

EXPERIENCES IN THE BIAS ANALYSIS IN THE CANADIAN INTERNATIONAL TRAVEL SURVEY

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The ongoing changes at Customs Canada, the low questionnaire return rates and the increasing demands of data users have led to the redesign of the International Travel Survey in Statistics Canada. As part of the redesign, a field test was conducted in the summer of 1997 to assess the impact of various questionnaire distribution methods on the return rates and the quality of survey responses. This paper describes the current survey, the reasons behind the redesign and some results of the field test.

1. Introduction

The International Travel Survey (ITS) is an ongoing survey conducted by Statistics Canada since the 1920s, to meet the requirements of the Canadian System of National Accounts (Balance of Payments (BOP)). Through the years, the need for detailed characteristics of travellers for market research and industry planning was gradually incorporated in the survey. Today, the ITS provides a full range of statistics on the volume of international travellers and detailed characteristics of their trips such as expenditures, activities, places visited and length of stay. It covers both Canadian residents returning from trips outside Canada and international visitors to Canada. In addition to fulfilling BOP requirements, the ITS is also being used by the Tourism Satellite Account (TSA), Customs Canada, the Canadian Tourism Commission (CTC), provincial tourism agencies, the US Department of Commerce and a number of private sector industries. The ITS is also used for reporting to international organizations such as the World Tourism Organization, the Organization for Economic Co-operation and Development and the Pacific-Asia Tourism Association.

2. Current Survey

The ITS has two distinct components: Frontier Counts and Questionnaire Surveys. The Frontier Counts component enumerates all persons who enter Canada via land, sea and air while survey questionnaires are handed out to a sample of international travellers in order to determine their characteristics and spending patterns. Customs Canada helps the ITS in collecting the frontier counts, as well as in the distribution of questionnaires to international travellers.

For, the Questionnaire Surveys component, the travellers are selected using a "stint" sampling methodology. This method selects, for each port of entry, a start day from which a pre-specified number of questionnaires is distributed on a continuous basis. The respondents provide information for themselves and only those for whom they feel comfortable reporting on spending and activities.

In 1997, about 300,000 Canadians, 340,000 US and 320,000 overseas questionnaires were given to international overnight travellers while about 130,000 and 170,000 questionnaires were distributed respectively to Canadian and US same-day travellers.

3. Reasons behind the redesign

Changes at Customs Canada, low return rates of ITS questionnaires and the constantly growing requirements from ITS users are the main reasons that have led to the redesign of the International Travel Survey in Statistics Canada.

Customs Canada

While the ITS benefits considerably from its continued collaboration with Customs Canada, the survey has very little control over the distribution of questionnaires and has to constantly adjust to operational changes taking place at the border entry points. For several years, Customs Canada has been re-engineering its operations at many of the major ports of entry. The introduction and expansion of the CANPASS program which involves the pre-clearance of frequent travellers, as well as the Primary Automated Lookout System (PALS) that scans car license plates have modified the Frontiers Counts component and the scope of ITS questionnaire distribution. The upcoming changes to the air travellers' declaration cards (E311) to collect family information instead of individual information, will also affect the data capture and the weighting system of the ITS survey.

Low return rates

Between 1982 and 1989, the questionnaire return rate held steady between 13-15%, but then began to decline in 1990 with the expansion of the questionnaire content. The overall return rate dropped to 9.8% in 1990 and has steadily declined to 5.8% by 1997. While some of this deterioration may arise from reluctance on the part of the

travelling public to provide information to governments, the persistent decline in ITS response rate may also reflect the effect of Customs officers' increasing focus on their core mandate of border enforcement. The potential risks of bias associated with these low response rates have been a concern to Statistics Canada, even though two past studies by Bailie and Gough (1974), Miller *et al* (1986) and Feder (1990) did not show a substantive bias for US and Canadian travellers.

