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**Willingness to participate in travel surveys: A cross-country and cross-methods comparison**

**By**

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**ABSTRACT:** Travel surveys are the primary source of data that feed into the analysis and modeling of travel behaviour. Numerous studies have found that the survey method, be it pen and paper, online, interview, smartphone app, or GPS, impacts participation, diligence and accuracy of reporting. In turn, this can lead to bias both in terms of the socio-demographic mix of respondents, and under/mis-reporting of trip information. To date, there is limited understanding of if/how preferences for particular travel survey methods vary across countries. In 2014, a survey of 17,510 adults from 24 countries was undertaken by an internationally-renowned market research firm to assess preferences for different survey methods. The current paper focuses on responses from five of these countries with long-standing household travel surveys - Australia, USA, France, Germany, and Japan. Results suggest that for a given survey method, willingness to participate in travel surveys varies across countries and within each group of respondents (classified by their socio-demographic characteristics). Australians tend to have a higher willingness to participate across different survey methods compared to their counterparts, particularly from Japan. In terms of socio-demographic characteristics, younger respondents tend to engage in travel surveys regardless of the method, while females are more likely to prefer diary-based methods than mobile-based methods. Respondents also appear to trade-off effort in completing travel surveys using traditional methods against privacy issues surrounding mobile-based methods. Results suggest that there is no 'one size fits all' methodology for travel surveys, with designers needing to carefully consider both socio-demographic and cultural differences.

**KEY WORDS:** *Travel Surveys; International comparisons*

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## **1. Introduction**

Across the globe, travel surveys remain a key bedrock of an evidence-based rationalization of transportation planning and policy decisions. Although there is a consensus in the saliency and primary utility of travel surveys as a data source for evaluating transportation alternatives, the context by which travel data is collected varies methodologically and geographically. For instance, Australia has maintained a face-to-face component for most of their surveys, while the United States largely uses telephone and web-based methods. With technological innovation, however, many countries, are now grappling with the opportunities and challenges presented by the potential of mobile technologies such as GPS and smartphones as survey methods (Bhat, 2015; Safi et al., 2014; Jariyasunant et al., 2014). Challenges associated with different survey methods, both traditional and new, and the impact on participation have been well-documented (Stopher and Greaves, 2007; Stopher, 2012; Richardson et al., 1995; Groves et al., 2004; Szelenyi et al., 2005). Among these challenges, declining participation is considered to be prevalent across most countries (Stopher and Greaves, 2007; Zimowski et al., 1997; Eisenmann et al., 2018). The combination of the decline in telephone usage and the increase in respondent burden (from survey saturation and the time demanded to complete traditional surveys) have contributed to such problems. To resolve the issue, survey researchers have explored alternatives to conventional methods to capture hard-to-reach socio-demographic groups, experimenting with mixed-method methods (Eisenmann et al., 2018; Bayart and Bonnel, 2015) and mobile-based technologies (Geurs et al., 2015; Zhao et al., 2015, Safi et al., 2013; Shin and Stopher, 2014). These explorations, however, have been done independently, either focusing on one specific geographic area or a specific survey method and subsequently comparing the outcome with a traditional method (Verreault and Morency, 2018; Eisenmann et al., 2018). Thus, there remains paucity of information around whether the survey methods are homogenous in terms of their effectiveness in different cross-country domains.

To address this gap, this study has three objectives: (1) to compare the preferred travel survey methods across different countries, (2) to determine how willingness to participate varies by respondent characteristics and country with a focus on five countries with long-standing household travel surveys: Australia, France, Germany, Japan, and the USA, and (3) to identify the factors impacting survey non-participation. This paper addresses these objectives using an online survey conducted across 24 countries, which investigates how likely people are to take part in a survey using various methods, ranging from traditional paper-based diaries to mobile technologies. In section 2, studies that explore the impact of travel survey method on participation are reviewed. Section 3 details the methodology and data used. Sections 4 and 5 present the results and discussion before we draw conclusions on the implications for understanding survey participation.

