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A Study of Data Revisions to the National Tourism Indicators

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A Study of Data Revisions to the National Tourism Indicators

How good are the National Tourism Indicators (NTI)? How can their quality be measured? This study looks to answer these questions through analysis of the revisions to the NTI estimates for the period 1997 through 2001. The notion of "quality" in the context of revisions analysis is clarified and its measurement is discussed. Generally, revisions to total tourism demand, domestic demand and exports as well as supply of tourism commodities were found to be relatively small (1.0% or less of the total). This was the case at the aggregate level and for most commodities. Two appendices provide detailed results and a history of NTI revisions.

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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

A Study of Data Revisions to the National Tourism Indicators

By Conrad Barber-Dueck [1]

1.0 Introduction

How “good” are the National Tourism Indicators (NTI)? How can their quality be measured? This study looks to answer these questions through analysis of the revisions to the NTI estimates for the period 1997 through 2001.

The study’s main findings are:

- Revisions to total tourism demand, domestic demand and exports as well as supply of tourism commodities were relatively small (1.0% or less of the total). This was the case at the aggregate level and for most commodities.
- Revisions to total tourism demand over 1997 to 2001 tended to be upward. In other words, the initial estimates tended to understate total tourism demand.
- Domestic demand and exports also tended to be revised upward. This was the case for spending on most tourism commodities, except for accommodation which was revised downward.
- The quarterly estimates of the supply of tourism commodities tended to be revised down. They also showed smaller revisions on average than those for tourism demand.
- Growth rates of total tourism demand were revised upward 0.4 percentage points on average over 1997 to 2001.
- The NTI tended initially to understate the downturns and upswings in tourism spending.
- Estimates of jobs generated by tourism on average were revised up a slight 0.03%. However, tourism employment growth was revised down 0.3 percentage points on average.

The following sections provide some background on quality measurement and motivation for the study. The notion of “quality” in the context of revisions analysis is clarified and its measurement is discussed. This is followed by a discussion of the study’s limitations and then its results. Two appendices provide more detailed results and a history of NTI revisions.

2.0 Background

Data quality is difficult to assess in integrated statistical systems like the NTI because of the many data sources and the resulting need to reconcile often conflicting data. Quality assessment of the sort done on sample surveys (such as confidence intervals or coefficients of variation) is not feasible given the integration and reconciliation of multiple data sources. There are however other ways of addressing the quality issue.

One way is to subjectively rate individual series based upon knowledge of the underlying data sources. A high rating would be given to a series based on data from administrative records. A lower rating would go to a series based on small sample surveys or other weaker data sources. An even lower rating would go to a series for which

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1. *The author Conrad Barber-Dueck is an economist with the Income and Expenditure Accounts Division, Statistics Canada. For further information, please call 613-951-3640 or e-mail: iead-info-dcrd@statcan.ca.* *The author wishes to thank all involved for their invaluable support and assistance especially Marcel Beaudry, Jacques Delisle, Doris DeZilva, Chris Jackson, Roger Jullion, Demi Kotsovos, Christina MacPhail, Pat O’Hagan, Chantal Rouvroy, Jamie Temple, and other staff members in Income and Expenditure Accounts Division. Lastly, we would like to thank the Canadian Tourism Commission who provided funding for the overall project.*

direct, reliable observation is not possible and which is therefore dependent on judgment or on indirect sources. Individual series can then be weighted up to give an overall quality rating for statistical aggregates (such as total tourism demand in the NTI). This type of quality assessment can be found in the *Guide to the National Tourism Indicators (Cat. No. 13-594-GPE)*. That report examined the quality of the various data sources for the NTI, including the Canadian Travel Survey and the International Travel Survey.

Another approach to quality assessment stems from the fact that the NTI go through a revision process, that is, estimates for each quarter get revised through time. This process strikes a balance between users needs for (1) timely estimates which can only be based on early and often imperfect information and (2) accurate and reliable estimates which are not always available on a timely basis. Thus estimates are made on a preliminary basis, but get revised subsequently as more complete information becomes available. Analysis of the resulting revisions provides information on the quality of initial estimates.

In the context of 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 (as discussed above).

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.

This study examines the quality of the NTI using this latter approach. It is modeled on similar studies done for the Canadian System of National Accounts (CSNA).