New Requirements

Other pressures on the ITS come from the data user community. While the BOP requirements are adequately covered by the current survey, the Tourism Satellite Account is seeking more detailed information to improve its measurement of the tourism industry, one of the fastest growing sectors in the economy. In addition, the CTC and the provinces would like to expand the ITS survey content and methodology in order to expand their policy and marketing needs. With the phenomenal growth of the tourism industry over the last two decades, the current design of the ITS is no longer able to meet the data demands of this large and complex industry.

Over the last few years, Statistics Canada has established a partnership with the CTC and the provincial tourism offices for the purpose of improving the ITS in order to meet these new challenges. Statistics Canada works closely with the partners, actively seeking advice, proposing strategies and work plans and reporting work progress. In addition, the project is monitored by an internal steering committee consisting of managers from participating divisions in Statistics Canada.

4. Field Tests

In order to assess more effectively questionnaire distribution methods for the ITS, Statistics Canada in partnership with the CTC conducted two field tests in 1997: Pilot I and Pilot II. Both tests focussed only on overnight travel. The first test essentially compared the survey return rates from questionnaire distribution by Statistics Canada and Customs officers. The second test went further to assess the impact of these and additional questionnaire distribution methods on data quality.

In Pilot I, Statistics Canada personnel carried out the ITS questionnaire distribution in January 1997 for two days at each of the seven selected airports and land ports. All the field work of this test was completed in two weeks. This personnel substitution yielded a much higher return rate of 15.2% compared to 6.4% by Customs. Due to budget and time constraints, data of Pilot I were not captured for further analysis.

In July 1997, Pilot II extended the scope to include personnel interviews of travellers as they entered into Canada. These entry interviews collected only data on certain key characteristics about the travelling party and the trip, such as country of residence, size of travelling party, gender of party members, age category of party members, main reason for the trip and trip duration. At the end of the entry interview, the traveller was given an ITS questionnaire to be completed and mailed back to Statistics Canada at the end of the trip.

The Pilot II data tested different methods of questionnaire distribution at selected ports. The methods included in the test were the distribution of questionnaires by Statistics Canada personnel with and without entry interviews and the distribution of questionnaires by Customs officers without an entry interview. The use of Japanese questionnaires was also studied in the July test that spanned over 3 weeks in the field. Figure 1 provides an overview of the structure of the July test while Table 1 presents the sample size of the pilot test by questionnaire distribution method. In August, the use of survey incentives for overnight travellers was also tested at 18 selected ports.

Figure 1

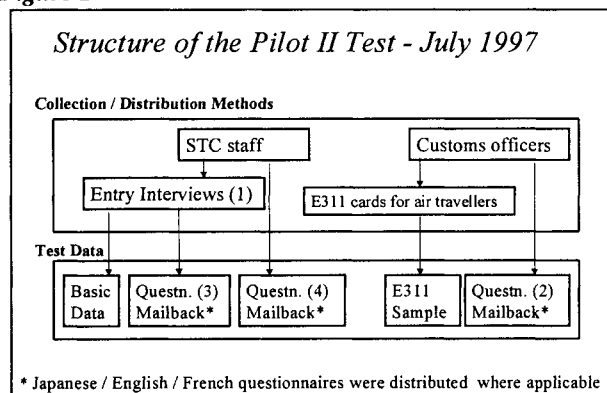


Table 1

Number of Travelling Party and Number of Person-Trips By questionnaire distribution method and type of ports			
		Travelling parties	Person-trips
Entry Interview (1)	Airports	7,617	13,967
	Land port	3,862	9,720
	Total	11,479	23,687
Questionnaire Mailback			
Customs (2)	Airports	977	1,819
	Land port	491	1,299
	Total	1,468	3,118
Statistics Canada With entry (3)	Airports	1,315	2,582
	Land port	870	2,376
	Total	2,185	4,958
Statistics Canada Without entry (4)	Airports	1,834	3,525
	Land port	1,839	5,318
	Total	3,673	8,843

For airports selected in the July test, a sample of the E311¹ cards was captured in order to obtain reliable estimates for the characteristics of the population of international travellers using commercial air carriers. The E311 sample is a large and representative sample of these air travellers in July 1997. The sampling rates were 10% for Canadian and US travellers and 20% for all overseas travellers, resulting in a sample of 152,904 travellers (42,017 Canadian, 30,972 US and 79,915 Overseas). In contrast, the file of entry interview data contained 7,617 records (parties) of air travellers and 3,862 records of land travellers.

