Catalogue no. 13-604-MIE — No. 047
ISSN: 1707-1739
ISBN: 0-662-39189-6

Research Paper

Income and Expenditure Accounts Technical Series

Revisions of the Canadian National Tourism Indicators

Income and Expenditure Accounts Division
21st Floor, R.H. Coats Building, Ottawa, K1A 0T6

Telephone: 1 613 951-3640

This paper represents the views of the authors and does not necessarily reflect the opinions of Statistics Canada.

Statistics Canada Statistique Canada

Canada

Revisions of the Canadian National Tourism Indicators

Reprinted with permission from *Tourism Satellite Account (TSA) Implementation Project: Enzo Paci Papers on Measuring the Economic Significance of Tourism (Volume 4)*, World Tourism Organization, 2004, pages 87-100.

This paper discusses the revision policy of Canada's ***National Tourism Indicators*** (NTI) and summarizes results from some recent studies of data revisions to the NTI. The discussion is timely, as the adoption of explicit data revision policies has been emphasized recently as an essential element in the good governance of statistical systems.

The paper starts with a brief description of the NTI, their underlying conceptual framework, and their sources and methods. Next comes a discussion of the need for data revisions, and an outline of various types of revisions. Then a few sections are devoted to the new NTI revision policy adopted with the first quarter 2004 estimates, and the associated costs and benefits. Revision studies, which have been used to assess quality of national accounts estimates, and the database established to track data revisions to the NTI are described next. Last, results from some recent NTI data revision exercises and studies are summarized.

Ottawa
January 2005

Catalogue no. 13-604-**MIE** no. 47
ISSN: 1707-1739
ISBN: 0-662-39189-6

Catalogue no. 13-604-**MPE** no. 47
ISSN: 1707-1720
ISBN: 0-662-39188-8

Published by authority of the Minister responsible for Statistics Canada

Table of contents

Symbols

The following standard symbols are used in Statistics Canada publications:

- **.** not available for any reference period
- **..** not available for a specific reference period
- **...** not applicable
- **0** true zero or a value rounded to zero
- **0**s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- **x** suppressed to meet the confidentiality requirements of the Statistics Act
- E use with caution
- **F** too unreliable to be published

Revisions of the Canadian National Tourism Indicators[1]

1.0 Introduction

This paper discusses the revision policy of Canada's ***National Tourism Indicators*** (NTI) and summarizes results from some recent studies of data revisions to the NTI. The discussion is timely, as the adoption of explicit data revision policies has been emphasized recently as an essential element in the good governance of statistical systems.[2]

The paper starts with a brief description of the NTI, their underlying conceptual framework, and their sources and methods. Next comes a discussion of the need for data revisions, and an outline of various types of revisions. Then a few sections are devoted to the new NTI revision policy adopted with the first quarter 2004 estimates, and the associated costs and benefits. Revision studies, which have been used to assess quality of national accounts estimates, and the database established to track data revisions to the NTI are described next. Last, results from some recent NTI data revision exercises and studies are summarized.

2.0 The National Tourism Indicators

The NTI show the quarterly evolution of tourism in Canada from first quarter 1986 through to the present. They include time series for the supply and demand for tourism commodities at current and constant prices, adjusted and unadjusted for seasonality. Tourism demand is separated into spending of non-resident visitors (exports) and resident visitors (domestic demand). They also include tourism Gross Domestic Product (GDP) and jobs attributable to tourism, both by industry. Last, there are several tables of related indicators including international travel, exchange rates and consumer prices in selected countries, among others.

The NTI were first published in June 1996, with time series estimates from the first quarter of 1986 to the first quarter of 1996. Since then, they have been released four times a year, about 90 days after the end of the reference quarter. The release schedule is pre-announced in December for the coming year. The NTI quarterly publication and a user guide are available in both paper and electronic format. In addition, about 300 NTI time series are available on-line in Statistics Canada's CANSIM electronic database.

3.0 The conceptual framework

The NTI were initially developed to provide more timely estimates of major aggregates of the Canadian Tourism Satellite Account (TSA) that became available only several years after the fact. As such, the definitions related to key concepts underlying the NTI flow from those of the TSA. These include concepts like tourism, visitors, tourism commodities and industries, domestic supply and tourism demand, tourism domestic demand and exports, tourism GDP and employment attributable to tourism. As a satellite account to the Canadian System of National Accounts (SNA), the concepts and definitions underlying the TSA closely follow those of the SNA. In addition, they generally follow the international guidelines as established in ***Tourism Satellite Account: Recommended Methodological Framework*** (TSA-RMF).[3]

Some conceptual differences exist between the Canadian TSA and the international guidelines in the TSA-RMF. These are related to valuation at basic prices, net valuation, and the treatment of business travel expenses.