## **2. Determinants of travel survey participation**

A high response rate is one of the primary quality measures of a survey, and hence, survey practitioners allocate substantial resources in designing and selecting an appropriate method for collecting data. The question remains, however, how can researchers maximize response rates given the study objectives? There is extensive literature examining factors that influence participation and its impact on response rates (Groves et al., 2004; Olson et al., 2003; Szelenyi et al., 2005). In these studies, common themes in influencing response are developing, with two of the main ones being participant characteristics and motivation. Theory-based constructs that explain these themes are reflected in the Leverage-Saliency Theory or LST (Groves et al., 2000) and Survey Participation Inventory or SPI (Bruggen et al., 2011). These constructs

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suggest that by understanding the characteristics of the respondents and by using a survey method that appeals to their motivations, researchers could improve participation. The robustness of these theoretical constructs, however, has not yet been confirmed in a travel survey context. Moreover, it has not been assessed as to how results may across countries. An exception is Behrens and Masaoe (2009) who compared response rates between Cape Town, South Africa and Dar es Salaam, Tanzania using three different types of travel diary. Such cross-cultural studies are rare in a travel survey context. We continue now with a review of the two primary factors that influence travel survey participation: respondent characteristics and respondent motivation.

## **2.1. Respondent characteristics**

Responses to surveys have been found to vary by demographics and survey design. For example, the impact of monetary incentives on participation has been found to be higher among individuals with lower community involvement than individuals with high community involvement (Groves et al., 2000). Such example illustrates that in cases where potential respondents are interested in the survey topic and are invested in the survey outcome, provision of monetary incentives tend to be counterintuitive. Age, gender, and income are all reported to influence survey participation, given a specific survey method. Middle-aged women were found to be most responsive to surveys, while higher-income individuals prefer online surveys (Safi et al., 2017; Bayart and Bonnel. 2015). Older respondents appear less likely to participate in smartphone-based travel surveys, but depending on the recruitment method, smartphone-based surveys could draw interest among women (Patterson et al., 2017). The latter result partially conflicts with findings from technology adoption studies in which men were found to have a higher likelihood to adopt new technologies in completing tasks (Venkatesh et al., 2012). However, existing travel survey research barely considers how cultural norms play a role in defining characteristics of individuals. In Hofstede's (1980) Power Distance Index or PDI, for example, countries that have a high PDI have high regard for hierarchy identified by experience, age, or sometimes even gender. Hence, such cross-cultural difference may also have an unintended consequence on survey participation. It might be the case that countries with a high PDI may respond positively to a survey request by a reputable organization (which might be perceived as an authority). Determining the characteristics of potential respondents that could be captured using a particular method is salient in ensuring the reliability and quality of the data. After-all, individuals belonging to a specific socio-demographic group have a higher propensity to underreport their trips or dropout from the survey (see e.g., Bricka and Bhat, 2006). Whilst high response rates are often attributed to quality results, knowledge regarding non-response remains an important factor. By evaluating how respondent characteristics influence decision regarding travel survey participation, we can have a better understanding of the potential biases of the results and its overall quality.

## **2.2. Motivation of respondents**

Motivations for participation can either be intrinsic, when survey completion adds personal value, or extrinsic, when survey completion adds value via an outside agent. In a study by Bruggen et al. (2011), intrinsic factors including interest, enjoyment, curiosity, helping, and giving an opinion contributed more to response rates than extrinsic factors such as incentives, obligation, and need for recognition. Similarly, Ellison et al. (2017) found that respondents who stayed in a longitudinal travel survey in Sydney, Australia are more likely to be intrinsically motivated than financially motivated (driven by the monetary reward). These findings suggest that enhancing elements of the survey that would heighten the intrinsic motivations of respondents may result in higher response rates.

With the growing popularity of smartphones and GPS devices in collecting data, it is also essential to understand how these motivations change with the use of these new technologies. Technology Acceptance Model (TAM) is a theoretical concept that describes the factors that influence the acceptance and adoption of a new technology. It often includes constructs such as ease of use (Davis, 1989), privacy (Lemay et al., 2017), and facilitating conditions (Venkatesh et al., 2012). In a travel survey context, Assemi et al. (2018) incorporated technology adoption constructs in assessing attitudes and perceptions towards smartphone-based travel surveys. Their study found that ease of use and the usefulness of the smartphone app facilitated respondents' intention to participate in a similar survey but did not find privacy to be a hindrance in willingness to participate in future surveys. Their study explored the condition by which mobile technology can serve as a booster or constraint in improving motivation to participate. The introduction of mobile technologies in a travel survey context could be a novelty that individuals may be curious about, appealing to the intrinsic motivation to participate. At the same time, however, the heightened privacy risks that mobile-based survey pose can be of equal concern for their impact on motivation to participate.