4. The analysis of Pilot II data

The next five sections present some results of the analysis of the Pilot II data. In particular, the results are related to:

- 1) the survey return rates under each questionnaire distribution method;
- 2) the quality of survey responses under each questionnaire distribution method;
- 3) the effect of survey adjustment using administrative data (i.e., E311) and data collected by entry interviews;
- 4) the language preference of Japanese visitors and,
- 5) the impact of survey incentives on ITS responses.

The detailed results of the Pilot II test have been documented in three internal reports of Statistics Canada (1998a, 1998b, 1998c).

First, the validity of the Entry Interview sample has to be established to address points 2 and 3 of the analysis. In Pilot II, the interview time periods were chosen carefully so as to represent adequately all the hours of border operation, taking into account travel variations between weekdays and weekends/holidays. Notwithstanding these design considerations, there was some concern that selection bias might still creep in due to unexpected field conditions and interaction between interviewers and respondents. For this reason, the test included the use of a large random sample of administrative records (i.e., E311) of air travellers in order to assess the validity of the Entry Interview data. Tables 2 and 3 present the comparison of traveller and trip characteristics based on

¹ Every person travelling on a commercial air carrier entering Canada from a foreign country is required to fill out a Customs Declaration card (E311). This administrative data represent the population of all international travellers (Canadians, Americans and Overseas) entering Canada by commercial planes.

the two data sets. The close similarity between these estimates verifies the validity of the Entry sample for air travellers. These findings give us some confidence in assuming that, for the purpose of this study, the Entry Interview data are sufficiently representative of the test population, including the land travellers for whom no administrative data was available for verification.

Table 2

Purpose of Trip distribution				
Country	Entry Interviews		E311	
	Business	Personal	Business	Personal
Canada	24.0%	76.0%	20.9%	79.1%
US	26.9%	73.1%	26.4%	73.6%
Overseas	8.3%	91.7%	8.5%	91.5%

Table 3

Age group distribution						
Country	Entry Interviews			E311		
	0-19	20-49	50+	0-19	20-49	50+
Canada	16.5%	62.2%	21.3%	16.7%	58.4%	24.9%
US	10.7%	55.6%	33.7%	12.0%	53.0%	35.0%
Overseas	22.5%	55.7%	21.9%	23.6%	49.2%	27.2%

4.1 Return Rates

The questionnaire return rates for distribution by Statistics Canada personnel were 16.5% (without entry interview) and 22.8% (with entry interview) as compared to 5.8% for distribution by Customs officers. It is interesting to note that the return rate without entry interviews (16.5%) was very comparable to the return rate of Pilot I (15.8%) notwithstanding the seasonal difference in international travel.

The Pilot II test also demonstrated that an increase in the return rates could be achieved when the questionnaire is translated into the native language of the traveller. The use of Japanese questionnaire increased substantially the return rate for this specific group to 11.2% compared to 2.8% for all overseas travellers with distribution by Customs officers.

4.2 Distribution of characteristics under various modes of distribution

The ITS mail returns under the current and all of the distribution methods tested in Pilot II, exhibited differences in terms of traveller and trip characteristics. In particular, the returns from distribution by Customs officers showed important differences with the Entry

interview data. Some examples of the observed discrepancies are presented below.

