

Popping the Question: The Influence of Survey Design on Estimated Visitor Spending in a Region

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Abstract

Regional scientists often use surveys to collect spending data as a first step in conducting state and local economic impact studies. This paper examines the influence of survey question type and wording on the information obtained about the expenditures of over 2,100 cruise passengers that visited Bar Harbor, Maine. Results show that average total spending amounts reported per passenger are not statistically different between surveys using open-ended (\$104 per passenger) and categorical (\$107 per passenger) expenditure questions. On the other hand, sample averages from surveys asking two different passenger spending questions—about group and personal purchases—are statistically different in five of eight product categories (e.g., meals and drinks, souvenirs) considered. A comparison of these survey results to per-passenger spending amounts from a regression analysis of taxable restaurant sales in the Bar Harbor region is used to estimate possible data reporting errors made by survey respondents. The study results suggest that Bar Harbor cruise passengers made expenditures of between \$16.9 million and \$23.2 million in 2017, and these visitors accounted for an estimated 3.6 to 6.0 percent of annual restaurant sales. The methods and results of this study may be of interest to regional scientists and organizations that conduct expenditure surveys used in economic impact analysis.

1 Introduction

Regional scientists are routinely asked to estimate the state and local economic impacts of companies, industries, groups of people present in a region (e.g., visitors, retirees), and various types of policies (Connaughton and Madsen, 2001; Shields et al., 2003; Choi and Johnson, 2014; Bae and Dall’erba, 2016). A common two-part approach to this task is to measure the direct output (or employment) that is associated with the economic activity of interest, and then to calculate the regional multiplier effects using an input-output or general equilibrium model. There is an extensive literature about how to construct and calibrate regional impact models (West and Jackson, 1998; Lazarus et al., 2002; Steinback, 2004; Lindall et al., 2006; Watson et al., 2015), and even some studies deal with the proper terminology to use when describing the results of the analysis—e.g., “impact” or “contribution” (Watson et al., 2007). Although regional scientists have devoted a lot of energy to aspects of the second part of conducting economic impact studies—i.e., calculating multiplier effects—there has been less attention paid to the first step of measuring the direct economic activity.

The direct impact in an industry impact study can be represented by the sector’s output, employment and labor income; and this information is often publicly available from sources such as County Business

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Patterns or the Census of Manufacturing. The direct change in economic activity that is associated with a state or local policy may be calculated using secondary data (Lester et al., 2015), but these kinds of studies often require primary data collection. Likewise, estimating the impacts of certain types of groups (e.g., tourists) and regional assets, from festivals (Chhabra et al., 2003) to farmers markets (Hughes et al., 2008), often rely on primary data collected by surveys.

When designing and conducting surveys, regional scientists make decisions about the topics to include on the questionnaire, the survey mode (e.g., mail, intercept or online), question order, the length of the questionnaire (e.g., a comment card or multiple-page booklet), question type (e.g., open-ended or categorical), the instructions to include on the survey, and the exact wording of questions. These choices often involve tradeoffs such as (in the case of survey length) a long survey may provide more information, whereas a short one might elicit a higher response rate. Related to the instructions printed on a survey, more details and lengthier explanations may help some respondents, but they might be a hindrance to others.

This paper examines the influence of survey design on the information obtained about visitor spending, which is often estimated as a first step in a tourism economic impact study. The analysis is based on surveys of over 2,100 cruise passengers that visited Bar Harbor, Maine, in 2016. Bar Harbor hosted about 115 cruise ships that year, with a combined capacity of over 150,000 passengers, and the passenger capacity increased to over 220,000 people in 2017. The project used multiple versions of questions about cruise passenger spending, which allowed us to test for differences in average per-person expenditures due to question type and wording. Some surveys had open-ended questions about expenditures, while other respondents were asked to select a spending category (e.g., \$1 to \$10). The surveys also differed in that some versions asked about personal expenditures, and other versions had questions about the spending of an entire group (e.g., family or traveling companions).

The results of this paper add to a broad literature related to the effects of survey methods on the responses obtained from study participants, which is useful for the study of regional economic impacts. Past research has looked at the influence of question order (Krosnick and Alwin, 1987), survey length (Galesic and Bosnjak, 2009), mode of data collection (Dolnicar et al., 2009), and how survey questions are worded (Rasinski, 1989). Many of these studies, spanning a variety of disciplines, show that the results obtained from surveys are affected by how the information is collected. The methodological approach used in this paper, which allows for direct comparisons of the results from different types of spending questions, provides new evidence about the influence of survey design (e.g., question type and wording) on visitor spending estimates.

Another contribution that this paper makes to the regional science literature is that, as a way to estimate the data reporting errors made by passengers that completed questionnaires, we compare the survey results to passenger spending amounts from a time-series regression analysis of monthly taxable restaurant sales in the Bar Harbor region.¹ In previous studies, regional scientists have examined secondary data, similar to the taxable sales data used in our work, to assess the local impacts and importance of tourists (Leatherman and Marcouiller, 1996; Gunderson and Ng, 2005; Thompson, 2007). For example, Thompson (2007) conducted a cross-sectional analysis of the growth of taxable lodging sales to estimate the basic tourism activity in Nebraska counties, and this information was used to measure the impacts of tourism on total employment. Gunderson and Ng (2005) used a quantile-regression approach to estimate the local employment and income that are associated with resource-based tourism.