---

1. *This paper was prepared by staff of the Research and Development Projects and Analysis Section of the Income and Expenditure Accounts Division at Statistics Canada. It draws heavily on three documents: "A study of data revisions to the National Tourism Indicators," by Conrad Barber-Dueck, published in the* ***National Tourism Indicators, Fourth Quarter 2003*** *issue, "The 1997-2003 revisions of the National Tourism Indicators," published in the* ***National Tourism Indicators, First Quarter 2004*** *issue, and "Proposal for an NTI/PTSA Revision Policy," prepared for the Canadian Tourism Commission Research Committee at their 7-11 November 2003 meetings in Toronto. For further information, please call Chris Jackson (Chief, Research and Development Projects and Analysis Section) at 1-613-951-4107 or e-mail jackchr@statcan.ca. We would like to thank the Canadian Tourism Commission who provided funding for this report.*
2. *See Carol S. Carson, "Revisions Policy for Official Statistics: A Matter of Governance," report prepared for the IMF for the meetings of the Committee for the Coordination of Statistical Activities, Second Session, 8-10 September 2003, in Geneva (SA/2003/13).*
3. *Commission of the European Communities, Organisation for Economic Co-operation and Development, World Tourism Organization, United Nations Statistics Division,* ***Tourism Satellite Account, Recommended Methodological Framework****, 2001.*

In all cases, they stem from differences between the Canadian SNA and the international guidelines for the System of National Accounts (SNA 1993).[4] In addition there are certain gaps in terms of coverage of the Canadian TSA related to second homes, post-trip expenditures, multiple-purpose durables, tourism collective consumption and capital formation. These stem from both differences between the Canadian SNA and the SNA 1993 as well as data gaps.[5] All the above differences carry through to the NTI.

4.0 NTI sources and methods

The NTI are benchmarked on detailed supply- and demand-side information in Tourism Satellite Accounts for 1988, 1992, 1996 and 1998.[6] These in turn draw on detailed supply-side information on the output of commodities by industries from Statistics Canada's annual Input-Output (I/O) Accounts, and demand-side information on visitor spending of residents from the Canadian Travel Survey (CTS) and of non-residents from the International Travel Survey (ITS).

Essentially, NTI updating entails carrying forward the most recent TSA benchmarks for the supply of tourism and non-tourism commodities on supply-side indicators, and carrying forward the TSA total tourism demand aggregates on the basis of demand-side indicators. Tourism export benchmarks from the TSA are carried forward on estimates from the ITS, and tourism domestic demand is estimated residually.

A wide array of quarterly supply and demand-side indicators, mainly from the SNA, is used to update the NTI. These include primarily the National Income and Expenditure Accounts series on components of consumer spending (such as spending on restaurants and accommodation and passenger transportation), the monthly GDP by Industry Accounts estimates for selected industries (such as air transportation, accommodation, etc), and estimates from the International Travel Account of the Balance of Payments Accounts.[7]

The Canadian Travel Survey, which gives resident visitor spending, and an alternative direct estimate for tourism domestic demand, is not released in timely enough fashion to factor into current quarter NTI estimates. However, it is used to establish domestic demand benchmarks for the TSA which in turn provide the annual benchmarks for the NTI. In addition, the CTS is used to establish seasonal factors for the NTI domestic demand series.

5.0 The need for data revisions

The NTI have undergone a variety of data revisions since their inception. The need to revise data arises from several factors. Users need timely estimates but typically these can only be based on early and often imperfect information. They also need accurate and reliable estimates but these are not always available on a timely basis. Statistical agencies strike a balance between these conflicting needs through data revisions. Thus, estimates are made on a preliminary basis (to meet the need for timeliness) but get revised subsequently as more comprehensive information becomes available (to meet the need for accuracy and reliability).

Large integrated statistical systems like the SNA draw on a wide variety of survey, census, administrative and other data sources each of which become available at different times after the reference period. In addition, many of these data sources may themselves be subject to revision over time. As a consequence, in order to bring the most up-to-date and comprehensive information into the SNA, data revisions must necessarily take place. Because the NTI draw heavily on the SNA, they too must undergo revision in order to keep in step with their underlying demand- and supply-side indicators. If the NTI were not revised, eventually they could be seriously at

---

4. *Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank,* ***System of National Accounts 1993****.*
5. *See Katharine Kemp and Shaila Nijhowne, "Study of the Canadian Tourism Satellite Account: Comparison of the TSA-RMF and CTSA," report prepared for the Canadian Tourism Commission for the meetings of the Macroeconomics and Statistics Sub-Committee of the World Tourism Organization, 8-9 March 2004 in Madrid.*
6. *For more details see: "The Tourism Satellite Account," in* ***National Income and Expenditure Accounts, Second Quarter 1994****, Cat. No. 13-001-XPB, "The Canadian Tourism Satellite Account: An Analysis of Results for 1988 and 1992," in* ***National Tourism Indicators, Second Quarter 2001****, Cat. No. 13-009-XPB, "The Provincial and Territorial Tourism Satellite Accounts for Canada, 1996,"* ***Income and Expenditure Accounts Division Technical Series*** *No. 38, Cat. No. 13F0063XPE, and "The Provincial and Territorial Tourism Satellite Accounts for Canada, 1998,"* ***Income and Expenditure Accounts Division Technical Series*** *No. 40, Cat. No. 13-604-MPE.*
7. *For more information see* ***Guide to the National Tourism Indicators****, Statistics Canada Cat. No. 13-594-GPE.*

odds with the rest of the statistical system. This would hamper analysis of the NTI and possibly even render it meaningless if other related statistics were substantially revised.

