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Analyzing Air Travel: A Comparison of Different Survey Methods and Data Collection Procedures

Jon Martin Denstadli

This article explores alternative ways of collecting data on air travel. Comparisons are made between two different survey methods (general household surveys and intercept air travel surveys), and two alternative data collection procedures in intercept surveys (on-board and at gate). Results show that air travel estimates do not depend heavily on survey method. Intercept and household surveys produce a more or less comparable picture of the air travel market, although some differences are found with regard to trip purpose distributions. Regarding data collection procedure in intercept surveys, interviews conducted at gate are found to be more susceptible to nonresponse than are on-board interviews. However, no significant differences exist between the samples with regard to trip and respondent characteristics, suggesting that the increased nonresponse in gate surveys is not systematic and that an equally valid picture of airline passengers can be obtained through gate and on-board surveys.

OBJECTIVES AND SCOPE

The task of selecting the appropriate survey method is crucial to the efficiency of the survey. Traditionally, air travel surveys have been conducted at airports, as what is often referred to as intercept surveys (Richardson, Ampt, and Meyburg 1995). Attempts to find airline passengers by means of general household surveys have been regarded as almost impossible, because they have represented such a small percentage of the total population. During recent years, however, there has been a substantial growth in air traffic—more people take the opportunity to fly both for business and private purposes. In the Scandinavian countries, the airlines are referred to as the "winners" in the long haul transportation market, gaining market share at the expense of car traffic. This trend may support alternative ways of collecting data on air travel. For instance, airline passengers should be more easily reached via general household surveys nowadays. Household surveys may represent an effective way of collecting air travel data at the aggregate level, and they offer several advantages to the travel researcher. Generally, they are more easily administered than intercept surveys, they make possible the collection of information on nonrespondents, and in most cases, the researcher is able to collect more information in household surveys. A fundamental question that remains, however, is whether these surveys give a valid picture of the airline passengers and the type of trips they make.

In recent years, much research has been devoted to the comparison of different data collection methods in intercept surveys (e.g., Bonsall and McKimm 1993) and household surveys (e.g., Brög and Meyburg 1980; Widlert 1993). In these studies, special attention has been given to the problems of nonresponse and underreporting of mobility. Apparently, less attention has been paid to the comparison of results derived from intercept surveys and household surveys. One exception is Barnard (1985) who compared results from five on-board surveys with those derived from home interview surveys. In four cases, the home interviews underestimated mobility (from 2% to 32%), while in the last survey, mobility was slightly overestimated. A priori, one would expect household surveys to produce travel estimates that are biased downward. The most mobile people can be difficult to reach in these surveys simply because they are less often at home (see, e.g., Brög and Meyburg 1982). With intercept surveys, on the other hand, interviewers are bound to meet all kinds of travellers, both high-mobility and low-mobility groups, which most likely will help produce a more valid picture of the market. The effect of survey method on air travel estimates, however, is not well documented in the literature. In this article, more light is shed on these questions. More specific, the following research questions are raised:

Research Question 1: Do household surveys and specially designed intercept air travel surveys produce diverging estimates of mobility?

Research Question 2: Do results derived from household surveys and specially designed intercept air travel surveys differ with regard to trip and respondent characteristics?

Although household surveys may represent an alternative way of collecting air travel data at the aggregate level, inter-

cept surveys are still needed to establish OD matrices. At the route level, household surveys are insufficient due to the relatively small number of observations. One of the first considerations when conducting intercept surveys is whether the survey shall be conducted on board the plane or at certain activity points at the airport (e.g., the gate area). Generally, on-board surveys give the researcher better control of the population and are recommended. An approved way of conducting intercept surveys is the so-called on-board vehicle distribution/on-board vehicle collection method (see Richardson, Ampt, and Meyburg 1995). For air travel surveys, this method may involve distribution of the questionnaires on entry by the survey staff and collection on arrival by the cabin crew. In this way, the questionnaires are completed on board the flight, which in most cases, poses no particular problems since generally there will be ample time for the passenger to complete the survey before the end of the trip. According to Richardson, Ampt, and Meyburg (1995), passengers may even welcome the survey as something constructive to do to pass the time on the flight. This special feature should provide the potential to achieve a high level of response.