### **3. Methodology**

#### **3.1. The Survey**

The survey comprised three parts. First, participants provided their characteristics including gender, age, country of residence, nationality, employment, marital status, household income, Internet and social media usage. Second, they were asked to indicate how likely they would be to take part in a travel survey conducted by a reputable research firm for eight potential survey approaches:

- i) Filling out a paper diary on every place they went for a 24-hour period.
- ii) Filling out an online diary on every place they went for a 24-hour period.
- iii) A face-to-face home interview covering every place they went for a 24-hour period.
- iv) Downloading an app on their smartphone that records location every few seconds and uploads the data each night, for one week.
- v) Carrying a small personal GPS unit that records location every few seconds over a week and uploads the data at the end of the week.
- vi) Allowing the location of their mobile/cell phone to be provided to the telephone company over a period of several weeks providing an understanding of individual travel behaviour.
- vii) Allowing the location of their mobile/cell phone to be combined with the data of many other respondents over a period of several weeks, providing a broad understanding of travel activity in an area.
- viii) Wearing a 'life-logging' camera that takes time-stamped photos of locations every few minutes for one week that uploads at the end of the survey.

Selectable options for respondents on a 5-point scale were: (1) I would definitely agree to do this, (2) I would probably agree to do this, (3) I would probably not agree to do this, (4) I would definitely not agree to do this, (5) I'm really not sure whether I would do this. Respondents who stated they would definitely or probably agree to downloading an app and/or carrying a GPS unit were asked the maximum number of days that they would be willing to do this for. Respondent who were unsure/not agreeable to participate in any of the eight survey methods were asked the main reason(s) why by selecting from a list of potential options as well as providing verbatim comments.

The survey was conducted online by Ipsos, an internationally-renowned market and social research firm over 2 weeks in September 2014. In total, 17,510 complete responses were obtained across 24 countries: Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Great Britain, Hungary, India, Italy, Japan, Mexico, Poland, Romania, Russia, Saudi Arabia, South Africa, South Korea, Spain, Sweden, Turkey and the United States. Targeted respondents were adults aged 18-64 in the US and Canada, and aged 16-64 in all other countries.

### 3.2 Data for Empirical Analysis

This paper uses a subset of these data from Australia, USA, France, Germany, and Japan. These countries were selected because they all have long-standing national travel surveys, apart from Australia which has major metropolitan surveys that cover around 90% of the Australian population. Summary information about these countries and the main national household travel survey method are provided in Table 1. Evidently, there are significant differences in the data collection methods used with France and parts of Australia maintaining a face-to-face component, the USA reliant on telephone interviews, Germany employing a mixture of self-completion and telephone interviews, and Japan relying on a more traditional mailout/mail back approach. While various trials of technological solutions have and will continue to be run, only France has added a GPS component to their face-to-face interviews national survey as has Perth in Australia.

Table 1: Country-level and travel survey methods differences

Variable	Australia	USA	France	Germany	Japan
Population <sup>a</sup>	24,772,247	326,766,748	65,223,271	82,293,457	127,185,332
Population density (persons/km <sup>2</sup> ) <sup>a</sup>	3	36	119	236	349
Urban population <sup>a</sup>	89%	83%	80%	76%	94%
GDP (in millions of \$US) <sup>b</sup>	1,204,616	18,624,475	2,465,454	3,477,796	4,949,273
Survey type <sup>c</sup>	Major metropolitan regions	National	National	National	National
Data Collection Method <sup>c, d</sup>	CAPI (Sydney); Self-completion diary/questionnaire delivered/picked up (most other regions); Face-to-face interview with GPS sample (Perth)	CATI	Face-to-face interview with GPS sample	CAWI and CATI	Mail out/ Mail back (2010)

- a. Worldometers. (2018). Countries in the world by population. Retrieved from <http://www.worldometers.info/world-population/population-by-country/>
- b. World Bank. (2016). Gross domestic product 2016. Retrieved from <http://databank.worldbank.org/data/download/GDP.pdf>
- c. Shen, L., Fields, S., Stopher, P., and Zhang, Y. (2016). *The future direction of household travel survey methods in Australia*. Australasian Transport Research Forum 2016 Proceedings. Melbourne, Australia.
- d. Note: CAWI and CATI is an abbreviation for computer-assisted web interview and computer-assisted telephone interview, respectively

Table 2 provides socio-demographics of the sample, weighted to Census data that were available at the time of the survey. Rim/raking weighting was employed across age, gender and region for all countries with additional weightings for education and income for most countries. Overall each country carrying the same relative weight to permit a cross-national comparison that was not influenced by the population size itself. It is acknowledged that because the sample were recruited from an online panel, they may not be fully representative of the overall

population, particularly around the use of Internet. However, it is interesting to note that while Internet usage per se is similar across the five countries, there are clear differences in social networking activity, which could underlie cultural differences and/or concerns over personal privacy (Minton et al. 2012).