For the selected airports in the test, we observe:

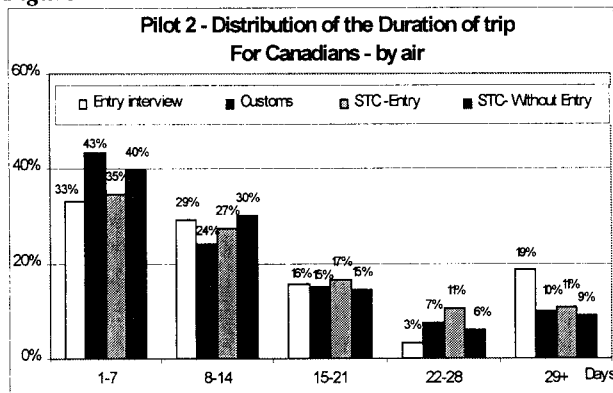
an over-representation of the 20-49 age group in the Customs Sample for all air travellers while an under-representation of the 0-19 age group for almost all countries; this discrepancy is even more pronounced when comparing directly with the E311 data;

an over-representation of the Canadian and US business travellers and an under-representation of the pleasure travellers in the Customs sample.

For the selected airports and land ports, we observe:

an over-representation of short trips (1-6 days) for all the travellers sample and an under-representation of longer trips (4 weeks and more). Figure 2 shows the duration of trip distribution under different methods of questionnaire distribution for Canadian travellers.

Figure 2



4.3 Error Adjustment analysis

An objective of these investigations is to examine the impact of adjusting the ITS total spending estimates based on traveller/trip characteristics in order to reduce the error caused by ITS non-response.

Adjustment based on the E311

Currently, the E311 cards provide limited data: age, purpose of trip and duration of trip (for Canadians only). Based on the results of linear regression analysis, the total spending is not well explained by the age of travellers and the duration of trip for any of the air traveller flows (Canadian, American, overseas). This suggests that the current data on the E311 cards are not sufficient for effective non-response error adjustment for the ITS.

Adjustment based on the Entry Interview

A series of regression models examining the relationship between total spending and traveller/trip

characteristics were developed and validated for each traveller flows (Canadian, US, overseas) using the information on the mail returns of Pilot II test.

Based on these analyses, the duration of trip, the travelling party size and their interactions were found to be the most important variables that explained the variation in total spending. Thus, the duration of trip/travel party size combination was used to re-weight the total spending data in each stratum. The re-weighting also ensured that the estimates of travellers continue to add up to the population counts.

Specifically, the estimate adjustment was performed by combining the estimated distribution of subpopulations (by stratum/duration of trip/travelling party size) using the entry interview characteristics, and the average expenditure estimates for the subpopulations based on mail returns.

Figure 3

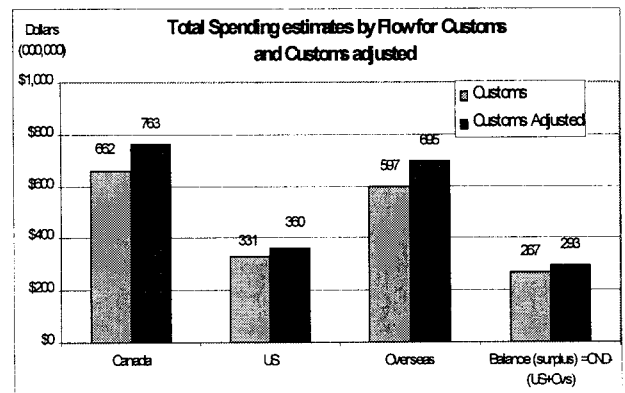


Figure 3 presents the comparison of the total spending estimates for the Customs sample before and after the adjustment by the Entry Interviews data for July at the ports selected in Pilot II. These results illustrate the impact of adjusting the ITS data to reflect the traveller characteristics as reported in the Entry Interviews. As we can observe, the ITS data systematically underestimated total spending compared to the adjusted estimates for all traveller flows. From the BOP perspective, this means that Canada would have reported in July a surplus in tourism of \$293M for the selected ports rather than \$267M, a difference of \$26M (10%). However, it should be noted that the results presented in this study could not be extrapolated beyond the one-month time period and outside the ports selected in the test.