Our focus on the spending of cruise passengers in Bar Harbor also extends the literature on the regional impacts of tourists, in general, and (more specifically) cruise visitors in a port-of-call. To support the efforts of regions seeking to enhance local tourism as a way to spur business and economic development (Jones et al., 2003; Marcouiller, 2007), researchers routinely conduct surveys to collect data about resident attitudes regarding tourism (Jakus and Siegel, 1997; Devine et al., 2009); as well as the opinions, activities and expenditures of tourists while visiting a destination (Wilton and Nickerson, 2006; Bernini et al., 2017). The information obtained from visitor expenditure surveys is often used in studies of tourism demand (Brida and Scuderi, 2013), and—as discussed above—as a first step to estimate the regional impacts of visitors and special events (Long and Perdue, 1990; Jones and Munday, 2004; Saayman and Saayman, 2006).

The topic of cruise passenger expenditures in a port-of-call has been investigated by other researchers

¹In a study focusing on the factors important to firm location, Carlson (2000) also compared the results obtained from surveys to those estimated by a regression model.

(Gargano and Grasso, 2016; Gouveia and Eusébio, 2018) and past studies reveal wide variation in average per-passenger spending. At the lower end of the range, surveys show average passenger spending figures that convert to about \$59 and \$74 (\$US in 2017) per day in Norwegian and Spanish ports (Larsen et al., 2013; Vayá et al., 2018). At the higher end of the spectrum, surveys have also found average passenger spending figures that convert to about \$124 and \$127 (\$US in 2017) per day in Costa Rican and Jamaican ports (Henthorne, 2000; Brida and Zapata, 2010). The results presented in this paper fall within the ranges found elsewhere and are generally similar to the findings of other cruise passenger expenditure studies.

2 Data and Comparisons of Sample Means

The analysis is based on surveys of cruise passengers that visited Bar Harbor in 2016. Surveys were distributed to 4,768 passengers (as they were returning to the ship after spending the day in port) from 31 ship visits over 24 days between May and October (Gabe et al., 2017).² Guests were surveyed from a mix of small (e.g., American Glory, with a capacity of 49 passengers) and large (e.g., Regal Princess, with a capacity of 3,560 passengers) ships, and across several cruise lines (e.g., Crystal Cruises, Holland America, Silversea Cruises). A total of 2,231 questionnaires were returned by mail, which gives a response rate of about 47 percent. The surveys included questions about passenger demographics, their activities while in port (e.g., cruise-line sponsored tours) and—most central to our analysis—passenger expenditures. Of the 2,231 returned surveys, 2,167 questionnaires had complete data for passenger spending, including respondents that reported zero expenditures.³

Figure 1: Open-Ended Questions about Group Spending

The next few questions ask about the money that you and others in your group (e.g., family, traveling companion) spent, and the stores and restaurants that you visited. Please do not include money paid to the cruise line for a tour.

Q11. Spending on...	Meals and drinks:	\$ _____
	Souvenirs (e.g., magnet, lighthouse):	\$ _____
	Clothing:	\$ _____
	Art and jewelry:	\$ _____
	Groceries and pharmacy items:	\$ _____
	Home furnishings:	\$ _____
	Books and paper goods:	\$ _____
	Recreation and transportation: (e.g., admissions, taxis)	\$ _____
	Other: _____	\$ _____
	Total Spending:	\$ _____

Q12. How many people are covered by the spending reported above? _____

²About 44 percent of the returned surveys are from cruise passengers that visited Bar Harbor during September and October. A comparison of the average passenger expenditure during these months (\$110) to the average passenger expenditure for the rest of the sample (\$106) does not show a statistically significant difference (1-percent significance level).

³This suggests that 97 percent of the returned surveys had spending information, including questionnaires with zero reported expenditures. In comparison, only 84 percent of the survey respondents reported their household income. In many cases, the surveys without spending data had large sections of the questionnaire that were not completed. If a respondent reported an expenditure for a single category and left the rest blank, we counted the blanks as zeroes.

Figures 1 and 2 are exact replicas of two of the expenditure questions used on the surveys of cruise passengers in Bar Harbor. The first figure has open-ended questions about group spending, while the second figure is a version with categorical responses for personal expenditures.⁴ The other two versions used in the study (included in an appendix: Figures A1 and A2) have an open-ended question about personal expenditures, and categorical responses for group spending.⁵ The categorical responses were converted to spending amounts using the midpoint of the option selected and the types of purchases indicated by the respondent.⁶ For example, if a cruise passenger selected the expenditure category of \$151 to \$200 and indicated that a group of two people spent money on “meals and drinks” and “clothing,” the responses were converted to \$175.50 in total expenditures, with \$87.75 allocated to the purchase categories of “meals and drinks” and “clothing.” Group expenditure figures were then divided by the party size to arrive at per-passenger spending amounts—that is, for a party of two people, \$43.87 per passenger on meals and drinks, and \$43.87 per passenger on clothing. To estimate passenger spending on cruise-line sponsored tours, an earlier survey question asked for the tour name, if any. The tour names provided by the passengers were matched to prices listed on cruise line websites to arrive at the estimated amount spent on tours.⁷

Figure 2: Categorical Questions about Personal Spending

The next few questions ask about the money you spent, and the stores and restaurants that you visited while in Bar Harbor. Please report the money that you personally spent in town—do not include money paid to the cruise line for a tour or money spent by others in your group.