Table 2. Summary of respondent characteristics (in %)

<b>Variable</b>	<b>Australia</b>	<b>France</b>	<b>Germany</b>	<b>Japan</b>	<b>USA</b>
<i>Age</i>					
16-34 years old	39.5	36.9	34.1	33.7	36.5
35-49 years old	30.1	30	28.8	36	28.5
50-64 years old	30.4	33.1	37.1	30.3	35.1
<i>Gender</i>					
Male	49.6	49.4	50.7	50.2	49.5
Female	50.4	50.6	49.3	49.8	50.5
<i>Chief Income Earner</i>					
Yes	56.7	58.7	67.3	42	54
No	43.3	41.3	32.7	58	46
<i>Marital status</i>					
Married/ Domestic Partnership	60	56.6	54.6	53.4	63.2
Single/ Divorced/ Widowed	40	43.4	45.4	46.6	36.8
<i>Employment</i>					
Employed (full- and part-time)	62	62.7	68.5	64.6	63.5
Student	11.2	10.7	11.3	8.2	5.9
Unemployed/retired	25.2	25.9	17.6	23.5	29.5
Prefer not to answer	1.5	0.6	2.6	3.7	1.1
<i>Internet Usage</i>					
Daily	94.7	94.2	96.7	91.1	95.9
<i>Social Networking Usage</i>					
Daily	62.9	52.7	47.3	29.7	62.7
Weekly	15.2	13.9	16.7	10.5	12.2
Monthly	8.1	8.2	10	8.1	7.7
Never	13.8	25.2	26	51.7	17.4
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

## 4. Results

This section presents the empirical results using both descriptive and modelling analyses of the data described in section 3 above.

### 4.1. Descriptive Summary

#### 4.1.1. Cross-National Differences

Figure 1 contrasts the willingness to participate (WtP) across all 24 countries surveyed - note, this is taken as respondents who indicated they would definitely or probably agree to participate. For the purposes of presentation, we took the average of the respondent's likelihood to participate across the eight survey methods, what we coin a 'pseudo-WtP'. Evidently, there are marked differences by country with the highest pseudo-WtP in India (59%), Turkey (47%), Saudi Arabia and South Africa (46%), and China (44%) and the lowest in Japan (14%), Germany (23%), France (26%), Belgium and South Korea (27%). Most countries were in the

30%-40% range. A One-way Analysis of Variance (ANOVA) test provided statistical confirmation of the pseudo-WtP variation across countries ( $F=39.811$ ,  $p\text{-value}=0.000$ ).



Figure 1: Indication of Willingness to Participate in a Travel Survey

Note: 1 = <25%; 2 = 25%-30%; 3 = 30%-35%; 4 = 35%-40%; 5 = 40%-45%; 6 = >45%. 0 = no data

#### 4.1.2. Differences in Survey Methods

In terms of the survey methods, over all countries the online diary was the most popular with a WtP of 44% (Figure 2). This may have reflected the Internet-based method of recruitment, but it is interesting that (arguably) the most traditional method of the eight, the paper diary, was a close second with 42% of participants indicating a WtP. Around 38% indicated they would be willing to carry a small, personal GPS device for one week and this was the most popular choice in one country, Mexico (43%). Around 35% indicated they would allow their mobile/cell data to be collected over several weeks and used either for understanding their own travel or combined with others to give a broad understanding of travel – interestingly, this latter option was the most popular method in Saudi Arabia (53%). Around one-third of participants were willing to conduct a face-to-face interview with a similar proportion willing to download an app onto their own smartphone for one week. The least popular approach overall was the wearing of a small ‘life-logging’ camera for one week with the purpose of taking photos of exact locations every few minutes.