4.4 Language preference of Japanese visitors

This section presents the results of the analysis of language preference for the overnight Japanese visitors. The two sample distributions obtained from the Japanese visitors (i.e., the mail returns from respondents that responded in English versus those who responded in Japanese) were compared to illustrate the differences between these two respondent groups.

Among the 162 Japanese/English mail returns questionnaires distributed by Statistics Canada personnel, 74% were completed in Japanese compared to 26% in English. In addition, about 21% (of the 26%) of Japanese visitors chose to write in English on the Japanese questionnaire. These results suggest a clear preference of Japanese visitors to the questionnaire in their native language.

The mail returns from Japanese visitors who responded in English versus those who responded in Japanese showed the following differences.

- *Younger travellers were more likely to respond to the ITS questionnaire in English than older travellers.*
- *Female travellers were more likely to respond in Japanese than male traveller.*
- *Respondents who respond in English stayed longer in Canada than those who responded in Japanese.*
- *Business travellers and those who visit friends and relatives were more likely to respond in English.*

4.5 Incentives Test

In August 1997, 14,980 questionnaires were distributed at 18 selected ports (7,480 to returning Canadians and 7,500 to US visitors). Coupons were included in these questionnaires offering travellers gifts (such as travel guides, posters and CD-ROMs), when they mail the completed questionnaires back to Statistics Canada. These questionnaires were mixed with the other ones without coupons to ensure unbiased distribution. This section presents the results of this test.

Return rates

In general, return rates were slightly higher when a promise of incentives was given to the respondents (figure 4).

Figure 4

	Return Rates	
	Incentive	No Incentive
Canadian	14.2%	10.7%
US	8.2%	7.3%
Total	11.3%	8.7%

Furthermore, the distributions of key traveller and trip characteristics (e.g., age, gender, duration and purpose of trip) of the mail returns from the two groups of respondents showed no significant differences.

5. Conclusion

The main goal of these investigations, over the two pilot studies, has been to evaluate questionnaire distribution methods that could improve the return rates and the quality of ITS data.

The results of these two tests have demonstrated that a considerable increase in the return rates could be achieved when Statistics Canada staff distributed the questionnaires at the ports of entry. The cost of this response increase, however would be also very high, far beyond the level that can be absorbed by the current ITS budget. More importantly, the gains in return rates were insufficient to alleviate the potential non-response bias which must be controlled in order to ensure the quality of the ITS data. Unfortunately, the bias control methods that hinge on having interviewers on site to conduct the entry interviews, would magnify further the cost implications on ITS.

Pilot II also demonstrated that some gains in the return rates could be achieved through the use of questionnaires in the native language of travellers. The change would be relatively easier to implement if the questionnaires were distributed by Statistics Canada personnel. In contrast, this change would pose operational difficulties to the distribution of questionnaires by Customs officers. The solution to these problems would have to be examined more closely.

Finally, the test showed that the use of survey incentives did not have a significant impact on the ITS data with respect to return rates or potential bias. However, these findings should not be generalized to other forms of incentives. For example, the use of a larger and more attractive incentive (e.g., free travel packages) may increase the survey return rates significantly.

6. Future work

Considering the costs and the benefits associated with the questionnaire distribution by Statistics Canada personnel, the ITS redesign project has decided to focus on the improvement of other aspects of the survey - namely the survey questionnaire and the control of non-response bias using administrative data.

The Pilot III test, is a new study planned for the summer of 1998. The main goal of the test is to investigate the impact of respondent-friendly questionnaire on the return rates, and the potential of using modular questionnaires to collect the various data elements. Each module will contain one or more of the specific topics plus a common core set of data elements which serve as data links when analysing the future ITS data. In particular, the survey has to meet specific data needs, such as BOP, travel activities and marketing information.

Finally, the investigations into the use of the administrative data in order to monitor and control potential non-response bias will be continued. The upcoming changes to the data collected by Customs Canada (e.g., the family E311 card) may provide cost-effective bias adjustment methods for the ITS.

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