There are other reasons for revisions beyond the incorporation of more up-to-date or complete data. In particular, statistical systems change over time as continual efforts are made to improve them, to implement efficiencies, to introduce the latest innovations in methodology, to take advantage of new data sources or to compensate for the loss of data sources. They are also adapted to keep in step with evolution in the phenomena under measurement and with evolving international standards and guidelines. These types of changes may simply involve refinements and small but limited data revisions, or they may entail major overhauls with significant and widespread data revisions.

6.0 Types of revisions

Current revisions, as are normally made in the NTI, are those made during the current reference year. In this case, estimates for any quarter are subject to revision at any subsequent quarter during the year. For instance, a first quarter estimate is revised on release of the second, third and fourth quarter estimates for the same year. This type of revision allows improvements to estimates for past quarters during the current year by bringing in the most up-to-date information available (including, for example, revisions to source data as a result of late reporting).

Annual revisions, of the sort carried out in the NTI with the first quarter of 2004, allow the incorporation of the most up-to-date information from censuses, annual surveys, taxation statistics, etc, which become available well after the fact. In this case, all estimates for a fixed number of years back from the current year are subject to change. In the Canadian SNA, annual revisions are done once a year with every first quarter release and estimates back four years are subject to revision. For instance, an estimate for the second quarter made at the time of the fourth quarter of 2004 would be subject to revision at the time of the first quarter releases for 2005 through to 2008. Once an estimate has gone through the cycle of annual revisions, it is considered “final” and is no longer subject to the annual revision process.

Historical revisions, of the sort carried out in the NTI with the third quarter of 2002, also provide the occasion to bring in new data. However, they are mainly for the purpose of implementing new concepts and definitions (as required by international accounting guidelines), new and refined methods and revamping of estimation systems. Historical revisions are normally carried out once a decade, and they typically result in changes to entire time series.

Rebasing of constant price series, as took place with the third quarter 1997 release of the NTI, is normally carried out twice a decade, in the Canadian experience at least, at the time of historical revisions and mid-way between. Rebasing is done to remove bias in measures of inflation-adjusted growth as relative prices in the economy evolve away from those of the base year. It involves revisions only to price indexes and constant price aggregates, leaving aggregates at current prices unaffected.

7.0 The new NTI revision policy

With the first quarter 2004 release a new revision policy was implemented, one that follows more closely the original vision for the NTI. This new policy is modelled on and meshes with the one in place for the quarterly SNA.

The NTI have always been, and under the new revision policy will continue to be, subject to both current and historical revisions as well as rebasing. The main difference is that the NTI are now subject to annual revisions, at the time of a first quarter release. Formerly, the NTI for any year were for all intents and purposes considered “final” at the time of the fourth quarter release for that year. With the new policy, they will only be considered “final” after going through the cycle of annual revisions. Normally, the cycle comes to an end when final annual benchmarks are incorporated. In the quarterly SNA, this occurs when final I/O benchmarks are brought in. These become available close to four years after the fact yielding a four-year window for data revisions.

The revision window for the NTI is wider, however, for a number of reasons. First, the key source of final benchmarks is the TSA. It takes close to a year to update the TSA on the basis of final I/O tables and to then

incorporate the new benchmarks into the NTI. As a result, the window for revision must be at least five years. Second, the TSA, over the last few years at least, has been done on a biennial basis. Incorporation of updated benchmarks every two years necessitates revisions between the benchmarks. This extends the window for revision to at least six years. Last, given the new policy, the work associated with annual revisions must be done in a relatively short time frame leading up to a first quarter release. If a TSA is not ready in time, it can only be incorporated at the next annual revision. In this event, the revision period would be extended beyond six years (as was the case with the NTI annual revision for the first quarter 2004 release).

Thus, the window for revision in the NTI is not fixed because its length depends on the frequency of TSA updates that in turn hinge on funding and resource constraints. These are less certain for the relatively small NTI/TSA operation than is the case for the much larger SNA system. In addition, and as a result, the NTI window for revision is variable, depending on whether a TSA is available. In years when there is no updated TSA, the revision period need only be four years, corresponding to the data revision period for the underlying SNA indicators. In years when an updated TSA is available, the window for revision will be six years (for a biennial TSA).

8.0 Benefits of the new policy

The introduction of annual revisions will help to improve the reliability and accuracy of the NTI. Under the former practice, revisions to source SNA and other data (such as the CTS and ITS) that became available more than three months after the reference year could not be incorporated, at least not on a regular basis. This resulted in the NTI being essentially time series of preliminary estimates that eventually departed from their underlying indicators until an historical revision brought them back in line. The new revision policy rectifies this situation, by enabling incorporation once a year of new and revised data for past reference periods.

The new revision policy also sets the stage for more regular benchmarking to updated TSAs. In particular, it imposes definite timelines within which to start and complete work on a TSA and to incorporate the new benchmarks in the NTI. With annual revisions scheduled for a first quarter release, re-benchmarking must take place in a two to three month window leading up to that release. Work to update the TSA has to start immediately with the availability of updated I/O tables in order to meet the deadline.

Under the new policy, and assuming a biennial TSA, the benchmarked NTI will now be no further than six calendar years behind the current quarter NTI. In the past, the benchmarks were at one point eleven years behind. Keeping the benchmarks as close as possible to the current reference year has important implications for the accuracy of the time series.