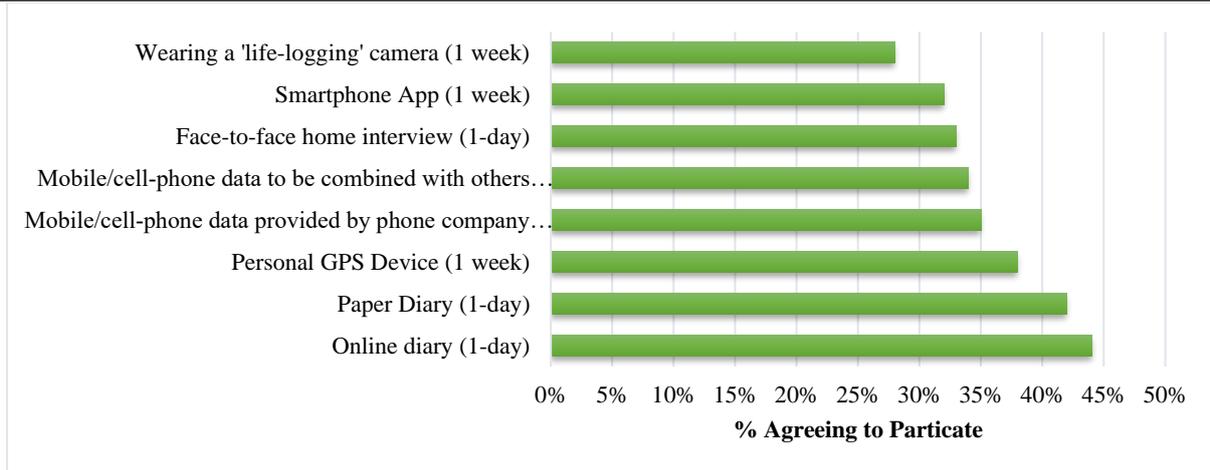


Figure 2: Willingness to Participate by Survey Method (All Countries)

#### 4.1.3. Country/Survey Method Differences

The five countries selected for closer analysis, reveal a similar pattern to that depicted in the aggregate (Figure 3). Australia has the highest WtP across all eight survey methods, closely followed by the USA with Japan consistently having the lowest WtP across all eight survey methods. Again, it appears these participants prefer the online and paper diary approaches the most and the camera the least. It is perhaps poignant that even for the most popular methods, most participants indicate an unwillingness to participate.

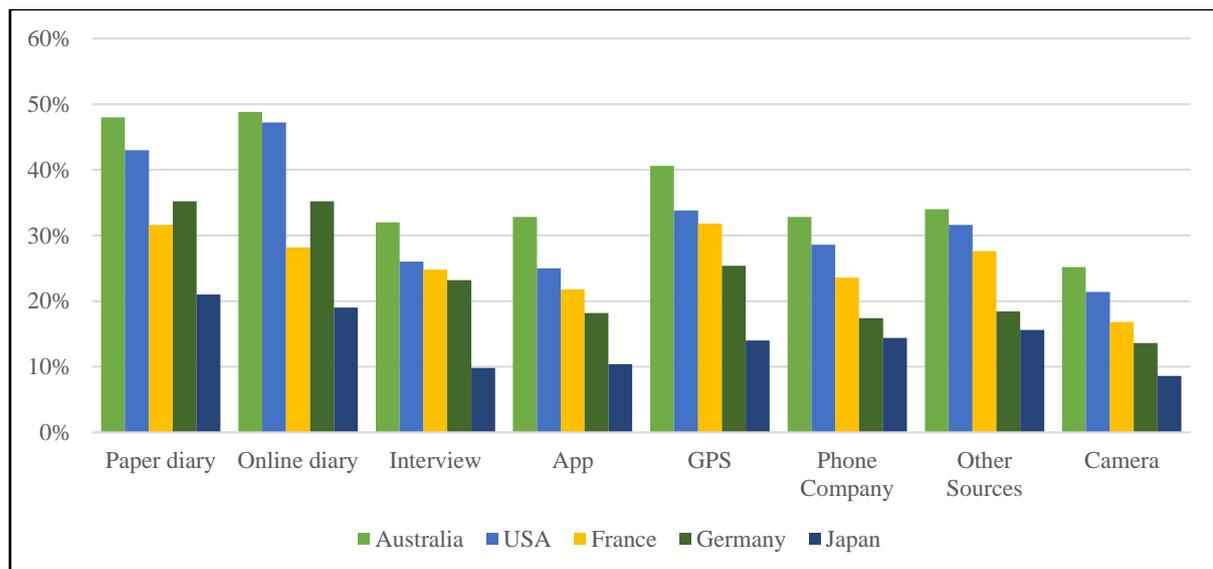


Figure 3: Willingness to Participate by Survey Method (Selected Countries)

