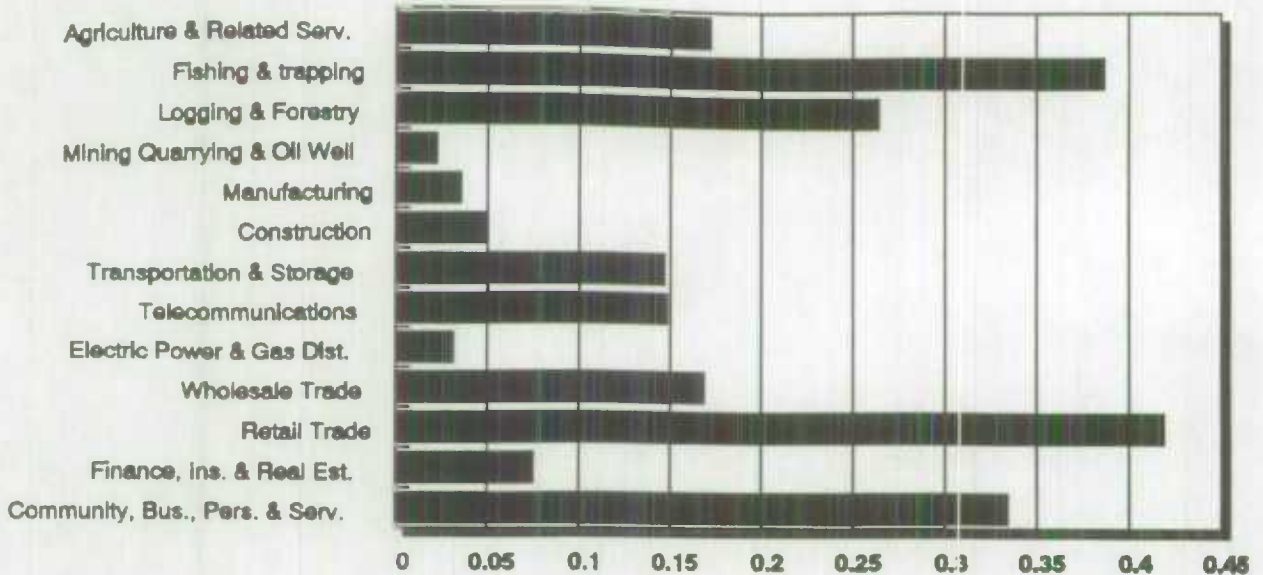


Figure 4

Differences between productivity growth rates based on hours worked and on employment, by industry, 1961-1991



In summary, the use of the more precise hours worked measure of labour input results in a thirty percent increase in the long term growth rate of business sector multifactor productivity. The estimates for total manufacturing are less sensitive, showing an increase of only 6% over thirty years. For the business sector and most of its industries, the impact took place entirely in the 1961-1982 period; the new data has no impact on the estimates for the 1982-1991 cycle as compared to the employment-based measures.

TECHNICAL SERIES/CAHIERS TECHNIQUES

INPUT-OUTPUT DIVISION/DIVISION DES ENTRÉES-SORTIES

STATISTICS CANADA/STATISTIQUE CANADA

(1)

Hoffman, *et al.*, *User's Guide to Statistics Canada Structural Economic Models*, Input-Output Division, Statistics Canada, Revised September 1980.

(2)

Hoffman, *et al.*, *Guide d'utilisation des modèles économiques et structureaux de Statistique Canada*, Division des entrées-sorties, Statistique Canada, Révisé septembre 1980.

(3)

Durand, R., and Rioux, R., *Estimating Final Demand Expenditure at Factor Cost and Net of Tax Price Indices in the Canadian Input-Output Tables*, Paper Presented at the International Round Table on Taxes and the CPI, Ottawa, Input-Output Division, Statistics Canada, March 3, 1987.

(4)

Siddiqi, Y., Murty, P.S.K., and Diena, J., *Highlights of the Public Sector Market Study, 1983*, Input-Output Division, Statistics Canada, September 1987.

(5)

Murty, P.S.K., *Size and Structure of the Public Sector Market, 1983, Sources and Methods*, Input-Output Division, Statistics Canada, September 1987.