On-board surveys presume cooperation with the airlines and that the cabin crew is ready to help. In some cases, this can be difficult to accomplish. Airlines often are unwilling to encumber the cabin crew with any extra work, impeding the collection of questionnaires. This of course could be solved by having surveyors at the destination airport to collect the questionnaires, but this is both very costly and difficult to accomplish when surveying international flights. Another problem is that the airlines are reluctant to do anything that can be regarded as an inconvenience to their passengers and, therefore, often are not willing to let the survey organizer conduct the survey on board the flight. In this case, a second best solution may be to interview the passengers at the gate, that is, while they are waiting to board the plane. With this method, the questionnaires are distributed, completed, and collected before boarding, posing no extra work to the cabin crew. The method makes possible the same control of the population as on-board surveys but is assumed to be more susceptible to nonresponse because many passengers arrive late at the gate and are precluded from answering. Low response rates increase the possibility of biased estimates and, in turn, the possibility of producing a distorted picture of the airline passengers. Thus, the following research questions are raised:

Research Question 3: How does data collection procedure (gate vs. on-board) affect response rates in airport travel surveys?

Research Question 4: Do results derived from gate and on-board interviews differ with regard to trip and respondent characteristics?

DATA

The Intercept Survey

Since 1972, the Institute of Transport Economics (TØI) has conducted nationwide travel surveys among airline passengers. The purpose of these surveys has been to analyze the role and function of air transport and to furnish data for traffic forecasts, airport planning, and route planning. Last year, TØI initiated the 1997-98 Norwegian Air Travel Survey (NATS). Data were collected at three different points of time: the second week in October 1997, the third week in March 1998, and the first week in August 1998. These dates were chosen based on previous experience and are intended to represent the three major seasons: autumn, winter/spring, and summer, respectively. Routes and flights to be surveyed were selected using a system of stratification. The data were weighted by traffic counts within the three periods, and the expanded data provide an estimate of all domestic air traffic in Norway in the 1-year period from September 1997 through September 1998. To test the research questions raised above, however, only data from October are used. These data are intended to represent the last 4 months in 1997.

The NATS was mainly conducted as an on-board survey. In approximately 80% of the cases, flights were surveyed using the on-board method, while in the remaining 20%, gate interviews were used. In the on-board surveys, passengers were handed a four-page questionnaire when boarding the plane and were requested to take a few minutes to answer the questions during the flight. The cabin crew collected the forms on arrival and gave a reminder over the loud speaker during the flight. In gate interviews, the passengers first were contacted in the gate area while they were waiting to board the plane and kindly were requested to participate in the survey. Those accepting were handed the same questionnaire as used in the on-board survey and were requested to fill in all the information and to leave the questionnaire in a marked box at the counter. A brief instruction was given whenever needed.

The questionnaire included information on start/end points of the journey, trip purpose, duration of the journey, the number of round-trip flights made within Norway the past 12 months, and background variables such as age, gender, occupation, and so on (see Table 1 for details). The NATS conducted in October 1997 provided almost 30,000 questionnaires usable for data processing (overall response rate of 45%).

To test response effects of the two data collection procedures (Research Questions 3 and 4), interviews were "matched" on Tuesday and Wednesday. Any flight that was surveyed by on-board interviews on Tuesday or Wednesday also was surveyed using the gate method the following or preceding day. For instance, if the 9:30 flight from Oslo to Trondheim on Tuesday was an on-board flight, the same flight on Wednesday was surveyed by gate interviews. Tuesday and Wednesday were chosen because experience has shown a similar traffic pattern between these two days. The matched interviews gave a total number of 78 flights and 2,526 respondents (see Table 2).