Revisions will henceforth take place in a systematic and timely way, allowing the incorporation of new data (benchmarks and indicators) on the occasion of a first quarter release. As a result, the NTI will be based on the most up-to date and comprehensive data, and move in step with their underlying data, thus reducing data discrepancies. This will help to smooth the transition to the final NTI, benchmarked on the most recent TSA, because the comprehensive data that goes into the TSA would be brought directly into the NTI ahead of the TSA benchmarks. In addition it will facilitate tourism analysis, because the NTI would be revised in step with comparative statistics from the SNA and other sources.

9.0 Other considerations

With each first quarter release, up to 24 quarters are now open to revision, as opposed to none before. This has significantly increased the first quarter workload. Coupled with the incorporation of updated TSA benchmarks at the time of a first quarter this poses certain risks to the release schedule. In particular, there is only three months to update the NTI benchmarks, incorporate underlying SNA indicators (which undergo annual revision during April/May), and prepare the first quarter estimates by the end of June.

The revision/release process for the NTI relies on a relatively stable framework for tourism statistics, both on the conceptual and operational levels. It is not possible to manage the operation and maintain the release schedule and at the same time implement frequent and significant changes to the framework (and the full TSA/NTI) time series on an ad hoc basis. These have to be held back or accumulated for implementation during historical

revisions, meaning that both the TSA and NTI could be out of step for some time with an evolving statistical framework. Likewise, revised or updated source data will be accumulated for incorporation into the NTI in one shot for a first quarter release. This means that for a short time, the NTI could be out of step for instance with data from monthly GDP by industry accounts (which go though annual revision during the third quarter).

While the annual revisions help to improve the quality of the NTI, it also means that users will be confronted with regular data revisions covering a period of up to six years. As well as imposing costs on users to retrieve the revised data, to update their own data and publications, to re-estimate their forecasting models and so on, data revisions raise questions for users about the quality of initial estimates and the reasons for revisions. It is therefore necessary to take efforts to ensure that users understand the revision policy (when data will be revised, and how far back), what causes the revisions (what are the major sources of revision) and what is the magnitude of the revisions (and what this implies about the quality of the estimates). These communications efforts, while very worthwhile, nonetheless impose additional costs on the NTI program.

10.0 Revision studies and quality assessment

An ongoing systematic revision process opens up possibilities for studies of data revisions. It is possible to examine how close 'initial' estimates (based on preliminary data) are to 'final' estimates (based on comprehensive, final data). Such investigations reveal how much estimates tend to be revised, if revisions tend to be in one direction (i.e., upwards or downwards), if they are larger or smaller in particular quarters, and so on. As in the SNA, analysis of revisions provides one way of assessing the quality of the current quarter estimates.[8]

In revision analysis the notion of 'quality' has a rather precise meaning and concerns two aspects of data quality: accuracy and reliability. Accuracy is associated with the final estimates, which are deemed 'accurate' if they closely approximate the true values of what they aim to measure. In this sense, accuracy cannot be directly measured since the true values are never known. It can only be judged by assessing the source data and methods used for the final estimates.

Reliability on the other hand is associated with the preliminary (or intermediate) estimates. These are deemed reliable if they closely approximate the final estimates. Reliability can therefore be directly gauged from characteristics of the revisions between first and final estimates. If the initial estimates are found to be reliable then users can confidently make analysis based on them, knowing they are almost as good as the final estimates. Such information could be built into NTI-based forecast models for instance. The performance (in terms of accuracy and reliability) of the NTI could also be examined, for example before and after revamping the estimation system.

11.0 Revision statistics

A variety of measures can be used to assess revisions.[9] Differences (or revisions) between final and initial estimates can be used to assess bias. These differences are averaged across a time series to arrive at a measure of the mean or average revision. If the mean revision is positive, the initial estimate is downward biased or, in other words, it tends to get revised up. It is upward biased if the mean revision is negative. More important, the closer the mean revision is to zero, the more reliable a series is deemed to be. Mean bias alone cannot tell the whole story on reliability, however, because estimates may undergo both large positive and offsetting negative revisions. A measure of dispersion is therefore needed to gauge the magnitude of the revisions.

To assess the dispersion of the revisions, the standard deviation of the differences between final and initial estimates can be used. This measures the likelihood that an initial estimate would be within, say, +/-$5 million of the final estimate or an initial estimated rate of growth would be within, say, +/- 0.3 percentage points of the final estimate. A relatively small value for the standard deviation indicates that most of the revisions are closely packed together around the mean revision. This, along with a small bias, would suggest that the series in question is very reliable.

8. *See for instance Doris de Zilva, " Gross Domestic Product (GDP) Growth Rate, 1981 to 2003 Revisions," System of National Accounts, Statistics Canada, forthcoming.*
9. *A wide variety of statistical tools for revisions analysis is discussed in Doris de Zilva, "Revision Studies Toolkit", System of National Accounts, Statistics Canada, (forthcoming).*

A few other simple measures are also available. One is based on counting how many revisions are positive and how many are negative. This shows if estimates tend to be revised up or down and is a useful indicator for users concerned about upside or downside risk. For users concerned about worst or best case scenarios, the minimum, maximum and the range of revisions are useful statistics. In order to put the revisions in perspective, it helps to compare certain measures (such as the mean revision, range and standard deviation) relative to the value of a series in total. For example, a mean revision or a standard deviation of $10 million may seem large, but if this represents less than 0.1% of the total then the estimates are clearly reliable.