3.0 Why do revisions analysis?

When an NTI estimate for tourism expenditure growth is, say, 1.4%, how reliable is this estimate? Is it going to be revised up or down? Could it be revised to as low as -0.2% or as high as 3.2%? What is the likelihood that it will be revised by more than +/- 0.5 percentage points? Revision studies provide answers to questions like these.

The NTI underwent a major revamping (or so-called “historical revision”) with their third quarter 2002 release. This entailed revising all quarterly estimates back to the first quarter of 1986 by incorporating new estimation methods and up-to-date data from new and existing sources. Did this revamping improve the quality of the NTI? Revision studies can help to address this type of question. It would be interesting to examine the NTI before and after the revamping, but there is too little data for the latter period to undertake this type of comparison at present.

At present, the NTI quarterly estimates are revised with releases for subsequent quarters for the same calendar year, as is the case in the CSNA. As a result, improvements to CSNA data throughout the year (such as incorporation of late reports) get carried through to the NTI. The CSNA, however, also undergoes an “annual revision” whereby, once a year, all quarterly estimates back four calendar years are revised. This allows for improved estimates by incorporating data from censuses, annual surveys, taxation statistics, public accounts, etc, which in some cases only become available up to four years after the fact.

The NTI do not go through annual revisions, so that information that becomes available more than three months after the reference year cannot be regularly incorporated. As a result, over time the NTI diverge from their underlying data sources (including the CSNA and the International and Canadian Travel Surveys). With the new revamped system, however, annual revisions can now be done more easily than in the past.[2] It has therefore been proposed that the NTI adopt a revision process like the one in the CSNA. If this were done, the quality of the NTI would be improved, but by how much? Again revision studies can shed some light on this issue.

2. Limited resources and other priorities also prevented ‘annual revisions’ of the NTI.

Revision studies provide useful information about the estimates and the estimation process itself. In one CSNA study it was noted that users could expect that initial GDP growth rate estimates would be within 0.1 percentage points of the final estimate 95% of the time.[3] Revisions to GDP were also found to be small and getting smaller. Another study reported that a downward bias in the initial estimates of GDP growth, evident in the 1970s and early 1980s was eliminated and the absolute size of the revisions reduced by half. Notably, the bias and size of the revisions were similar whether in a period of increasing or declining real GDP. A forthcoming study to be published by Statistics Canada indicates that some of the biggest revisions to quarterly GDP occur when the Input-Output benchmarks are introduced three years after the initial GDP estimates are made.

These findings are particularly important considering the proposal to move to a CSNA-like revision process. They suggest that the NTI would be subject to larger revisions as IO data become incorporated indirectly through other CSNA series. On the other hand, they also suggest that the revisions to major CSNA aggregates are not overly large as to be of major concern to users.

4.0 How is reliability measured?

The methods used to assess revisions can often be quite straightforward. Simple methods such as graphing and taking the difference of the final and initial estimates are easy to understand and provide quick insights into the "black box" of the data revision process. This study, being the first of its kind for the NTI, employs fairly simple statistical tools. This allows the study to be easily updated in the future and renders the results friendly to non-technical users.[4]

This study uses the differences (or revisions) between final and initial estimates to assess the bias in the revisions. These differences are averaged across an NTI 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, this study uses the standard deviation of the differences between final and initial estimates. This measure can be used to assess 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.

A few other simple measures are used. 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. Another set of measures, for users concerned about worst or best case scenarios, show the minimum, maximum and the range of revisions. The range simply measures the difference between the minimum and maximum revision.

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. This helps to put the revisions in perspective.

5.0 Revision analysis: limitations

It is possible in theory that a reliable first estimate can have a corresponding final estimate that is inaccurate. For instance, an initial estimate that is never revised is totally reliable but may be off target. Conversely, a first

3. This assumes a normal distribution; an assumption that was supported in subsequent analyses of the revisions to GDP.
4. A wide variety of statistical tools for revisions analysis is discussed in DeZilva (forthcoming).

estimate may be very different from the final that is judged very accurate. However, each round of revision is expected to bring it closer to the final (accurate) estimate.