The Household Survey

The household survey was conducted in October and November of 1997 as part of the Norwegian National Travel Survey (NNTS). The NNTS is a nationwide telephone-based survey conducted every fifth year. A random nationwide sample was drawn from the official telephone register produced by Norwegian Telecom. This register is revised every month and is the most updated register containing personal information available to the public. More than 98% of all

TABLE 1

SURVEY ITEMS COVERED

Intercept Survey	Household Survey
Person	Person
Gender	Gender
Year of birth	Year of birth
Occupation	Occupation
Industry of work	Driver's license
Primary area of work	Education
Position at work	Any disabilities that make it difficult to travel
Number of round-trip flights within Norway	Number of round-trip flights within Norway
during the past 12 months	during the past 12 months
Place of residence	Place of residence
Frequent flyer program membership	Income
	Household
	Size
	Vehicle ownership
Journey	Journey
Departure date and airport	Departure date and place
Mode of transport to the airport	Mode of transport
Place of destination	Place of destination
Time of arrival at the airport	Type of overnight accommodation
Duration of journey	Duration of journey
Place of visit	Number of accompanying persons
Type of ticket and who was paying	Type of ticket and who was paying
Main purpose	Main purpose
Whether the trip is associated with oil operations	

TABLE 2

SAMPLE SIZE FOR "MATCHED" INTERVIEWS

	On-Board	Gate
Number of flights	39	39
Number of respondents	1,462	1,064

Norwegian households have a telephone, making the potential of sampling bias often emphasized in telephone surveys a minor problem.

Twenty-eight persons were interviewed each day over a period of 1 month. The respondents were asked to describe any long-distance trip (more than 100 km) undertaken during the month preceding the interview (including any trip made by air). Characteristics of trips and related activities were collected, as well as the number of round-trip flights made within Norway during the past 12 months, background information on the individual and his or her household, and access to car and public transport (see Table 1). Although the sampling unit is the household, the unit for analysis is the individual. Only one person in each household was interviewed, and only about his or her own travel activities. To obtain a random sample within the households, the interviewer asked to speak to the person in the household who was the last to celebrate his or her birthday. If the prospective respondent was not available at the moment, agreement to call back was made with other members of the household whenever possible. If no one answered the phone, up to eight callbacks were made in the following week.

A total of 836 persons completed the interview, which gave a response rate of 58%. Thirty-seven percent ($n = 308$) of the respondents had made at least one round-trip flight within Norway during the past 12 months. This group is used in the comparison of mobility between the intercept and household survey (Research Question 1). Twelve percent ($n = 101$) reported one or more flights within Norway during the past month prior to the interview. These account for a total of 271 trips, which form the basis for analyzing trip purpose and sociodemographic status of airline passengers (Research Question 2).

The two surveys are very unbalanced when it comes to the number of observations. Clearly, with 101 respondents and 271 trips in the database, the household survey will not produce a complete picture of the air travel market. However, it will give some valuable indications of the kind of sampling bias that may occur when using household surveys to collect data on air travel.

RESULTS

Intercept versus Household Survey

Research Question 1: Variations in Mobility

In both surveys, respondents were asked how many round-trip flights they had made within Norway during the past 12 months. Respondents in the intercept survey were instructed to include the trip they were about to make. As mentioned previously, there are reasons to believe that the household survey produces travel estimates that are biased downward. The most mobile people can be hard to reach in these surveys. They are often away from home and/or are very busy, which increases the possibility for refusals.

FIGURE 1
TRIP FREQUENCIES (ROUND-TRIP
FLIGHTS WITHIN NORWAY
DURING PAST 12 MONTHS)
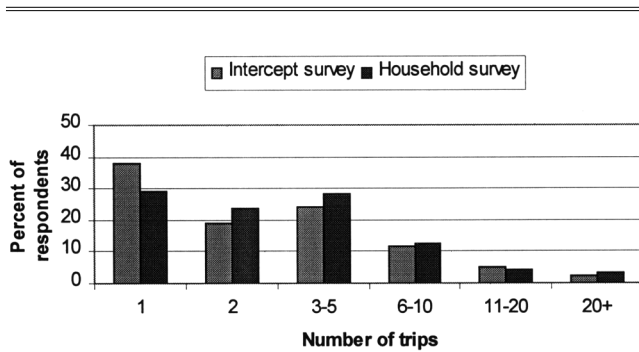
Note: Average trip rate intercept survey = 4.1 trips ($n = 29,496$);
average trip rate household survey = 4.5 trips ($n = 308$).