12.0 The NTI revisions database

A prerequisite for the above type of analysis is a database that tracks the history of data revisions. As part of the development work leading up to the implementation of the new revision policy, an NTI "revisions database" was constructed. This is a large database with around 55,000 series, compared to about 1,300 series for the internal NTI dataset, and about 300 published series. This database will be updated once a year starting with the first quarter 2004 NTI release.

The revisions retained in the database include: those made to the constant price series with the third quarter 1997 release, when prices were rebased from 1986 to 1992; those made during the historical revision with the third quarter 2002 estimates, when a new TSA benchmark (1996) was introduced, new concepts and definitions reflecting implementation of the SNA 1993 in the Canadian SNA were brought in, new sources and methods were adopted, and all constant price series were rebased to 1997; the annual revision of the NTI with the first quarter 2004 release, when a new TSA benchmark (1998) as well as revised estimates for underlying indicators were brought in; and, last, all the current revisions made to the NTI since first quarter 1997.[10]

For all the above, the database includes the resulting revisions to all estimates in the main NTI tables at the detailed working level (below the level actually published). Thus revisions to both seasonally adjusted and non adjusted data are included, as well as current and constant price estimates. These details are available for exports, domestic and total tourism expenditure as well as supply. The revisions to estimates of levels as well as growth rates are kept in the database.

The revisions stored in the database reflect differences between the various vintages of estimates for each NTI series for each quarter. So, for instance, the estimate for growth of real domestic spending on passenger air transport for first quarter 1998 was revised with the second, third and fourth quarter estimates for 1998, with the historical revision of the NTI at the time of the third quarter 2002 release, and most recently with the annual revision of the NTI at the first quarter 2004 release. Thus, so far, there have been five estimates made on this particular data point, and four revisions to the initial estimate, all of which are stored in the database.

13.0 Current revisions in the NTI

A recent study,[11] the first of its kind for the NTI, examined revisions from first-release through to final estimate over the period 1997 to 2001.[12] The intent was to investigate the characteristics of current data revisions prior to the historical revision of the NTI. When more observations on revisions have been collected, it will be possible to repeat the study for the post-historical revision period to examine if the quality of the NTI during the current reference year has improved.

10. Because of their very preliminary nature, the current revisions and an historical revision made during the first year of NTI operations are excluded from the database.

11. See Conrad Barber-Dueck "A study of data revisions to the National Tourism Indicators," in the ***National Tourism Indicators, Fourth Quarter 2003.***

12. It might be re-emphasized that during the period under study, NTI estimates were considered "final" by the time of a fourth quarter release, so the revisions under study here are the differences between estimates for the first through third quarters, as they stood at the fourth quarter (i.e., final estimates), and as they stood on first release.

Table 1: Current revisions, NTI levels, current dollars, unadjusted for seasonality, 1997-2001

	Mean revision	Relative mean revision	Percent[1] negative revisions	Percent[1] positive revisions	Standard deviation	Minimum revision	Maximum revision	Relative range
	$ millions		%			$ millions		%
Total Demand	105	0.8	20	80	120	-112	297	3.1
Exports	5	0.1	40	60	97	-159	160	7.6
Domestic Demand	100	1.1	13	87	75	-58	225	3.1
Tourism Supply	-213	-0.8	87	13	160	-435	86	2.6
Total Employment (000's)	0.1	0.0	60	40	7	-9	22	5.8

[1] *Positive and negative revisions will not sum to 100% if some revisions are 0.*

The results (see Table 1) indicate that initial estimates tended to understate tourism total demand over 1997 to 2001. The mean revision was $105 million, a relatively small 0.8% of the total. Revisions were in the upward direction 80% of the time. The standard deviation of the revisions for tourism total demand was $120 million indicating that one could expect roughly 95% of the initial estimates to be within $240 million (or 1.8%) of the final estimates. Even in the most extreme cases, initial estimates understated tourism total demand by $297 million and overstated it by $112 million, giving a range of 3.1% relative to the total.

These results suggest that the first-release estimates for total tourism demand were quite reliable. They also suggest a small downward bias over 1997 to 2001. Given that tourism demand was growing rapidly over this period this finding is not too surprising.

The revisions were similar for tourism domestic demand and exports insofar as they tended to be revised upwards. When looking at dispersion however a very different picture emerged. Although domestic demand had a relatively strong downward bias, the standard deviation of its revisions was a relatively small $75 million dollars (or 0.8% of the average value of domestic demand). And while exports were virtually unbiased, they were quite dispersed. The standard deviation of revisions to exports was $97 million (or 2.3% of the average value of exports).

The pattern of revisions to the supply of tourism commodities was quite different than for demand. Here the revisions on average were downward. All the major commodity categories tended to be revised downward from initial to final estimate as well. It might be noted that the supply-side NTI were more reliable than the demand-side, with smaller relative mean revision and less dispersion relative to the total values.