The conclusions of revisions analysis are strictly in relation to the final estimates, so it is important to clarify the meaning of 'final' in this context. Estimates are considered 'final' when they have gone through the regular revision process. With the NTI, this is presently at the time of the fourth quarter release for the year. In the CSNA this is only when the four-year annual revision cycle is completed.

The NTI go through a sequence of revisions during the year leading to different vintages of estimates for a given quarter (i.e., there is a first, second, third and fourth and final estimate for the first quarter of any year). These different vintages can reveal important details about the quality of the estimates at various stages of revision. However, because the revision from first to final estimate summarizes all intervening revisions and analysis of the sequence of revisions is more complicated, the following focuses on the final and initial estimates.

The short history of the NTI also limits the analysis. In particular, there is no history of regular revisions to the NTI for first quarter 1986 through to first quarter 1996 because these estimates were introduced all at once. In addition, they were benchmarked on only one Tourism Satellite Account (for 1988) and were all significantly revised with the incorporation of a second benchmark TSA (for 1992) in the following year. Because of the preliminary nature of the first year of the NTI the regular revisions made that year are excluded from the analysis.

The fact that regular revisions to the NTI are entirely within-calendar-year and do not involve regular annual revisions also limits the analysis. In particular, fourth quarter estimates have been excluded because they are not normally revised. To include them would unduly affect the analysis because the revisions in this case are all zero. The major revamping of the NTI in the third quarter of 2002 also limits the analysis. Estimates made in this year are excluded because they did not go through the regular revision process.

The analysis is limited to the major aggregates total tourism spending, domestic demand, exports, and supply for the main commodity categories (transportation, accommodation, food and beverages, other tourism commodities and non-tourism commodities) as well as tourism employment. The focus is on the current dollar, seasonally unadjusted levels of these aggregates and their constant dollar, seasonally adjusted growth rates, which are of primary concern to most users.

6.0 Revisions analysis: results

The results (Table 1) indicate that initial estimates tended to understate tourism total demand (in current dollars, seasonally unadjusted) over 1997 to 2001. The mean revision was $105.4 million; in other words, final estimates were $105.4 million higher on average than the initial estimates. This is relatively small, amounting to 0.8% of tourism total demand (which was $13.4 billion on average in this period). Revisions to tourism total demand more often than not were in the upward direction. In fact, 80% were on the up-side.

Table 1: Revision statistics, 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
		%	%	%				%
Total Demand	105.4	0.8	20	80	120	-112	297	3.1
Exports	5.2	0.1	40	60	97	-159	160	7.6
Domestic demand	100.2	1.1	13	87	75	-58	225	3.1
Tourism Supply[2]	-213.2	-0.8	87	13	160	-435	86	2.6
Total Employment	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.
2. Of tourism commodities.

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. In the most extreme cases, the final estimates were $112 million less, and $297 million more, than at first-release.

These results suggest that the first-release estimates for total tourism demand were quite reliable. They also suggest a possible, albeit small, bias in the estimation methods and/or the source data leading to systematic underestimation in first estimates over 1997 to 2001. Given that tourism demand was growing rapidly over this period this finding is not too surprising.

Total demand for most commodity categories (see appendix table 1 for commodity details), also tended to be revised upward between first and final release. There were, however, variations across commodities in both the mean revision and the likelihood of being revised upwards. Total demand for food and beverage services, for instance, was almost always (93% of the time) revised up, on average by $38 million (or 1.8%). Accommodation was the only exception to the general pattern. More often than not, first estimates for accommodation services were higher than final estimates and were subsequently revised down, on average, by $15 million (or 0.8%). Among the various commodities, transportation demand had the smallest bias (with a relative mean revision of 0.4%) while demand for other tourism commodities had the largest bias (with a relative mean revision of 1.9%).

For tourism domestic demand and exports the revisions were similar to those for total demand. First–release estimates tended to be revised upwards, both at the aggregate level and at the commodity level. Accommodation was once again the exception, tending to be revised downwards. Exports of transportation also tended to be overstated on first-release. However, exports in total were fairly well-estimated. They had only a slight relative mean revision overall and relatively small mean revisions across all the major commodity categories. Domestic demand had somewhat larger relative mean revisions.

When looking at the dispersion of these aggregates a very different picture emerges. Although domestic demand had a relatively strong upward 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 2.3% of the average value of exports.

The pattern of revisions to the supply of tourism commodities is 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.