Figure 1 compares mobility patterns among the household and intercept respondents. Contrary to expectations, the average mobility is slightly higher in the household survey than in the intercept survey. Averages are 4.5 and 4.1 trips per year, respectively. The distributions diverge among the low frequency travellers (fewer than six trips) and in particular the single trip makers. Thirty-eight percent of the respondents in the intercept survey are classified as single trip makers; that is, they report the present trip to be the only one made within the past 12 months, while the corresponding number for respondents in the household survey is 29%. Less divergent distributions are revealed among the high-mobility groups, although a slightly higher proportion of respondents with more than 20 trips is found in the household survey (3.1% vs. 2.2%). Thus, a first conclusion is that the most mobile air passengers are surveyed as easily at home as at the airports.

Research Question 2: Variations in
Trip and Respondent Characteristics

Table 3 compares the distribution of trip purpose in the household and intercept survey. Comparisons are made between the present trip for intercept respondents (expanded to represent the last 4 months in 1997) and all air trips reported within the last month for household respondents. Thus, the household survey makes possible multiple observations for each respondent. This was done to produce an estimate of all domestic air traffic during autumn of 1997 that was comparable to the expanded intercept data. In Table 3, 101 respondents count for the total of 271 air trips in the household survey.

In both surveys, business trips are dominating while private trips and combined trips are in minority. This corresponds to previous air travel surveys conducted in Norway, which have shown a great dominance of business purposes. Hence, both surveys seem to capture this distinctive characteristic of the market. The distributions, however, are diverging, with the proportion of business trips markedly higher in the household survey. The statistical significance of these differences was tested using a chi-square test. The results indicated highly significant differences, with $p = .000$

TABLE 3
VARIATIONS IN TRIP CHARACTERISTICS (%)

	Intercept Survey ($n = 29,496$)	Household Survey ($n = 271$)
Purpose[a]		
Business	59.5	71.1
Private	34.9	26.9
Combination of business and private	5.6	2.0
Purpose specified[b]		
Business		
Commute to and from place of work	11.0	34.4
Conference	19.3	11.9
Sales, purchasing, negotiations, trade fair	9.0	3.2
Service job or consulting work	7.2	3.2
Other purposes	13.0	18.6
Private		
Visit relatives or friends	20.8	15.8
Holiday or weekend trip	5.4	2.4
Medical treatment	2.2	0.8
Travel to and from place of study	1.5	0.8
Other private purposes	5.1	7.1
Combination of business and private	5.6	2.0
Who paid for the ticket[c]		
Employer/client	62.0	67.9
Himself or herself, or another person in the family	29.2	25.8
Sports organization or cultural organization	2.7	2.6
Social Security office	2.2	1.8
Other	3.9	1.8
Type of ticket[d]		
Full fare	61.8	52.9
Discount	32.8	41.8
Free ticket/bonus	5.4	5.3

a. Pearson's χ^2: 16.5, $p = .00$, $df = 2$.
b. Pearson's χ^2: 173.1, $p = .00$, $df = 10$.
c. Pearson's χ^2: 8.2, $p = .08$, $df = 4$.
d. Pearson's χ^2: 8.4, $p = .02$, $df = 2$.

(Pearson's χ^2: 16.5, $df = 2$). Hence, to a certain degree, the two surveys give a contradictory picture of the air travel market.

If we look at the more disaggregate level, differences become even greater ($p = .000$, Pearson's $\chi^2 = 173.1$, $df = 10$). The most striking difference is found within the category "Commute to/from place of work," which is three times higher in the household survey. This may explain the high mobility reported by household respondents. People commuting to and from place of work are generally very mobile. Often, these kinds of trips are undertaken on a regular basis, making the overall mobility within the group high. Both in the intercept and the household survey, the commuters report almost twice as high mobility as do respondents travelling for other purposes. Thus, it is obvious that the high share of commuters found in the household survey makes a significant contribution to the results in Figure 1.