(6)

Durand, R., *The Adding-Up Problem in the Computation of Aggregate Constant Price GDP*, Input-Output Division, Statistics Canada, October 1987.

(7)

Durand, R., and Markle, T., *Measuring the Variability of Input-Output Structures: A Progress Report*, Input-Output Division, Statistics Canada, December 1987.

(8)

Durand, R., and Markle, T., *On the Variability of Input-Output Structures: A Progress Report on the Constant Price Industrial Input Structures*, Input-Output Division, Statistics Canada, April 1988.

(9)

Durand, R., and Markle, T., *Structural Change in the Canadian Economy: The Supply Side in Current Prices*, Input-Output Division, Statistics Canada, July 1988.

(10)

Durand, R., *Statistics Canada's Price Model: A Detailed Description of the Structure and Simulation Capacities*, Input-Output Division, Statistics Canada, August 1988.

(11)

Durand, R., and Markle, T., *Structural Change in the Canadian Economy: The Supply Side in Constant Prices*, Input-Output Division, Statistics Canada, October 1988.

(12)

Durand, R., and Markle, T., *A Diversity Analysis of Structural Change Based on the Canadian Input-Output Tables*, Input-Output Division, Statistics Canada, January 1989.

(13)

Durand, R., and Diaz, A., *Input-Output Modelling of Commodity Indirect Taxes for Macroeconomic Analysis*, Input-Output Division, Statistics Canada, January 1989.

(14)

Murty, P.S.K., Gagnéux, P.A., Leblanc, D., and Greenberg, M., *Provincial Sales Tax Commodity Allocation Project, 1984 Sources and Methods*, Input-Output Division, Statistics Canada, January 1989.

(15)

Durand, R., *The Balancing Process of the Regional Input-Output Tables*, Input-Output Division, Statistics Canada, February 1989.

(16)

Siddiqi, Y., Murty, P.S.K., and Diena, J., *Highlights of the Provincial Sales Tax Commodity Allocation Project, 1984*, Input-Output Division, Statistics Canada, January 1989. Reprinted from Canadian Economic Observer, May 1989.

(17)

Durand, R., *Aggregation Formulas for Multifactor Productivity*. Input-Output Division, Statistics Canada, June 1989.

(18-E)

Mercier, P., Durand, R., and Diaz, A., *Specification of parameters for the National Input-Output Model*, Input-Output Division, Statistics Canada, December 1991.

(18-F)

Mercier, P., Durand, R., et Diaz, A., *Spécification des paramètres du modèle d'entrées-sorties national*, Division des entrées-sorties, Statistique Canada, décembre 1991.

(19-E)

Siddiqi, Y., and Murty, P.S.K., *Commodity Indirect Taxes in the Canadian Input-Output Accounts, 1984*, Input-Output Division, Statistics Canada, July 6, 1989.

(19-F)

Siddiqi, Y., and Murty, P.S.K., *Impôts indirects sur les biens et services dans les comptes d'entrées-sorties du Canada, 1984*, Division des entrées-sorties, Statistique Canada, 6 juillet 1983.

(20)

Siddiqi, Y., and Murty, P.S.K., *Progress Report # 5: On the Temporal Variability of the Aggregate Input Structure*, Input-Output Division, Statistics Canada, September 1989.

(21)

Siddiqi, Y., and Murty, P.S.K., *Highlights of Commodity Taxes for 1984*, Input-Output Division, Statistics Canada, Canadian Economic Observer, September 1989.

(22)

Siddiqi, Y., and Murty, P.S.K., *Commodity Indirect Taxes - An Inventory before the GST*, Input-Output Division, Statistics Canada, Canadian Economic Observer, October 1989.

(23)

Murty, P.S.K., and Siddiqi, Y., *Government Expenditures on Goods and Services and Transfer Payments in Canada, 1961-1985*, Input-Output Division, Statistics Canada, December 1989.

(24)

Murty, P.S.K., and Siddiqi, Y., *Government Expenditures on Goods and Services and Transfer Payments in Canada 1961-1985*, Input-Output Division, Statistics Canada, Reprint from Canadian Economic Observer, May 1990.