- Q11. About how much money did you spend?
- | | | |
|--|---|--|
| <input type="checkbox"/> \$0 (I did not spend any money) | | |
| <input type="checkbox"/> \$1 to \$10 | <input type="checkbox"/> \$11 to \$25 | <input type="checkbox"/> \$26 to \$50 |
| <input type="checkbox"/> \$51 to \$75 | <input type="checkbox"/> \$76 to \$100 | <input type="checkbox"/> \$101 to \$150 |
| <input type="checkbox"/> \$151 to \$200 | <input type="checkbox"/> \$201 to \$250 | <input type="checkbox"/> \$251 to \$500 |
| <input type="checkbox"/> \$501 to \$750 | <input type="checkbox"/> \$751 to \$1,000 | <input type="checkbox"/> More than \$1,000 |
- Q12. What types of things did you purchase? (Please check all that apply.)
- | | |
|---|--|
| <input type="checkbox"/> Meals and drinks | <input type="checkbox"/> Souvenirs (e.g., magnet, lighthouse) |
| <input type="checkbox"/> Clothing | <input type="checkbox"/> Art and jewelry |
| <input type="checkbox"/> Home furnishings | <input type="checkbox"/> Groceries and pharmacy items |
| <input type="checkbox"/> Books and paper goods | <input type="checkbox"/> Recreation and transportation (e.g., admissions, taxis) |
| <input type="checkbox"/> Other (please describe): _____ | |

A comparison of the results from the questions that ask about group and personal expenditures provides an idea of the extent to which these approaches may over- or under-estimate tourist spending. Stynes and White suggest that asking about personal spending may lead to inflated estimates because “couples and families likely have difficulty identifying what one individual is paying...” (Stynes and White, 2006, p.9). They discuss the results of several studies, conducted to measure the spending of recreational visitors to U.S. national forests, which suggest that “most respondents were reporting expenses of the entire travel party...” (Stynes and White, 2006, p.13). The issue of shared expenses counted by multiple respondents is especially problematic for lodging and transportation (e.g., taxicab) purchases, which are unlikely to vary for parties of fewer than four people (Frechtling, 2006).

⁴The number of questionnaires with complete data from the open-ended questions about group spending (Figure 1) is 548 surveys, and 550 surveys are used that contain categorical questions about personal expenditures (Figure 2).

⁵The number of questionnaires with complete data from the open-ended questions about personal expenditures (Figure A1) is 498 surveys, and 571 surveys are used that contain categorical questions about group spending (Figure A2).

⁶The practice of using the midpoint of a selected option to convert a categorical variable to a continuous one is reasonably common in other studies (Byrne et al., 1996; Gould, 1996; Hughes et al., 2008; Carroll et al., 2009), and Bhat (1994) suggests that if small intervals are used—the midpoint method may provide accurate estimates.

⁷In cases where passengers provided tour names that did not appear on the cruise line websites, we assigned the price corresponding with the tour name of the closest match. In cases where the tour names were unknown, we assigned the average tour price calculated from all passengers that took tours.

In our study of cruise passenger expenditures, the sources of data reporting errors could come from—among other things—people counting total party spending when asked for personal expenditures, or from an inaccurate listing of group size and/or purchases. The problem of overstating lodging and transportation expenditures does not apply to our study of Bar Harbor cruise passengers because they do not spend the night in a hotel, and seldom use a car or taxicab. An issue that is relevant to the analysis of cruise passengers, which may be less of a concern in other tourism studies, is that some passengers are unable (or chose not) to get off the ship in a port-of-call.⁸ A respondent asked about travel party size might inadvertently count someone who did not disembark from the ship, which would result in an artificially low per-person spending amount (from surveys asking about group purchases).

A comparison of the average per-passenger spending figures based on the two question types provides evidence on the differences due to the use of open-ended and categorical questions. When collecting expenditure data from just one person, an open-ended question will provide more precise information than a question asking that person to select a category (e.g., spending of \$1 to \$50). Information collected using categorical questions can be made more precise, however, by reducing the range of response categories (e.g., spending of \$1 to \$10, \$11 to \$25, \$26 to \$50, etc.). The approach taken in our study of Bar Harbor cruise passengers was to ask one categorical question about the total amount spent on goods and services, and a second categorical question about the types of purchases (e.g., clothing, souvenirs, meals and drinks). This method, which used 13 spending categories for total expenditures (e.g., \$11 to \$25, \$26 to \$50, etc.), may provide reasonably accurate estimates of total purchases, but less accuracy for the amounts spent per passenger on each product type.

Tables 1 and 2 show average per-passenger spending figures for the product categories of meals and drinks, souvenirs, clothing, art and jewelry, groceries and pharmacy items, home furnishings, books and paper goods, and a product category labeled “recreation, tours and other.”^{9,10} The final category combines recreation and tours because they both involve forms of sightseeing in and around Bar Harbor. The “other” category from the survey is combined with recreation and tours because “independent” tours (i.e., not sponsored by the cruise line) is one of the most frequently noted purchases for “other” expenditures. Figured across all of the surveys, cruise passengers visiting Bar Harbor spent an average of \$105 on goods and services.¹¹ The largest expenditure categories (in terms of average per-passenger spending) are recreation, tours and other; and meals and drinks.

Looking at the figures in Table 1 from the open-ended and categorical questions, we see that the total expenditure amounts spent per passenger are similar based on the surveys using these question types.¹² A t-test comparing the two sample means (i.e., \$104 for open-ended questions and \$107 for categorical questions) suggests that the average amounts spent per passenger are not statistically different at a 1-percent significance level. However, for the individual product categories, t-tests of the sample means reveal statistically significant (at a 1-percent significance level) differences in average per-passenger spending on art and jewelry; groceries and pharmacy items; and books and paper goods.

A general finding revealed in the results comparing the information collected from the open-ended and categorical questions is a greater similarity in the averages for categories with the highest counts of non-zero expenditures. For example, the five “categories” with the highest counts—i.e., total; meals and drinks;

⁸When distributing the surveys to passengers as they were returning to the ship, some people told us that other members of their parties did not visit Bar Harbor due to mobility issues and the fact that they had to ride tenders from the ship to the shore.

⁹When calculating the average values from the surveys asking about group spending, we first divided the total reported expenditure by party size to arrive at a per-passenger expenditure for each party.

¹⁰The average values are based on respondents that reported positive expenditures for a particular spending category as well as those that indicated they did not spend any money (see note 3).