The first estimates for total demand (see Table 2) tended to understate growth. On average, the initial growth rate estimates were subsequently revised up 0.39 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 under study.

Table 2: Revision Statistics, 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
		%	%	%		
Total Demand	0.39	27	73	0.7	-0.9	1.8
Exports	0.63	27	73	1.4	-1.9	2.7
Domestic demand	0.29	27	67	0.8	-1.2	1.9
Tourism Supply[2]	-0.09	53	47	0.7	-1.5	1.5
Total Employment	-0.06	47	53	0.4	-0.7	0.7

1. Positive and negative revisions will not sum to 100% if some revisions are 0.
2. Of tourism commodities.

A cyclical bias existed in total tourism demand in that of the four negative quarters of growth from 1997 to 2001, three had negative revisions. In fact, these were the only negative revisions to tourism demand over this period. This implies that the NTI tended to initially understate the downturns in tourism demand and, conversely, also understated the upturns. This result has also been found in CSNA revision studies. In fact, the upturns and downturns of economic variables are one of the most difficult phenomena to capture with initial estimates, when these are often based in part on trend estimates.

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 number of jobs generated by tourism).

The average revision to employment growth rates on the other hand was -0.3 percentage points. In other words, the first-release estimates for tourism employment overstated growth by 0.3 percentage points on average. Growth in tourism employment averaged 0.6% over this period. About 95% of the first estimates were within 0.8 percentage points of the final estimates.

7.0 Conclusion

This study examined quality of the NTI through analysis of their revisions from first-release through final estimate. The current dollar, seasonally unadjusted, NTI were fairly reliably estimated at first release. The supply side NTI were generally better estimated than those on the demand side. Demand side estimates tended to be revised up over time, while supply side estimates tended to be revised down, although the understatement and overstatement in each instance was relatively small. Tourism employment also underwent relatively small revisions between first and final release, suggesting the initial estimates were not far off the mark.

In terms of growth rates, there was a tendency on the demand-side for fairly significant upward revision between first and final release. This was likely due to the fact that tourism was growing over the period under study (1997-2001). Growth in the supply of tourism commodities was reliably estimated, but with a fair amount of dispersion. Initial estimates of employment growth tended to be on the high side.

The above results establish some of the characteristics of the NTI and their data revisions before their major revamping in 2002. Given the new estimation system and data sources now in place, the quality of the NTI is expected to have improved. Ideally, the NTI would be compared before and after 2002. However, it is too early to make any findings here because there are only three observations on revisions since 2002, and these have not yet completed their full revision cycle. In the future, when more data have been collected, it will be possible to revisit this issue.

Appendix A: History of NTI Revisions

When they were first published, NTI time series were produced for first quarter 1986 to first quarter 1996, based on one TSA benchmark for 1988. With the first quarter of 1997, a second TSA benchmark (for 1992) was incorporated, and all the time series were revised again. With the third quarter 1997 release, the prices for the NTI were rebased from 1986 to 1992.

The most recent historical revision was completed with the release of the third quarter 2002 data. This again incorporated a new TSA benchmark (1996) and added new concepts and a new methodology for calculating the indicators. It might be noted that the 1998 TSA data, published in June 2003, have not been incorporated yet into the NTI

Thus, the NTI have undergone a number of revisions. For instance, the NTI constant dollar estimates for first quarter 1996 (which were made when the NTI were first published) were revised at the time of:

- the second, third and fourth quarter NTI releases for 1996
- the historical revision with the first quarter 1997 release
- the rebasing of the NTI with the third quarter 1997 release
- the historical revision with the third quarter 2002 release

Thus, so far, there have been seven estimates for the constant dollar NTI for first quarter 1996, or six revisions since the initial estimates. The current dollar NTI for this quarter have been estimated six times, with five revisions to the initial estimates. This is because the rebasing of the NTI affected the constant dollar time series estimates, while the current dollar time series were unaffected.