Differences also are revealed among other groups of business travellers. In general, the household survey indicates less traditional business traffic. For instance, 9% of the intercept respondents travel for the purpose of sales or purchasing, while the corresponding number in the household survey is only 3%. A greater proportion of the business trips reported in the household survey are unspecified ("other purposes"). This may indicate that interviewers have done a poor job when classifying trips described by the respondents, which in turn, may have affected response patterns in the other categories. Yet, poor classification cannot explain all differences, and the overall impression is that the two surveys produce a divergent picture of the business passengers.

Differences also are found between trips for private purposes, but these trips seem to be less discrepant. Trips to friends and relatives constitute a major part of the total number of trips in both surveys, and both surveys suggest that private trips such as holidays, medical treatment, and so on are rarely undertaken by plane.

The last rows in Table 3 compare the distribution of ticket type and who paid for the ticket. With regard to the latter, the employer/client more often seems to pay for the ticket in the household survey. Most likely, this is due to the greater number of business trips found in the household survey. However, differences are only marginally significant ($p = .08$, Pearson's $\chi^2 = 8.2$, $df = 4$), and no clear conclusions can be drawn.

Due to the greater number of business trips, we would expect that household respondents more often use full fare tickets (Norwegian domestic flights do not offer business class). This seems not to be the case. Fifty-three percent of the household respondents report to have travelled on a full fare ticket, while the corresponding number in the intercept survey is 62%. As Table 4 illustrates, both business and private travellers report more frequent use of discount tickets in the household survey.

Table 5 compares the distribution of gender, working status, and age within the two surveys. The figures are very similar. In fact, no significant differences are found. Table 5 draws a picture of the airline passengers consistent with previous air travel surveys. Men are in great majority, and so are middle-age people and people in regular work. The results suggest that previous differences are not due to sampling or nonresponse bias, and therefore, it is hard to give a reasonable explanation to the contradictory figures in Table 3. This question is further discussed in the concluding section.

Gate versus On-Board for Intercept Surveys

Research Question 3: Variations in Response Rates

Table 6 compares response rates for on-board interviews and gate interviews. Response rates are calculated as the number of forms returned divided by the total number of passengers on the respective flights. As expected, there is clear evidence of a higher response rate for the on-board survey. Fifty percent of these passengers completed the questionnaire and returned it to the cabin crew, while only 35% of the gate respondents gave a complete response. As mentioned previously, late-arriving passengers who are precluded from answering before they board the plane most likely cause the

TABLE 4
TRIP PURPOSE BY TICKET TYPE

Trip Purpose	Ticket Type (%)			
	Full Fare	Discount	Total	n
Household survey				
Business	70.2	29.8	100	178
Private	12.3	87.7	100	65
Intercept survey				
Business	82.5	17.5	100	15,875
Private	26.8	73.2	100	9,595

TABLE 5
VARIATIONS IN RESPONDENT CHARACTERISTICS (%)

	Intercept Survey (n = 29,496)	Household Survey (n = 271)
Gender[a]		
Male	64.5	64.6
Female	35.5	35.4
Working status[b]		
Working	83.7	86.0
Not working	16.3	14.0
Age[c]		
13-29 years	22.1	19.6
30-44 years	38.2	43.2
45-59 years	33.0	30.6
60+	6.7	6.6

a. Pearson's χ^2: 0.00, $p = .98$, $df = 1$.
b. Pearson's χ^2: 1.02, $p = .31$, $df = 1$.
c. Pearson's χ^2: 2.96, $p = .40$, $df = 3$.

difference. In an attempt to make up for this methodological problem, these passengers were handed a reply-paid questionnaire, requested to fill in the form on board the plane, and post it back at a later time. Only about 10% returned the questionnaire, making just a minor increase in the overall response rate. Hence, there is little doubt that gate interviews are more susceptible to nonresponse.