¹¹The spending figures in Tables 1 and 2 are based on 2,159 observations, which is the sample size after removing eight “outlier” observations from the original sample of 2,167 observations. On the high end, we removed four observations with over \$751 in reported spending per passenger (the difference between \$751 and the expenditure reported on the “first” removed observation (\$1,000) is \$249, which is a gap that far exceeds the largest difference in expenditures, ordered by amount of per-passenger spending, in the sample after removing outliers). To “balance” the sample, we also removed four observations with zero reported expenditures. Three of the four observations with over \$751 in reported spending are from surveys that asked about group expenditures. Removing the outliers lowered the average passenger expenditure from \$108 to \$105, and the standard deviation fell substantially from \$112 to \$78.

¹²Our comparison of the results from open-ended (see Figures 1 and A1) and categorical (see Figures 2 and A2) questions are based on surveys of group and personal expenditures.

Table 1: Average Per-Passenger Spending Figures by Product Category for Open-Ended and Categorical Expenditure Questions, n=2,159

Product Category	All Surveys	Open-Ended (n=1,041)	Categorical (n=1,118)	Statistical Difference?
Meals & drinks average	24.5	25.01	24.04	No
standard deviation	29.38	27.07	31.37	
count of non-zero expenditures	1609	819	790	
Souvenirs average	11.58	10.45	12.62	No
standard deviation	20.9	18.42	22.92	
count of non-zero expenditures	1036	532	504	
Clothing average	14.12	12.74	15.41	No
standard deviation	25.31	23.68	26.69	
count of non-zero expenditures	940	430	510	
Art & jewelry average	5.79	7.51	4.19	Yes
standard deviation	25.53	31.95	17.41	
count of non-zero expenditures	275	157	118	
Groceries & pharmacy items average	2.58	1.83	3.29	Yes
standard deviation	10.72	5.92	13.72	
count of non-zero expenditures	310	174	136	
Home furnishings average	1.57	1.55	1.6	No
standard deviation	12.98	14.86	10.96	
count of non-zero expenditures	81	35	46	
Books & paper goods average	2.06	1.4	2.67	Yes
standard deviation	9.98	7.86	11.58	
count of non-zero expenditures	226	115	111	
Recreation, tours & other average	43.08	42.8	43.32	No
standard deviation	44.18	44.92	43.49	
count of non-zero expenditures	1376	673	703	
Total average	105	104	107	No
standard deviation	78.37	74.74	81.61	
count of non-zero expenditures	2126	1023	1103	

recreation, tours and other; souvenirs; and clothing-have expenditure averages that are not statistically different between the open-ended and categorical questions. On the other hand, three of the four categories with the lowest counts of non-zero expenditures-i.e., art and jewelry, groceries and pharmacy items, and books and paper goods-have spending averages that are statistically different between the open-ended and categorical questions. This pattern is likely explained, at least in part, by our method of estimating the detailed expenditures from the categorical questions, in which we evenly split the total reported expenditure into the specific types of purchases based on those that were indicated by the respondent.

A comparison of the sample averages from surveys asking about group and personal spending (Table 2) shows statistically significant differences (at a 1-percent significance level) in five of the eight product categories, and for total expenditures.¹³ The results show higher average per-passenger expenditures from surveys that asked about personal spending (as compared with group spending) in the product categories of meals and drinks, souvenirs, clothing, groceries and pharmacy items, and books and paper goods. Overall, the average per-passenger total spending estimate from the surveys asking about personal expenditures is \$17 higher than the average across all surveys (i.e., \$122 compared with \$105), while the per-passenger spending total from the surveys asking about group spending is \$16 lower than the average across all surveys.¹⁴

¹³Our comparison of the results from questions about group (see Figures 1 and A2) and personal (see Figures 2 and A1) expenditures are based on surveys using open-ended and categorical questions.

¹⁴In an analysis of the entire sample (i.e., without removing the outliers-see note 11), the average expenditure from the surveys asking about group spending is \$94 per passenger and the average from the surveys asking about individual spending is \$123 per passenger. Removing the outliers has a larger influence on the average expenditures from the surveys asking about

Table 2: Average Per-Passenger Spending Figures by Product Category for Group and Personal Expenditure Questions, n=2,159