Table 2: Current revisions, NTI growth rates, constant dollars, seasonally adjusted, 1997-2001

	Mean revision	Percent[1] negative revisions	Percent[1] positive revisions	Standard deviation	Minimum revision	Maximum revision
	% points	%		% points		
Total Demand	0.4	27	73	0.7	-0.9	1.8
Exports	0.6	27	73	1.4	-1.9	2.7
Domestic Demand	0.3	27	67	0.8	-1.2	1.9
Tourism Supply	-0.1	53	47	0.7	-1.5	1.5
Total Employment (000's)	-0.1	47	53	0.4	-0.7	0.7

[1] *Positive and negative revisions will not sum to 100% if some revisions are 0.*

The first estimates for total demand (see Table 2) tended to understate growth. On average, the initial growth rate estimates were subsequently revised up 0.4 percentage points. This is a relatively large revision given that total tourism demand grew an average 0.6% per quarter over this period. The standard deviation of revisions to the

growth rates indicates that one could expect roughly 95% of the initial estimates to be within 1.4 percentage points of the final estimates. Again, this is a fairly wide margin given the average growth over the period.

Quarterly estimates of employment generated by tourism over 1997 to 2001 were quite reliable. They showed little difference between first and final release, with a mean revision of only 0.03% of the final estimates, and their standard deviation was only 7000 jobs (or 1.3% of the total jobs generated by tourism). The average revision to employment growth rates on the other hand was -0.1 percentage points. In other words, the first-release estimates for tourism employment overstated growth by 0.1 percentage points on average. Growth in tourism employment averaged 0.6% over this period.

14.0 Annual revision of the NTI

During the first annual revision of the NTI, that took place with the first quarter 2004 release, 28 quarters of data were revised.[13] The annual revisions tended to be larger than the current revisions reported above, largely because they involved incorporation of annual survey benchmarks, updated I/O tables and the 1998 TSA benchmarks.

The results are shown in Table 3. The mean annual revision to the quarterly estimates of tourism demand (current dollars, seasonally unadjusted) from 1997 to 2003 was $236 million (or 1.8%). This was more than twice the $105 million (or 0.8%) mean current revision to the estimates from 1997 to 2001 (reported above). Similarly, the annual revisions to tourism domestic demand, exports, supply and employment were much larger, on average, than the current revisions reported above. They also tended to be in the same direction, with the exception of exports.

Table 3: Annual revisions, NTI levels, current dollars, unadjusted for seasonality, 1997-2003

	Mean revision	Relative mean revision	Percent[1] negative revisions	Percent[1] positive	Standard deviation	Minimum revision	Maximum revision	Relative range
	$ millions		%			$ millions		%
Total Demand	236	1.8	7	93	190	-73	726	6.1
Exports	-17	-0.4	46	54	78	-169	89	6.5
Domestic Demand	253	2.8	7	93	197	-65	637	7.7
Tourism Supply	-700	-2.2	100	0	478	-1555	-22	4.7
Total Employment (000's)	3	2.1	39	61	5	-5	12	11.8

[1] *Positive and negative revisions will not sum to 100% if some revisions are 0.*

The annual revisions to the NTI for tourism GDP were also considerably larger than the annual revisions made to the SNA estimates of quarterly GDP. Annual revisions to GDP (adjusted for seasonality and inflation) with the first quarter of 2004, ranged between -0.2% and +0.4%.[14] For comparison, annual revisions to the NTI for tourism GDP ranged between -1.8% and 2.4%.

This is not too surprising, however, as tourism GDP is a much smaller aggregate than economy-wide GDP; it made up 2.0% of Canada's overall GDP at basic prices in 2003. It lacks large components like consumer spending (or labour income) that tend to be very stable and little revised. In addition, tourism is simply a more volatile phenomenon than the economy as a whole[15] so that early indicators are more likely to be revised, and to a larger degree.

13. *See "The 1997-2003 revisions of the National Tourism Indicators," **National Tourism Indicators, First Quarter 2004.***
14. *For more information on the recent round of annual revisions to GDP see "The 2000-2003 revisions of the Income and Expenditure Accounts" in **National income and Expenditure Accounts, First Quarter 2004**.*
15. *See David Wilton, **Recent Developments in the National Tourism Indicators**, Research Report for the Canadian Tourism Commission, forthcoming.*

One important concern is that the broad picture conveyed by the NTI should hold up through revision exercises. If this were not the case, one might well be doubtful of preliminary results and the revision exercises themselves. Table 4 shows the NTI estimates for growth of total tourism demand before and after the annual revision with the first quarter 2004 release.

The annually revised estimates continued to show the upswing of tourism demand in Canada in the late nineties through to the year 2000. They also continued to show a downturn (-1.1%) of tourism demand in the second quarter of 2001, although not as steep as previously published (-1.9%). The third quarter of 2001, which included 9/11, showed more of a decline than previously estimated. Also, a much sharper decline was indicated in the aftermath of 9/11. The rebound in the first quarter of 2002, on the other hand, was revised to nearly twice the previous estimate.

The downturn of tourism demand in the first quarter of 2003, was revised to a sharper -1.9%, versus a previously published -1.3%. The second quarter, which in Canada bore the brunt of the effects of SARS, continued to show a steep decline in tourism spending. As well, the rebound in the third quarter was revised to be somewhat stronger, while a robust advance continued to be indicated for the fourth quarter of 2003.

Generally, the broad picture held up through the annual revision exercise, and if anything, it was sharpened. This suggests that the earlier estimates had provided reliable signals, and that the revised estimates provided a more accurate portrayal of events.