Appendix B: NTI revisions, 1997-2001, summary statistics

Appendix Table 1: Tourism Demand in Canada, revisions, 1997 - 2001

		MEASURES OF BIAS				MEASURES OF DISPERSION			
	Average of published estimates [1]	Mean revision	Relative mean revision	Percent [2] negative revisions	Percent [2] positive revisions	Standard deviation of revisions	Minimum revision	Maximum revision	Relative Range
	a	b	c=b/a	d	e	f	g	h	i=(h-g)/a
Levels									
Seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	5030	23	0.5	33	67	62.6	-112	105	4.3
Accommodation	1736	10	0.6	27	73	39.0	-65	80	8.4
Food and beverage services	2006	19	1.0	20	80	23.8	-27	78	5.2
Other tourism commodities	1260	21	1.7	7	93	22.5	-14	66	6.4
Total tourism commodities	10032	74	0.7	20	80	100.5	-154	220	3.7
Total other commodities	2409	10	0.4	33	67	32.6	-51	63	4.7
Tourism expenditures	12440	84	0.7	20	80	124.5	-205	262	3.8
Not seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	5276	21	0.4	40	60	64.2	-87	115	3.8
Accommodation	1912	-15	-0.8	53	47	41.7	-100	64	8.6
Food and beverage services	2192	38	1.8	7	93	32.8	-32	103	6.2
Other tourism commodities	1400	26	1.9	13	87	28.6	-29	89	8.4
Total tourism commodities	10780	71	0.7	33	67	106.1	-136	240	3.5
Total other commodities	2616	34	1.3	13	87	25.9	-6	82	3.4
Tourism expenditures	13396	105	0.8	20	80	119.6	-112	297	3.1
Growth Rates									
Seasonally adjusted	%	%	%	%	%	%	%	%	
Transportation	0.6	0.2	42	20	80	1.0	-1.7	1.8	
Accommodation	-0.1	0.3	-178	40	60	1.3	-1.5	3.6	
Food and beverage services	0.7	0.6	80	20	80	1.0	-1.1	2.6	
Other tourism commodities	0.8	0.9	107	13	87	1.0	-1.3	2.4	
Total tourism commodities	0.5	0.3	54	33	67	0.6	-0.6	1.3	
Total other commodities	0.7	0.4	50	33	67	1.0	-2.1	1.9	
Tourism expenditures	0.6	0.4	69	27	73	0.7	-0.9	1.8	

1. As of the fourth quarter of 2001. Figures for seasonally adjusted and unadjusted estimates are not equal because fourth quarter estimates are excluded.
2. Positive and negative revisions will not sum to 100% if some revisions are 0.

Appendix Table 2: Tourism Domestic Demand in Canada, revisions, 1997 - 2001

		MEASURES OF BIAS				MEASURES OF DISPERSION			
	Average of published estimates [1]	Mean revision	Relative mean revision	Percent [2] negative revisions	Percent [2] positive revisions	Standard deviation of revisions	Minimum revision	Maximum revision	Relative Range
	a	b	c=b/a	d	e	f	g	h	i=(h-g)/a
Levels									
Seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	4069	13	0.3	40	60	60.6	-112	94	5.1
Accommodation	903	2	0.2	47	53	27.3	-57	42	11.0
Food and beverage services	1149	13	1.2	20	80	18.0	-18	48	5.7
Other tourism commodities	914	19	2.1	7	93	21.4	-19	58	8.4
Total tourism commodities	7034	47	0.7	33	67	79.5	-119	156	3.9
Total other commodities	1683	5	0.3	27	73	30.6	-56	48	6.2
Tourism expenditures	8717	53	0.6	33	67	104.5	-175	189	4.2
Not seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	4192	25	0.6	27	73	55.4	-102	96	4.7
Accommodation	967	-12	-1.2	60	33	28.1	-64	26	9.3
Food and beverage services	1242	31	2.5	0	100	18.3	3	67	5.2
Other tourism commodities	1011	24	2.4	13	87	25.9	-30	80	10.9
Total tourism commodities	7412	69	0.9	27	73	71.3	-82	153	3.2
Total other commodities	1808	32	1.8	0	100	18.4	5	72	3.7
Tourism expenditures	9220	100	1.1	13	87	75.0	-58	225	3.1
Growth Rates									
Seasonally adjusted	%	%	%	%	%	%	%	%	
Transportation	0.6	0.1	22	40	60	1.1	-1.9	1.8	
Accommodation	-0.6	-0.2	28	53	47	2.1	-4.2	2.6	
Food and beverage services	0.7	0.5	71	27	73	1.1	-1.9	2.2	
Other tourism commodities	1.0	1.1	111	13	87	1.4	-2.2	3.5	
Total tourism commodities	0.5	0.1	14	40	60	0.7	-1.2	1.3	
Total other commodities	0.6	0.3	43	27	73	1.1	-2.6	1.5	
Tourism expenditures	0.6	0.3	52	27	67	0.8	-1.2	1.9	

1. As of the fourth quarter of 2001. Figures for seasonally adjusted and unadjusted estimates are not equal because fourth quarter estimates are excluded.
2. Positive and negative revisions will not sum to 100% if some revisions are 0.