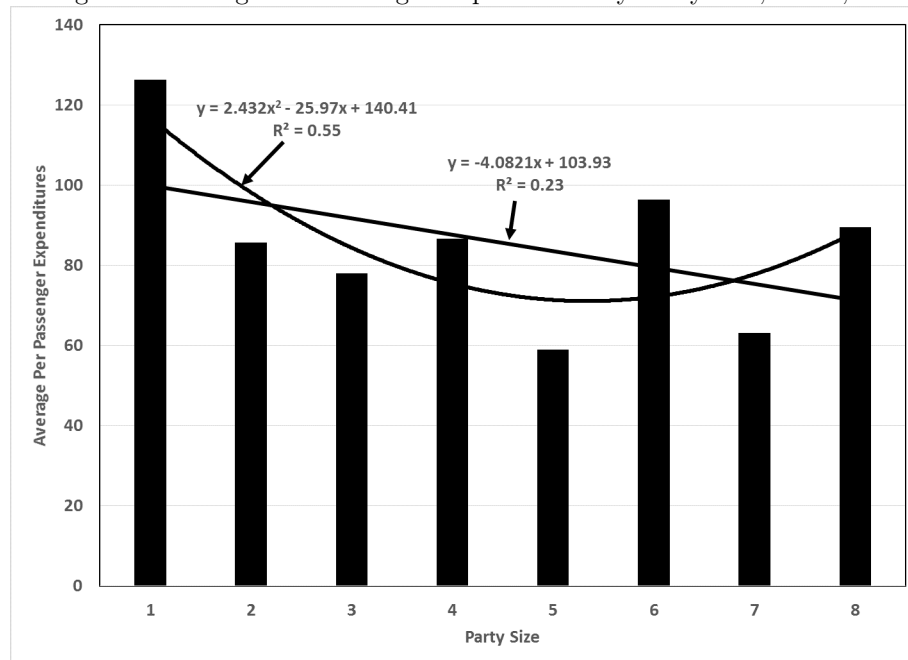
Product Category	All Surveys	Group (n=1,114)	Personal (n=1,045)	Statistical Difference?
Meals & drinks average	24.5	18.67	30.72	Yes
standard deviation	29.38	20.47	35.53	
count of non-zero expenditures	1609	869	740	
Souvenirs average	11.58	8.95	14.38	Yes
standard deviation	20.9	14.76	25.59	
count of non-zero expenditures	1036	569	467	
Clothing average	14.12	10.54	17.94	Yes
standard deviation	25.31	18.38	30.59	
count of non-zero expenditures	940	508	432	
Art & jewelry average	5.79	5.84	5.73	No
standard deviation	25.53	28.55	21.86	
count of non-zero expenditures	275	152	123	
Groceries & pharmacy items average	2.58	1.81	3.41	Yes
standard deviation	10.72	9.26	12.03	
count of non-zero expenditures	310	162	148	
Home furnishings average	1.57	1.25	1.91	No
standard deviation	12.98	8.91	16.24	
count of non-zero expenditures	81	46	35	
Books & paper goods average	2.06	1.41	2.75	Yes
standard deviation	9.98	5.57	13.11	
count of non-zero expenditures	226	122	104	
Recreation, tours & other average	43.08	40.76	45.57	No
standard deviation	44.18	41.53	46.73	
count of non-zero expenditures	1376	730	646	
Total average	105	89	122	Yes
standard deviation	78.37	65.56	86.85	
count of non-zero expenditures	2126	1105	1021	

Figure 3 provides a more detailed look at the results from the surveys asking group expenditure questions, showing the variation in average per-passenger spending by party size. The figure reveals that a “group” of one person (i.e., the respondent noted on the group expenditure survey that they were traveling alone) spends an average of \$126 in total, a group of two passengers spends an average of \$86 per person, a group of three passengers has an average expenditure of \$78 per person, and so on.¹⁵ The figure includes two OLS trend lines that represent the relationship between average spending per passenger and group size. The linear trend line, which has a downward slope and an R-squared value of 0.23, is consistent with a negative relationship between per-passenger spending and group size. In previous research on visitor spending, Taylor et al. (1993) and Mok and Iverson (2000) found that per-person tourism expenditures decrease with party size. The curved (i.e., second-order polynomial) trend line, which has an R-squared value of 0.55, is consistent with a U-shaped relationship between per-passenger spending and group size. This pattern of per-person tourist spending was found by Perez and Juaneda (2000) and Thrane and Farstad (2011).

The \$33 difference between the average per-passenger expenditure amounts from the surveys asking group spending (\$89 compared to \$94) than on the average expenditures from the surveys asking about individual spending (\$122 compared to \$123) because three of the four largest expenditures were reported on surveys asking about group spending.

¹⁵In addition to the party sizes shown in Figure 3, we also received four surveys from groups of nine people (average expenditure of \$91 per passenger), three surveys from groups of 10 people (average expenditure of \$50 per passenger), and one survey each from groups of 13, 14 and 20 people. The expenditures for these three largest party sizes are not disclosed to protect respondent confidentiality.

Figure 3: Average Per Passenger Expenditures by Party Size, n = 1,104



about personal expenditures (\$122) and group spending (\$89) suggests some combination of two types of data reporting errors. One type could be survey respondents, when asked about their own purchases, inadvertently reporting the expenditures of others. This could explain the higher spending average generated from the surveys asking about personal expenditures (e.g., Figure 2). A second type of data reporting error could come from study participants, when asked about group spending, providing an inaccurate listing of party size and/or the amount of purchases made by the group. This could explain the lower per-passenger expenditure average estimated from the surveys that dealt with group expenditures (e.g., Figure 1).

Although it is not possible to pinpoint the exact sources of these data reporting errors, the information presented in Figure 3 can be used to estimate potential errors of the respondents that were asked about group purchases. The second-order polynomial OLS trend line provides a better fit to the data than the linear trend line, and suggests a U-shaped relationship between average spending per passenger and group size (Perez and Juaneda, 2000; Thrane and Farstad, 2011). A comparison of the per-passenger spending amounts reported on the surveys to the values predicted by the U-shaped trend line suggest, for example, that the data obtained from solo travelers provide an overestimate of their expenditures, the data from passengers in parties of two and three provide an underestimate of their purchases, and so on.

A comparison of the average per-passenger spending figures reported by the survey respondents to the amounts that are estimated by the trend line in Figure 3 suggest that the passengers asked about group purchases underestimated their spending by an average of \$8 per person. That is, the average per-passenger spending of the study participants asked about group spending, estimated by the U-shaped trend line, is \$97; and this value is \$8 higher than the average value of \$89 as reported on the surveys. To put this figure into perspective, the data reporting error of \$8, estimated by the regression line shown in Figure 3, is equivalent to 23 percent of the entire difference of \$33 between the average per-passenger expenditures reported by the survey participants asked about personal (\$122) and group (\$89) spending. This suggests that 77 percent of the \$33 difference in average per-passenger expenditures is due to survey respondents, asked about personal spending, incorrectly reporting the purchases of others; while the remaining 23 percent is due to study participants, asked about group spending, providing an inaccurate listing of party size and/or spending amounts.¹⁶

¹⁶In an analysis of the entire sample (i.e., without removing the outliers-see note 11), we found that 62 percent of the \$29 difference in average per-passenger expenditures (i.e., \$123 compared to \$94-see note 14) is due to survey respondents,