What also can be seen from Table 6 is that passengers travelling on full fare tickets are more willing to respond than are passengers using discount tickets. This holds true for both data collection methods. Type of ticket can be considered a proxy for trip purpose (see Table 4), indicating that business passengers are more willing to respond. This is likely to be associated with the interest or motivation factor. People travelling in business are generally more mobile, and because of their great exposure to the transport system, they often are more willing to answer questions about it. Moreover, we expect business travellers to be more skilled in answering these kinds of questions. Compared to the average personal traveller, the businessman or businesswoman is more familiar with questionnaires, application forms, and so on. Consequently, he or she will feel the questionnaire less burdensome and will spend less time completing it.

TABLE 6
RESPONSE RATES (%)

	On-Board	Gate
Overall response rate	50	35
Type of ticket		
Full fare	57	38
Discount	37	27

Research Question 4:
Variations in Trip and
Respondent Characteristics

    In general, the possibility of nonresponse bias is reduced if the response rate can be increased. Considering the results in Table 6 above, there is a chance that gate surveys will produce a more distorted picture of the airline passengers. Moreover, we expect the "last-minute passengers" not captured in gate surveys to be highly mobile people, primarily business travellers. Previous air travel surveys have shown that people travelling in business spend less time at the airport, are more likely to use airline membership lounges, and consequently are less available than are personal travellers. Hence, the increased nonresponse found in the gate interviews might produce systematic errors in the data.

    Looking at Table 7, however, this seems not to be the case. The table compares trip and respondent characteristics within the two samples. The figures are surprisingly similar. Running a chi-square test for the grouped variables and a one-way ANOVA for the continuous variables, differences are not found to be statistically significant. This also applies to the mobility question. The average mobility reported by gate respondents is actually a bit higher. Thus, no support is found for the hypothesis concerning the "last-minute passengers." Although the gate survey is more susceptible to nonresponse, the sample characteristics are similar to those produced by the on-board interviews.

    Both surveys, however, are overrepresented by passengers travelling on full fare tickets. The exact distribution of full fare or discount tickets provided by the airlines shows that two-thirds of the passengers travelled on full fare tickets and one-third on discount tickets (ticket type is the only population data available). The corresponding figures in the two samples are approximately 75% full fare and 25% discount. Using ticket type as a proxy for trip purpose (see above), this indicates that business travellers are overrepresented in the samples. Again, the interest or motivation factor and the more professional attitude toward surveys in general seem to have had an impact.

DISCUSSION

    Results have shown that air travel estimates depend less on survey method than anticipated. No support was found for the hypothesis concerning survey method and mobility. In fact, the average mobility was higher in the household survey, suggesting that the most mobile airline passengers are surveyed as easily at home as at the airports. Also, the distribution of age, gender, and working status within the two

TABLE 7
VARIATIONS BY TRIP AND
RESPONDENT CHARACTERISTICS (%)

	On-Board	Gate
Trip purpose[a]		
Business	75.5	73.8
Private purposes	24.5	26.2
Type of ticket[b]		
Full fare	74.2	72.9
Discount	25.8	27.1
Who paid for the ticket[c]		
Employer/client	78.1	75.9
Himself or herself, or another person in the family	17.8	19.2
Sports organization or cultural organization	1.1	0.8
Social Security office	0.8	1.2
Other	2.3	2.9
Time spent at the airport[d]		
20 minutes or less	14.3	12.6
21-45 minutes	44.5	44.7
More than 45 minutes	41.2	42.7
Gender[e]		
Male	69.0	69.9
Female	31.0	30.1
Mobility[f]		
Average number of domestic round-trip flight within past 12 months	14.4	15.6
Member of frequent flyer program[g]		
Yes	71.7	69.5
No	28.3	30.5
Working status[h]		
Not working	9.5	11.5
Working	90.5	88.5
Age[i]		
13-29 years	15.3	15.7
30-44 years	39.6	37.9
45-59 years	34.3	35.7
60+	10.7	10.7
Managerial position at work[j]		
No	38.1	37.0
Yes	61.9	63.0

a. Pearson's χ^2: 0.93, $p = .34$, $df = 1$.
b. Pearson's χ^2: 0.49, $p = .48$, $df = 1$.
c. Pearson's χ^2: 3.52, $p = .48$, $df = 4$.
d. Pearson's χ^2: 1.58, $p = .45$, $df = 2$.
e. Pearson's χ^2: 0.21, $p = .65$, $df = 1$.
f. ANOVA: $p = .09$, $F = 2.83$, between groups $df = 1$, within groups $df = 2,338$.
g. Pearson's χ^2: 1.29, $p = .26$, $df = 1$.
h. Pearson's χ^2: 2.34, $p = .13$, $df = 1$.
i. Pearson's χ^2: 0.86, $p = .83$, $df = 3$.
j. Pearson's χ^2: 0.26, $p = .61$, $df = 1$.