Appendix Table 3: Tourism Demand by Non-residents (Exports), revisions, 1997 - 2001

		MEASURES OF BIAS				MEASURES OF DISPERSION			
	Average of published estimates [1]	Mean revision	Relative mean revision	Percent [2] negative revisions	Percent [2] positive revisions	Standard deviation of revisions	Minimum revision	Maximum revision	Relative Range
	a	b	c=b/a	d	e	f	g	h	i=(h-g)/a
Levels									
Seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	962	10	1.1	27	67	21	-26	56	8.5
Accommodation	833	8	1.0	33	67	21	-33	43	9.1
Food and beverage services	857	6	0.7	33	67	15	-22	30	6.1
Other tourism commodities	346	2	0.6	27	67	5	-8	10	5.2
Total tourism commodities	2997	27	0.9	33	67	49	-55	125	6.0
Total other commodities	726	5	0.7	33	67	14	-26	31	7.9
Tourism expenditures	3723	31	0.8	40	60	59	-54	154	5.6
Not seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	1083	-4	-0.4	33	67	32	-81	43	11.4
Accommodation	945	-3	-0.3	53	47	33	-57	48	11.1
Food and beverage services	950	8	0.8	33	67	26	-42	54	10.1
Other tourism commodities	390	2	0.5	20	80	6	-11	12	5.9
Total tourism commodities	3368	3	0.1	40	53	84	-145	137	8.0
Total other commodities	808	2	0.3	47	53	16	-24	34	7.2
Tourism expenditures	4176	5	0.1	40	60	97	-159	160	7.6
Growth Rates									
Seasonally adjusted	%	%	%	%	%	%	%	%	
Transportation	0.4	0.7	153	40	60	2.4	-3.5	5.2	
Accommodation	0.4	0.8	188	40	60	2.4	-3.9	4.9	
Food and beverage services	0.7	0.6	91	33	67	1.8	-3.5	3.9	
Other tourism commodities	0.5	0.4	77	33	67	1.5	-2.4	2.7	
Total tourism commodities	0.5	0.8	152	40	60	2.0	-1.6	6.6	
Total other commodities	1.0	0.6	61	40	60	1.9	-2.0	3.9	
Tourism expenditures	0.6	0.6	105	27	73	1.4	-1.9	2.7	

1. As of the fourth quarter of 2001. Figures for seasonally adjusted and unadjusted estimates are not equal because fourth quarter estimates are excluded.
2. Positive and negative revisions will not sum to 100% if some revisions are 0.