3 Regression Analysis of Restaurant Sales in Bar Harbor

As a second way to measure the data reporting errors of study participants, we can compare the survey findings to a regression-based estimate of Bar Harbor cruise passenger spending on meals and drinks. This approach provides a useful frame of reference to the survey results because the regression-based expenditure figure comes from an analysis of secondary data on monthly restaurant sales. Regression analysis of secondary data is a common procedure used to estimate visitor spending and the importance of tourists (Gunderson and Ng, 2005; Thompson, 2007; Song and Li, 2008; Paci and Marrocu, 2014). This method has some advantages, relative to conducting visitor surveys, in terms of its low cost (if suitable data are available for the region of interest), and its ability to isolate the impacts of visitors from locals and generate forecasts of tourism demand. In particular, our passenger spending estimate is from a time-series regression analysis of the relationship between monthly taxable sales at restaurants and the number of cruise passengers that enter Bar Harbor, with controls for spending at lodging establishments in the area, the number of Acadia National Park users, and U.S. restaurant sales.¹⁷

Figure 4 shows monthly restaurant sales (adjusted, using the CPI, to values in October 2016) in the Bar Harbor ESA (Economic Summary Area), which includes the town of Bar Harbor and a few (small) surrounding communities that some of the passengers visit while in port. The figure reveals strong seasonal trends, with the highest values in July and August, and a 46-percent increase in annual restaurant sales between 2000 and 2017. These seasonal trends are largely the result of overnight tourists, with many of these visitors attracted by Acadia National Park. Similar to the large spikes in restaurant sales (e.g., 47.3 percent of annual sales occur in July and August), the number of Acadia National Park users (46.4 percent are in July and August) and lodging sales (July and August account for 50.4 percent of the total) exhibit high seasonality. Unlike the overnight tourists that mostly come to Bar Harbor during the summer, about 75 percent of cruise passengers visit in September and October.

Figure 4: Real Monthly Sales at Restaurants in Bar Harbor ESA

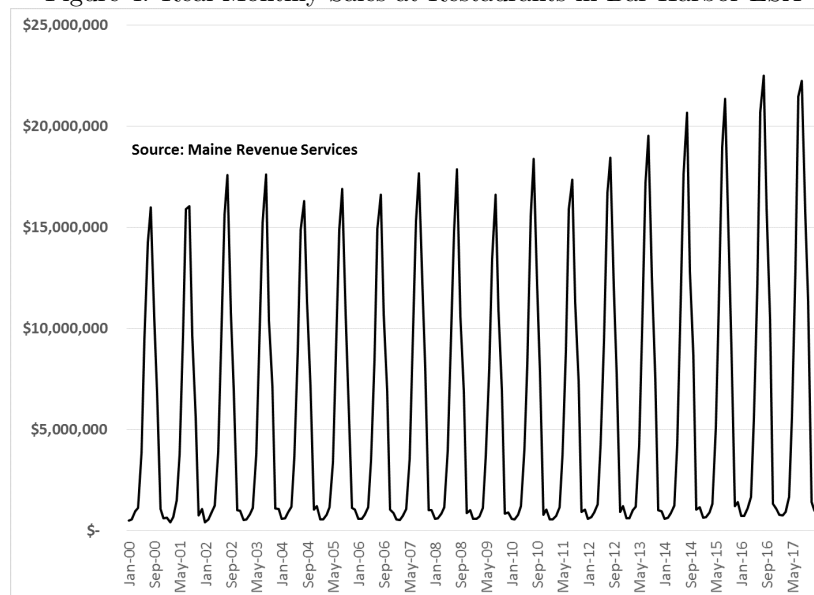


Table 3 shows results of a regression analysis of the factors impacting monthly restaurant sales in Bar Harbor. The time-series model used is a seasonal ARIMA (2,1,0) (1,1,0)₁₂, which has non-seasonal lags (of one and two months) and accounts for seasonality. Looking first at the control variables, we see that lodging sales, the number of Acadia National Park users, and U.S. restaurant sales are positively related to restaurant sales in Bar Harbor. The marginal effect of 0.44 suggests that every dollar spent on lodging is

asked about personal spending, incorrectly reporting the purchases of others; while the remaining 38 percent is due to study participants, asked about group spending, providing an inaccurate listing of party size and/or spending amounts.

¹⁷Bar Harbor is the gateway community to Acadia National Park.

associated with an additional \$0.44 spent at restaurants. Similarly, 2015 figures from the Maine Office of Tourism show that overnight visitors in Maine spent an average of \$0.45 on food and beverages for every \$1.00 spent on lodging (Maine Office of Tourism, 2017).

Table 3: Regression Analysis of Factors Affecting Monthly Restaurant Sales in Bar Harbor, Maine

Variable	Definition	Source	Estimated Coefficient	Standard Error
Cruise Passengers	Number of Cruise Passengers Entering Bar Harbor	Cruise ship schedules from Town of Bar Harbor, adjusted for passengers that do not disembark the ship.	23.13**	4.672
Lodging Sales	Real monthly lodging sales in Bar Harbor ESA	Maine Revenue Services	0.443**	0.029
Acadia National Park Users	Number of Acadia National Park Users	U.S. National Park Service	3.723**	0.782
U.S. Restaurant Sales	Real retail sales at U.S. food services and drinking places (\$millions)	U.S. Census Bureau	122.2*	52.58
Constant	NA	NA	94.53	9895
ARMA L1	Non-seasonal, one-month lag	NA	-0.560**	0.053
ARMA L2	Non-seasonal, two-month lag	NA	-0.282**	0.061
ARMA12 L1	Seasonal lag	NA	-0.506**	0.044

Note: The superscripts ** and * indicate statistical significance at the 1- and 5-percent levels.