Table 4: Annual revisions, NTI Growth rates, constant dollars, seasonally adjusted, 1997-2003

Reference period		Revised estimate	Previous estimate	Difference
Year	Quarter	%		% points
1997	Q1	3.7	3.0	0.7
	Q2	2.7	2.8	-0.1
	Q3	1.5	1.3	0.2
	Q4	0.7	0.2	0.5
1998	Q1	0.3	-0.5	0.8
	Q2	2.5	1.8	0.7
	Q3	0.8	0.1	0.7
	Q4	2.2	2.4	-0.2
1999	Q1	0.8	1.4	-0.6
	Q2	-0.7	-0.5	-0.2
	Q3	1.5	1.3	0.2
	Q4	0.9	1.2	-0.3
2000	Q1	1.3	0.8	0.5
	Q2	1.4	1.4	0.0
	Q3	1.1	1.0	0.1
	Q4	1.7	2.2	-0.5
2001	Q1	1.4	0.8	0.6
	Q2	-1.1	-1.9	0.8
	Q3	-2.9	-2.6	-0.3
	Q4	-2.6	-1.3	-1.3
2002	Q1	1.9	1.0	0.9
	Q2	0.5	0.9	-0.4
	Q3	0.1	-0.5	0.6
	Q4	0.9	0.9	0.0
2003	Q1	-1.9	-1.3	-0.6
	Q2	-4.6	-4.7	0.1
	Q3	1.9	1.4	0.5
	Q4	3.3	3.2	0.1

15.0 Historical revision of the NTI

The NTI underwent an historical revision with the third quarter 2002 release, resulting in data revisions for 66 quarters back to the first quarter of 1986. This entailed incorporation of updated TSAs for 1988 and 1992 and a new TSA for 1996, and some conceptual and methodological changes. The most current SNA data (reflecting revisions due to implementation of SNA 1993) were also brought in as well as data from the International Travel Account from the Balance of Payments. In addition, all constant price series were updated to the 1997 base year.

Significant changes were made to the vast majority of NTI series. This was due in part to the conceptual and methodological changes to the NTI, as well as to their underlying TSA benchmarks and SNA indicators. Also, until this historical revision, the NTI had essentially been considered final at a fourth quarter release and had not undergone further annual revisions after the close of the reference year, so revisions made elsewhere had simply cumulated.

Table 5: Historical Revision, NTI levels, Current dollars, Unadjusted for seasonality, 1986-2002

	Mean revision	Relative mean revision	Percent[1] negative revisions	Percent[1] positive	Standard deviation	Minimum revision	Maximum revision	Relative range
	$ millions	%			$ millions			%
Total demand	-521	-5.7	77	23	653	-2165	488	29.0
Exports	271	9.5	2	98	154	-50	782	29.3
Domestic demand	-792	-12.6	97	3	580	-2353	137	39.5
Tourism supply	993	4.6	15	85	1131	-1280	3451	21.9
Total employment (000's)	6	1.2	29	71	15	-32	33	13.1

[1] *Positive and negative revisions will not sum to 100% if some revisions are 0.*

As a consequence, the historical revisions were considerably larger (see Table 5) than the annual revisions reported above. Total tourism spending was revised down on average $521 million per quarter (or -5.7%) over the entire time series, with just over three-fourths of all quarters registering lower spending than previously published. Both exports and domestic demand also underwent significant revisions, while tourism supply and tourism employment were not revised by quite as much.

16.0 Conclusion

The revision history of the Canadian SNA goes back over fifty years. In contrast, the revision history of the NTI is relatively short, going back a mere seven years. This short history limits the scope for revision analysis, and full assessment of quality in the NTI. Nevertheless, a system is now in place to track all data revisions. In the future, when more of a history has been established, it will be possible to further analyze the NTI revisions, to compare quality before and after historical revisions, or across periods of upturns and downturns in tourism demand. As knowledge is built up on the characteristics of data revisions, improvements could be identified for the NTI estimation system itself, and users will be better informed about how good initial NTI estimates are, and what can be anticipated in terms of subsequent data revisions.

Technical series

The Income and Expenditure Accounts Division (IEAD) has a series of technical paper reprints, which users can obtain without charge. A list of the reprints currently available is presented below. For copies, contact the client services representative at 613-951-3810 or write to IEAD, Statistics Canada, 21st Floor, R.H. Coats Building, Tunney's Pasture, Ottawa, Ontario, K1A 0T6. (Internet: iead-info-dcrd@statcan.ca)

1. "Laspeyres, Paasche and Chain Price Indexes in the Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, fourth quarter 1988.

2. "Technical Paper on the Treatment of Grain Production in the Quarterly Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, first quarter 1989.

3. "Data Revisions for the Period 1985-1988 in the National Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, first quarter 1989.

4. "Incorporation in the Income and Expenditure Accounts of a Breakdown of Investment in Machinery and Equipment", reprinted from *National Income and Expenditure Accounts*, third quarter 1989.

5. "New Provincial Estimates of Final Domestic Demand at Constant Prices", reprinted from *National Income and Expenditure Accounts*, fourth quarter 1989.

6. "Real Gross Domestic Product: Sensitivity to the Choice of Base Year", reprinted from *Canadian Economic Observer*, May 1990

7. "Data Revisions for the Period 1986 1989 in the National Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, first quarter 1990.