(25)

Siddiqi, Y., and Murty, P.S.K., *Commodity Indirect Taxes in the Canadian Input-Output Accounts, 1984-1986*, Input-Output Division, Statistics Canada, February 1990.

(26)

Durand, R., *Growth Accounting and the Quality Adjustment of the Capital Stock*, Input-Output Division, Statistics Canada, February 1990.

(27)

Durand, R., and Salem, M., *On a Dynamic Productivity Index Number Formula*, Input-Output Division, Statistics Canada, revised version February 1990.

(28)

Diaz, A., *The 1989 increase in Labour Compensation per Person: Was it caused by wage demands?*, Input-Output Division, Statistics Canada, June 1990.

- (29)
Murty, P.S.K., *Federal Goods and Services Tax and the Canadian System of National Accounts*, Input-Output Division, Statistics Canada, October 1990.
- (30)
Effective tax rates and net price indexes/Les taux de taxe actuels et les indices de prix net, Feature Article/Etude spéciale, Canadian Economic Observer/L'observateur économique canadien, November 1990/novembre 1990.
- (31)
Salem, M., *Documentation of Capital Input and Capital Cost time series for Multifactor Productivity Measures*, Input-Output Division, Statistics Canada, reviewed and updated by R. Fortin and Y. Sabourin, December 1990.
- (32)
Siddiqi, Y., and Murty, P.S.K., *Federal Sales Tax in the Canadian Input-Output Accounts*, Input-Output Division, Statistics Canada, July 1989.
Draft, (Out of Print).
- (33)
Murty, P.S.K., *New Paradigm to Analyze Government Transfer Payments with special reference to Canada*, Input-Output Division, Statistics Canada, Draft, January 3, 1991.
- (34)
Durand, R., *Productivity Analysis and the Measurement of Gross Output Net of Intra-Industry Sales*, Input-Output Division, Statistics Canada, January 1991.
- (35)
Murty, P.S.K., and Siddiqi, Y., *A New Paradigm to Analyze Commodity Indirect Taxes and Subsidies, 1986-1989*, Input-Output Division, Statistics Canada, April 5, 1991.
- (36)
Généreux, P., *The Input-Output Structure of the Economies of the Yukon and Northwest Territories, 1984*, Input-Output Division, Statistics Canada, May 1991.
- (37)
Généreux, P., *La structure par entrées-sorties des économies du Yukon et des territoires du Nord-Ouest, 1984*, Division des entrées-sorties, Statistique Canada, mai 1991.
- (38)
Durand, R., *An Alternative to Double Deflation for Measuring Real Industry Value-Added*, Input-Output Division, Statistics Canada, June 1991.
- (39)
Généreux, P., *I/O Tables in constant prices: Revised deflation process and analysis of the machinery and equipment sector*, Input-Output Division, Statistics Canada, September 1984.
Reprint July, 1991.
- (40)
Murty, P.S.K., and Siddiqi, Y., *Government subsidies to industries/Les subventions gouvernementales accordées aux industries*, Input-Output Division/Division des entrées-sorties, Statistics Canada/Statistique Canada, Reprint from Canadian Economic Observer/Réimprimé de l'observateur économique canadien, May 1991/mai 1991.
- (41)
Diaz, A., *Alternative Concepts of Output and Productivity*, Input-Output Division, Statistics Canada, Catalogue 15-204, 1989 issue; July 1991.
- (42)
Durand, R., *Aggregation, Integration and Productivity Analysis: An Overall Framework*, Input-Output Division, Statistics Canada, Catalogue 15-204, 1989 issue; July 1991.
- (43)
Diaz, A., *The Statistics Canada Concepts and Measures of Productivity*, Input-Output Division, Statistics Canada, December 6, 1990. (Reprinted October 1991).
- (44-E)
Dionne, M., *Measuring Capital Depreciation*, Input-Output Division, Statistics Canada, July 1991.

(44-F)

Dionne, M., *Mesure de la dépréciation du capital*, Division des entrées-sorties, Statistique Canada, novembre 1991.

(45)

Murty, P.S.K., and Siddiqi, Y., *Scope of Public Grants Economy in Canada*, Input-Output Division, Statistics Canada, December 6, 1991. (Draft).