The marginal effect of 3.72 suggests that, other things being equal, an additional 10,000 monthly Acadia National Park users is associated with a \$37,230 increase in restaurant sales. This does not mean, however, that an overnight visitor that recreates in Acadia spends only \$3.72 on food and beverages in the area. The impacts of overnight tourists-e.g., those that come to Bar Harbor to explore Acadia-are captured in the effect associated with lodging sales. Since the regression model “holds constant” the impact of overnight visitors and, because the number of park users counts locals and visitors, the Acadia variable measures the impacts on restaurant sales associated with the recreational activities of locals and tourists in the area, above what is attributed to overnight visitors. The positive relationship between Bar Harbor restaurant sales and a similar measure of U.S. restaurant sales suggests that, other things being equal, the Bar Harbor area followed national trends over the period.

Now moving to the variable of primary interest, we find a positive and statistically significant relationship between restaurant sales and the number of cruise passengers. Specifically, the results suggest that cruise passengers spend an average of \$23.13 on food and beverages while in Bar Harbor. To get an idea of the robustness of this result, we estimated additional versions of the model using all possible combinations of the explanatory variables (e.g., a model that controls only for lodging sales, a model that controls for Acadia users and U.S. restaurant sales, etc.) and four different time-series lag structures. The number of cruise passengers has a positive and statistically significant effect in all 32 versions of the model estimated, including the original specification shown in Table 3, and the average marginal effect is 23.22 (with a standard deviation of 4.48).

The regression-based estimate of cruise passenger spending at restaurants (i.e., \$23 per person) in Bar Harbor is \$4 higher than the average per-passenger spending amount (on meals and drinks) from the surveys that asked about group spending (\$19 per person), and \$8 lower than the amount from the surveys that asked about personal spending (\$31 per person). This suggests that about two-thirds of the \$12 difference in average per-passenger spending on meals and drinks (from the surveys asking about personal and group spending) is due to survey respondents, when asked about personal spending, also reporting the purchases of others. The other one-third of the \$12 difference is from study participants, when asked about group

purchases, providing an inaccurate listing of party size and/or group spending amounts.¹⁸

4 Summary and Conclusions

Regional scientists have examined numerous aspects of tourism, including its economic impact and importance to the local area economy (Taylor et al., 1993; Gartner, 2005; Marcouiller and Prey, 2005; Hughes and Shields, 2007). This paper contributes to this literature with an analysis of the influence of survey question type and wording on the information obtained about the average per-person expenditures of tourists, which is important information for estimating visitor economic impacts. The study used results from a survey of over 2,100 cruise passengers that visited Bar Harbor, Maine. Our results suggest that question type-whether it is open-ended or categorical-has very little impact on estimates of total spending per-passenger. This suggests that a researcher's decision to use an open-ended or categorical question about visitor expenditures does not influence the overall results of a regional expenditure study. The use of spending categories to collect total expenditure data may be perceived as less intrusive (than asking for exact amounts) and may not require that the survey participants consult spending records (e.g., sales receipts) from their time on vacation. This approach, therefore, might make it easier for respondents to complete surveys.

The decision to use categorical questions as a way to make it easier for study participants, however, may involve a tradeoff of less accurate expenditure estimates for specific product types. Although the results of our study suggest that average total expenditure amounts are not statistically different from the surveys that used open-ended and categorical questions, we find statistically significant differences in average per-passenger expenditures in three of the eight product categories considered. If the intent of a research project is to provide information on overall expenditures and a general idea about the types of goods and services purchased, a survey using categorical expenditure questions may meet this need. If the purpose of a study is to obtain highly accurate information about tourist spending on specific goods and services, which is important for economic impact studies where the multiplier effects often differ by sector, the project might require the use of open-ended expenditure questions.

A potential way that categorical questions could be used to obtain more accurate information about tourist expenditures on specific goods and services would be to have different questions for each product type. The categorical questions used in our study, shown in Figures 2 and A2, had a single question about the total amount of money spent and a second question that asked about the “types of things” purchased. Given the similarity of the estimates for total expenditures from the two question types (i.e., open-ended and categorical) used in the surveys, it is possible that categorical questions about the amounts spent on specific goods and services could yield more accurate estimates. A tradeoff of using this approach of asking study participants to select expenditure categories for each product type (e.g., meals and drinks, souvenirs, books and paper goods, etc.) is that the potential benefit of more accurate spending results must be weighed against the cost (in terms of the time required to complete the questionnaire) of adding several questions to the survey.

Our other main results show that average per-passenger spending figures are higher on surveys that ask about personal spending than on questionnaires that ask about group purchases. Although the total spending estimates are higher from the surveys asking about personal expenditures, the results are mixed for specific types of purchases. A series of t-tests show statistically significant (at a 1-percent level) differences in the average per-passenger spending figures (from the surveys asking about group and personal expenditures) in five of the eight product categories. This could happen if people asked about personal expenditures overstated their spending (e.g., by also reporting the purchases of others), or if those asked about group expenditures understated per-passenger spending (e.g., by counting people in the party size that did not get off the ship). A potential way to address this latter issue would be to include a survey question asking if anyone in their travel party remained on the ship.

To estimate the relative magnitudes of these two types of data reporting errors, we compared the actual results from the surveys asking about group spending to amounts estimated by a trend line of a U-shaped

¹⁸These results are very similar to the relative magnitudes of the data reporting errors-i.e., 62 percent due to survey respondents reporting the purchases of others, and 38 percent due to study participants providing an inaccurate listing of party size and/or purchases-estimated using the entire sample of survey data focusing on group expenditures (see note 16).

relationship between average per-passenger purchases and group size (Perez and Juaneda, 2000; Thrane and Farstad, 2011). A second approach compared results from the cruise passenger survey to a regression-based estimate of average spending at restaurants in the Bar Harbor area. This regression-based method is similar to the approaches employed in other studies that used secondary data to measure the regional impacts and importance of tourists (Leatherman and Marcouiller, 1996; Gunderson and Ng, 2005; Thompson, 2007). Both of the methods used in our analysis suggest that data reporting errors made by survey respondents asked about personal purchases are at least twice as large (e.g., 67 percent compared to 33 percent) as the errors made by survey participants asked about group spending.