8. "Volume Indexes in the Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, first quarter 1990.

9. "A New Indicator of Trends in Wage Inflation", reprinted from *Canadian Economic Observer*, September 1989.

10. "Recent Trends in Wages", reprinted from *Perspectives on Labour and Income*, winter 1990.

11. "The Canadian System of National Accounts Vis-à-Vis the U.N. System of National Accounts", reprinted from *National Income and Expenditure Accounts*, third quarter 1990.

12. "The Allocation of Indirect Taxes and Subsidies to Components of Final Expenditure", reprinted from *National Income and Expenditure Accounts*, third quarter 1990.

13. "The Treatment of the GST in the Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, first quarter 1991.

14. "The Introduction of Chain Volume Indexes in the Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, first quarter 1991.

15. "Data Revisions for the Period 1987-1990 in the National Income and Expenditure Accounts", reprinted from *National Income and Expenditure Accounts*, second quarter 1991.

16. "Volume Estimates of International Trade in Business Services", reprinted from *National Income and Expenditure Accounts*, third quarter 1991.

17. "The Challenge of Measurement in the National Accounts", reprinted from *National Income and Expenditure Accounts*, fourth quarter 1991.

18. “A Study of the Flow of Consumption Services from the Stock of Consumer Goods”, reprinted from *National Income and Expenditure Accounts*, fourth quarter 1991.

19. “The Value of Household Work in Canada, 1986”, reprinted from *National Income and Expenditure Accounts*, first quarter 1992.

20. “Data Revisions for the Period 1988-1991 in the National Income and Expenditure Accounts”, reprinted from *National Income and Expenditure Accounts*, Annual Estimates, 1980-1991.

21. “Cross-border Shopping - Trends and Measurement Issues”, reprinted from *National Income and Expenditure Accounts*, third quarter 1992.

22. “Reading Government Statistics: A User's Guide”, reprinted from *Policy Options*, Vol. 14, No. 3, April 1993.

23. “The Timeliness of Quarterly Income and Expenditure Accounts: An International Comparison”, reprinted from *National Income and Expenditure Accounts*, first quarter 1993.

24. “National Income and Expenditure Accounts: Revised Estimates for the period from 1989 to 1992”, reprinted from *National Income and Expenditure Accounts*, Annual Estimates, 1981-1992.

25. “International Price and Quantity Comparisons: Purchasing Power Parities and Real Expenditures, Canada and the United States”, reprinted from *National Income and Expenditure Accounts*, Annual Estimates, 1981-1992.

26. “The Distribution of GDP at Factor Cost by Sector”, reprinted from *National income and Expenditure Accounts*, third quarter 1993.

27. “The Value of Household Work in Canada, 1992”, reprinted from *National Income and Expenditure Accounts*, fourth quarter 1993.

28. “Assessing the Size of the Underground Economy: The Statistics Canada Perspective”, reprinted from *Canadian Economic Observer*, May 1994.

29. “National Income and Expenditure Accounts: Revised Estimates for the period from 1990 to 1993”, reprinted from *National Income and Expenditure Accounts*, first quarter 1994.

30. “The Canadian National Accounts Environmental Component: A Status Report”, reprinted from *National Income and Expenditure Accounts*, Annual Estimates, 1982-1993.

31. “The Tourism Satellite Account”, reprinted from *National income and Expenditure Accounts*, second quarter 1994.

32. “The 1993 International System of National Accounts: Its implementation in Canada”, reprinted from *National Income and Expenditure Accounts*, third quarter 1994.

33. “The 1995 Revision of the National Economic and Financial Accounts”, reprinted from *National Economic and Financial Accounts*, first quarter 1995.

34. “A Primer on Financial Derivatives”, reprinted from *National Economic and Financial Accounts*, first quarter 1995.

35. “The Effect of Rebasing on GDP”, reprinted from *National Economic and Financial Accounts*, second quarter 1996.

36. “Purchasing Power Parities and Real Expenditures, United States and Canada - An Update to 1998”, reprinted from *National Income and Expenditure Accounts*, third quarter 1999.

37. “Capitalization of Software in the National Accounts”, *National Income and Expenditure Accounts technical series*, February 2002.

38. “The Provincial and Territorial Tourism Satellite Accounts for Canada, 1996”, *National Income and Expenditure Accounts technical series*, April 2002.

39. “Purchasing Power Parities and Real Expenditures, United States and Canada”, reprinted from *National Income and Expenditure Accounts*, first quarter 2002.

40. “The Provincial and Territorial Tourism Satellite Accounts for Canada, 1998”, *National Income and Expenditure Accounts technical series*, June 2003.

41. “Government revenue attributable to tourism, 1998”, *National Income and Expenditure Accounts technical series*, September 2003.

42. “Chain Fisher Index Volume Methodology”, *National Income and Expenditure Accounts*, November 2003.

43. “Trends in provincial and territorial economic statistics: 1981-2002”, *National Income and Expenditure Accounts*, November 2003.

44. “The 1997-2003 Revisions of the National Tourism Indicators”, *National Income and Expenditure Accounts*, October 2004.

45. “A study of data revisions to the National Tourism Indicators”, *National Income and Expenditure Accounts*, October 2004.

46. “Provincial and Territorial Economic Accounts”, *National Income and Expenditure Accounts*, November 2004.