(46)

Murty, P.S.K., et Siddiqi, Y., *Portée de l'économie des subventions publiques au Canada*, Division des entrées-sorties, Statistique Canada, le 6 décembre 1991. (Projet).

(47-E)

Gill, K., and Larose, M., *Sources and Methods of Estimating Employment by Input-Output Industries for the years 1961 to 1989*, Input-Output Division, Statistics Canada, November 1991, revised February 1993.

(47-F)

Gill, K., et Larose, M., *Sources et Méthodes d'estimation de l'emploi par industries entrées-sorties de 1961 à 1989*, Division des entrées-sorties, Statistique Canada, novembre 1991, révisé février 1993.

(48)

Murty, P.S.K., and Siddiqi, Y., *Transfer Payments in National Accounts and Grants Economics*, Input-Output Division, Statistics Canada, May 25, 1992.

(49)

Interprovincial and International Trade Flows of Goods 1984-1988/Flux du commerce international et interprovincial des biens 1984-1988, Input-Output Division/Division des entrées-sorties, Statistics Canada/Statistique Canada, June 1992/ juin 1992. Cost/Coût=\$500.00

(50)

Messinger, H., *Canada's Interprovincial Trade Flows of Goods, 1984-88/Flux du commerce interprovincial des biens au Canada 1984-1988*, Input-Output Division/Division des entrées-sorties, Statistics Canada/Statistique Canada, January 1993/janvier 1993. Forthcoming/A venir.

(51)

Webber, M., *Estimating Total Annual Hours Worked from the Canadian Labour Force Survey*, Labour and Household Surveys Analysis Division and Input-Output Division, Statistics Canada, April 1983.

(52-E)

Statistics Canada's input-Output Model: General description, Critical Analysis of Partially Closed Version and Alternative Solutions, Input-Output Division, Statistics Canada, June 1991.

(52-F)

Le modèle d'entrées-sorties de Statistique Canada: présentation générale, analyse critique de la version avec fermeture partielle et solutions de rechange, Division des entrées-sorties, Statistique Canada, juin 1991.

(53)

Murty, P.S.K., *A New Approach to Analyze Public Sector Grants: A Case Study of Canada*, Input-Output Division, Statistics Canada, January 1993.

(54)

Murty, P.S.K., *Scope of the Public Sector Grants in the Canadian Economy Revisited*, Input-Output Division, Statistics Canada, January 1993.

(55)

Murty, P.S.K., *A Blueprint for the System of Grant Accounts*, Input-Output Division, Statistics Canada, February 1993.

(56)

Murty, P.S.K., *The Need for a System of Grant Accounts*, Input-Output Division, Statistics Canada, March 1993.

(57-E)

Siddiqi, Y., and Salam, M., *Estimating More Timely Input-Output Accounts: A Synthetic Approach*, Input-Output Division, Statistics Canada, March 1993.

(57-F)

Siddiqi, Y., et Salem, M., *Estimation des comptes d'entrées-sorties dans des délais raisonnables : une méthode synthétique*, Division des entrées-sorties, Statistique Canada, mars 1993

(58-E)

Poole, E., *A Guide to using the Input-Output Model of Statistics Canada*, Input-Output Division, Statistics Canada, June 1993.

(59)

Murty, P.S.K., *A System of Grant Accounts*, Input-Output Division, Statistics Canada, September 1993.

(60-E)

Allard-Saulnier, M., *Comparability of Multifactor Productivity Estimates in Canada and the United States*, Input-Output Division, Statistics Canada, February 1993.

(60-F)

Allard-Saulnier, M., *Comparabilité des estimations de la productivité multifactorielle au Canada et aux Etats-Unis*, Division des entrées-sorties, Statistique Canada, février 1993.

(61-E)

Maynard, J-P., *Hours Worked: A New Measure of Labour Input for Multifactor Productivity Estimates*, Input-Output Division, Statistics Canada, February 1993.

(61-F)

Maynard, J-P., *Les heures travaillées: une nouvelle mesure de l'entrée de travail pour la productivité multifactorielle*, Division des entrées-sorties, Statistique Canada, février 1993.

STATISTICS CANADA LIBRARY
BIBLIOTHEQUE STATISTIQUE CANADA



1010161210

008