Appendix Table 4: Supply of Tourism Commodities, revisions, 1997 - 2001

		MEASURES OF BIAS				MEASURES OF DISPERSION			
	Average of published estimates [1]	Mean revision	Relative mean revision	Percent [2] negative revisions	Percent [2] positive revisions	Standard deviation of revisions	Minimum revision	Maximum revision	Relative Range
	a	b	c=b/a	d	e	f	g	h	i=(h-g)/a
Levels									
Seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	11351	1	0.0	47	53	94.5	-192	154	3.0
Accommodation	1871	6	0.3	40	60	46.5	-78	88	8.9
Food and beverage services	8609	-13	-0.2	47	53	88.2	-191	112	3.5
Other tourism commodities	3750	-0	0.0	53	47	51.6	-63	102	4.4
Total tourism commodities	25582	-7	0.0	47	53	150.6	-247	311	2.2
Total other commodities	63786	-92	-0.1	67	33	293.0	-746	340	1.7
Tourism expenditures	89368	-99	-0.1	53	47	283.9	-589	298	1.0
Not seasonally adjusted	millions of dollars		%	%	%		millions of dollars		%
Transportation	11479	-145	-1.3	100	0	104.6	-324	-6	2.8
Accommodation	2059	-10	-0.5	47	47	43.1	-102	71	8.4
Food and beverage services	8655	-42	-0.5	60	40	128.6	-356	155	5.9
Other tourism commodities	3845	-16	-0.4	67	33	58.8	-117	87	5.3
Total tourism commodities	26038	-213	-0.8	87	13	159.8	-435	86	2.0
Total other commodities	62233	-225	-0.4	93	7	189.4	-659	8	1.1
Tourism expenditures	88270	-438	-0.5	93	7	252.9	-915	10	1.0
Growth Rates									
Seasonally adjusted	%	%	%	%	%	%	%	%	
Transportation	0.6	-0.2	-35	67	27	0.8	-1.4	1.9	
Accommodation	-0.3	-0.1	45	60	40	1.7	-2.8	3.9	
Food and beverage services	0.6	0.1	21	33	67	0.7	-1.3	1.5	
Other tourism commodities	0.4	-0.4	-103	53	47	1.3	-2.7	1.0	
Total tourism commodities	0.5	-0.1	-18	53	47	0.7	-1.5	1.5	
Total other commodities	0.8	0.0	3	27	73	0.5	-1.2	0.8	
Tourism expenditures	0.7	0.0	-2	40	60	0.3	-0.7	0.3	

1. As of the fourth quarter of 2001. Figures for seasonally adjusted and unadjusted estimates are not equal because fourth quarter estimates are excluded.
2. Positive and negative revisions will not sum to 100% if some revisions are 0.

Appendix Table 5: Employment Generated by Tourism, revisions, 1997 - 2001

		MEASURES OF BIAS				MEASURES OF DISPERSION			
	Average of published estimates [1]	Mean revision	Relative mean revision	Percent [2] negative revisions	Percent [2] positive revisions	Standard deviation of revisions	Minimum revision	Maximum revision	Relative Range
	a	b	c=b/a	d	e	f	g	h	i=(h-g)/a
Levels									
Seasonally adjusted	thousands of jobs		%	%	%		thousands of jobs		%
Transportation	94	-1	-0.9	87	13	2	-3	3	6.8
Accommodation	146	1	0.9	33	67	4	-2	13	10.4
Food and beverage services	144	1	0.4	53	47	3	-2	11	9.4
Other tourism industries	31	-1	-1.8	100	0	1	-3	0	8.4
Total tourism industries	416	0	0.1	60	40	7	-6	25	7.3
Other industries	114	0	-0.3	60	40	1	-2	1	1.8
Tourism activities	529	0	0.0	60	40	7	-7	25	6.0
Not seasonally adjusted	thousands of jobs		%	%	%		thousands of jobss		%
Transportation	94	-1	-0.9	80	20	1	-3	3	6.8
Accommodation	148	1	0.8	40	60	3	-2	12	9.6
Food and beverage services	145	0	0.3	53	47	3	-2	10	8.6
Other tourism industries	31	0	-1.2	73	13	1	-2	1	9.2
Total tourism industries	418	0	0.1	60	40	7	-7	23	7.0
Other industries	114	0	-0.2	67	33	1	-2	1	2.1
Tourism activities	532	0	0.0	60	40	7	-9	22	5.8
Growth Rates									
Seasonally adjusted	%	%	%	%	%	%	%	%	
Transportation	0.5	-0.4	-89	73	27	1.1	-2.3	1.6	
Accommodation	0.8	0.3	31	27	73	0.6	-0.8	1.7	
Food and beverage services	0.6	-0.1	-23	67	20	0.4	-0.6	0.7	
Other tourism industries	0.4	-0.2	-64	60	40	0.9	-1.8	1.8	
Total tourism industries	0.6	-0.1	-10	47	53	0.4	-0.7	0.7	
Other industries	0.6	0.0	-8	47	47	0.3	-0.6	0.7	
Tourism activities	0.6	-0.1	-10	47	53	0.4	-0.7	0.7	

1. As of the fourth quarter of 2001. Figures for seasonally adjusted and unadjusted estimates are not equal because fourth quarter estimates are excluded.
2. Positive and negative revisions will not sum to 100% if some revisions are 0.

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