samples was remarkably similar, indicating that the results are not a product of sampling or nonresponse bias. Considering this, it is hard to give a reasonable explanation of the different trip purpose distributions in the intercept and household survey. In particular, the high number of commuting trips found in the household survey, and consequently, the low number of more traditional business purposes (e.g., sales, marketing, and conferences), are remarkable. Although population data are not available, there are reasons to believe that the household survey gives a distorted picture of the

business traffic. The dominating number of trips to and from work is not consistent with previous air travel surveys, and quite certainly, these trips are overrepresented in the household survey.

Memory effects may have had an impact on the results. In the intercept survey, respondents were only to report on the trip they were about to make, while household respondents were requested to describe all trips made within the last month. The retrospective approach makes memory effects a potential problem, and several studies have shown that omission of trips due to memory effects can lead to considerable bias in data (e.g., Denstadli and Lian 1998; Armoogum and Madre 1997). Commuting trips may be more easily remembered due to their regularity, while sporadic trips are more often forgotten. This is supported by Wermuth (1985), who found that regular trips were better reported than irregular ones.

When interpreting these results, we must have in mind the low number of observations in the household survey. As mentioned previously, the survey was conducted as part of the NNTS. Among the respondents, only 12% reported that they had made one or more trips by air within the reporting period, indicating that airline passengers are not reached as easily at home as expected. The relatively low number of observations makes results susceptible to "outliers," that is, respondents with extremely high mobility. A closer investigation of the results reveals that a few people dominate the commuting trips—three respondents count for one-third of the total number of trips to and from work in the household survey. If these respondents are excluded from the analysis, the share of commuting trips drops to 25%. However, they did not have an unreasonably high mobility, and therefore, they were included in the sample. Nevertheless, it illustrates the potential impact of small sample size. Most likely, the distributions of trip purpose would have been less divergent if the number of observations in the household survey had been greater.

The overall impression is that intercept and household surveys produce a more or less comparable picture of the air travel market. The correspondence between the surveys, however, does assume that each type is conducted according to recognized sampling and surveying principles. It is also important to bear in mind that the area of application is different. If one aims to establish OD matrices, intercept surveys are the only true alternative. At the route level, household surveys are still insufficient due to the small number of observations. Household surveys, however, do represent an alternative way of collecting air travel data at the aggregate level if one ensures a sufficient sample size.

The hypothesis concerning data collection procedure in intercept surveys was supported. Gate interviews are more susceptible to nonresponse, due to passengers arriving late at the gate. Yet, no significant differences were found between the samples with regard to trip and respondent characteristics, suggesting that the increased nonresponse in the gate survey is not systematic across these characteristics and that the "last-minute passengers" are more or less randomly distributed between high- and low-mobility groups, business and private travellers, men and women, and so on. This also suggests that an equally valid picture of airline passengers can be obtained through gate and on-board surveys. The possibility of nonresponse bias, however, is generally reduced if the response rate can be increased, and on-board interviews should be employed when conducting these kinds of surveys, although gate interviews seem to represent a reliable alternative.

In both surveys, business travellers were overrepresented. This also indicates that they are overrepresented in the intercept survey as such. Most likely, the difference in response rate between business and private travellers is due to an interest factor. Business travellers are generally frequent flyers. Thus, they probably feel the survey to be of greater importance, and consequently, they are more motivated to participate. Weighting the data to correct for obvious differences in response rates between business and private travellers can reduce biases in data, but some error will undoubtedly remain. Therefore, one needs to increase motivation among private travellers.

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