The different ways of asking about expenditures can have an impact on estimates about the aggregate spending of Bar Harbor cruise passengers of about “plus or minus” 16 percent compared to the average based on all surveys. The sample averages for total expenditures and spending on meals and drinks are within eight percent of the estimates based on our analysis of the “data reporting errors” by survey respondents—e.g., \$105 compared to \$97 for total expenditures, and \$23.13 compared to \$24.50 for spending on meals and drinks. Using data on the number of cruise passengers scheduled to visit Bar Harbor in 2017, and adjusting for the estimated number of passengers that did not make it into town (e.g., people who are unable to get off the ship) (Gabe et al., 2017), the aggregate passenger expenditures (based on an average of \$105 per person from all of the surveys) are \$20.0 million. The estimated aggregate spending of cruise passengers is \$16.9 million based on an average of \$89 per passenger (from the surveys asking about group purchases), and \$23.2 million using an estimate of \$122 per person (from the surveys that asked about personal purchases).¹⁹

Focusing on passenger spending on meals and drinks, the results of the survey suggest aggregate expenditures of \$4.7 million (based on all of the surveys) in 2017; and \$3.5 million and \$5.8 million in aggregate spending using the surveys that ask about group and personal purchases, respectively. The regression-based estimate of \$23.13 in average spending per person suggests aggregate passenger expenditures at Bar Harbor area restaurants of \$4.4 million. Compared to the total annual taxable restaurant sales in the Bar Harbor ESA of about \$98 million in 2017, our results suggest that cruise passengers account for an estimated 3.6 to 6.0 percent of overall restaurant sales.²⁰

Future research could further explore the types of data reporting errors found in our analysis using experimental approaches (e.g., testing for survey response differences in a controlled laboratory setting) or by sending follow-up surveys to study participants. Other extensions to this study could be to examine the influence of survey design on the expenditures reported by different types of visitors, and in non-tourism related economic impact studies. Yet another possibility for future research could involve modifying the instructions given to study participants across different versions of the survey. For instance, a version of the survey could have a long set of instructions printed above the expenditure questions, along with examples of how (and how not) to fill out the survey form (e.g., a reminder to exclude cruise passengers that did not disembark from the ship) while other versions could have fewer instructions. Comparing the results from these different surveys could provide additional evidence about the influence of survey design on the information collected about expenditures in a region.

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¹⁹All three of these average per-passenger spending estimates, as well as the estimate of \$97 from the trend line of the relationship between per-passenger spending and group size, are within the range of cruise passenger spending amounts reported in other academic studies (Henthorne, 2000; Brida and Zapata, 2010; Larsen et al., 2013; Gargano and Grasso, 2016; Gouveia and Eusébio, 2018; Vayá et al., 2018).

²⁰The taxable restaurant sales data are from Maine Revenue Services.

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Appendix

Figure A1: Open-Ended Question about Personal Spending

The next few questions ask about the money you spent, and the stores and restaurants that you visited while in Bar Harbor. Please report the money that you personally spent in town—do not include money paid to the cruise line for a tour or money spent by others in your group.

Q11. Spending on...	Meals and drinks:	\$ _____
	Souvenirs (e.g., magnet, lighthouse):	\$ _____
	Clothing:	\$ _____
	Art and jewelry:	\$ _____
	Groceries and pharmacy items:	\$ _____
	Home furnishings:	\$ _____
	Books and paper goods:	\$ _____
	Recreation and transportation: (e.g., admissions, taxis)	\$ _____
	Other: _____	\$ _____
	Total Spending:	\$ _____

Figure A2: Categorical Questions about Group Spending

The next few questions ask about the money that you and others in your group (e.g., family, traveling companion) spent, and the stores and restaurants that you all visited. Please do not include money paid to the cruise line for a tour.

Q11. About how much money did you and your group spend?

- | | | |
|---|---|--|
| <input type="checkbox"/> \$0 (We did not spend any money) | <input type="checkbox"/> \$11 to \$25 | <input type="checkbox"/> \$26 to \$50 |
| <input type="checkbox"/> \$1 to \$10 | <input type="checkbox"/> \$76 to \$100 | <input type="checkbox"/> \$101 to \$150 |
| <input type="checkbox"/> \$51 to \$75 | <input type="checkbox"/> \$201 to \$250 | <input type="checkbox"/> \$251 to \$500 |
| <input type="checkbox"/> \$151 to \$200 | <input type="checkbox"/> \$1,001 to \$2,000 | <input type="checkbox"/> More than \$2,000 |
| <input type="checkbox"/> \$501 to \$1,000 | | |

Q12. How many people are covered by the spending reported above? _____

Q13. What types of things did your group purchase? (Please check all that apply.)

- | | |
|---|--|
| <input type="checkbox"/> Meals and drinks | <input type="checkbox"/> Souvenirs (e.g., magnet, lighthouse) |
| <input type="checkbox"/> Clothing | <input type="checkbox"/> Art and jewelry |
| <input type="checkbox"/> Home furnishings | <input type="checkbox"/> Groceries and pharmacy items |
| <input type="checkbox"/> Books and paper goods | <input type="checkbox"/> Recreation and transportation (e.g., admissions, taxis) |
| <input type="checkbox"/> Other (please describe): _____ | |