## 4.2. Binomial Logistic Regression Analysis

The descriptive analysis presented above indicates that the WtP in travel surveys varies substantially both across countries and survey methods. However, this analysis fails to control for the influence/importance of individual and cross-national factors. We deduced a binary dependent variable from a 5-point Likert scale by counting “I would definitely / would probably agree to do this” as a yes (coded as 1) and “I would definitely not/ would probably not agree to do this” as a no (coded as 0). Respondents who were unsure about their participation decision were excluded from the analysis. The regression model can be written as follows:

$$\text{Logit (yes to a survey request)} = \log(p/(1-p)) = \beta_0 + \beta_1 * \text{Age} + \beta_2 * \text{Gender} + \beta_3 * \text{Chief earner} + \beta_4 * \text{Marital Status} + \beta_5 * \text{Employment} + \beta_6 * \text{Social Media Usage} + \beta_7 * \text{Country}$$

As with many other discrete choice models, coefficients of logistic regression models do not have a particular meaning, and hence we report the odds ratio to assist interpretation (expressed in the formula below):

$$\text{Odds ratio} = \text{Probability (yes to a survey request)} / \text{Probability (no to a survey request)}$$

In SPSS 24, the odds ratio is automatically derived as the exponent of the coefficient  $\beta$ .

Explanatory variables include socio-demographic characteristics of respondents and country. Coding for each variable is described in Table 3. It also shows the percentage of respondents in each socio-demographic category that was included in the model. Note that the category assigned to the highest number serves as the reference category.

Table 3: Coding of variables and descriptive statistics

Variable	Description	% of respondents
Dependent variable (Willingness to participate)	1 = Yes 0 = No	35.8% (Paper), 35.6% (Online), 23.1% (Interview), 21.7% (App), 29.1% (GPS)
Age	1 = 16-34 years old	36.1%
	2 = 35-49 years old	30.7%
	3 = 50-64 years old (Ref)	33.2%
Gender	1 = Female	50.1%
	2 = Male (Ref)	49.9%
Chief Income Earner	1 = Yes	55.7%
	2 = No (Ref)	44.3%
Marital status	1 = Married/in a partnership	57.5%
	2 = Not in relationship (Ref)	42.5%
Employment	1 = Employed	64.3%
	2 = Student	9.5%
	3 = Retired/ Unemployed (Ref)	25.2%
Social Media Usage	1 = Daily	51.1%
	2 = Weekly	13.7%
	3 = Monthly	8.4%
	4 = Never (Ref)	26.8%
Country	6 = Australia	20%
	7 = Germany	20%
	11 = Japan	20%
	22 = USA	20%
	24 = France (Ref)	20%

Table 4 summarises the odds ratio for the WtP from the binomial logistic regression model. In terms of age, the results suggest that in general younger respondents (aged 16-34 years old) are more likely to participate than older respondents (50-64 years old) for the paper, online and app-based methods. For instance, the first cell in Table 4 (1.592) indicates that the odds for

those 16– 34 years old to participate in a paper survey is 59.2% higher than the odds for those 50-64 years old (the reference group). Females appear to prefer a paper or online survey method to males while the opposite is true for GPS and app-based methods, with no significant difference for the interview method. Respondents who are either married or in a relationship indicate a stronger preference for traditional surveys (paper, online, and interview) with no statistically significant difference for the GPS or app-based surveys. Chief income earners and those making more use of social media appear generally more likely to indicate a preference for completing a travel survey, irrespective of the method employed. Although not statistically significant, employed respondents prefer app-based survey methods than un-employed or retired respondents – an opposite effect than the other survey methods.

Table 4: Odds Ratio Results of Willingness to participate by survey method

	Paper	Online	Interview	App	GPS
	Odds (95% Confidence Interval)				
<i>Age</i>					
16-34 years old	1.592*** (1.335-1.898)	1.622*** (1.356-1.939)	1.129 (0.931-1.369)	1.829*** (1.497-2.236)	1.151 (0.960-1.381)
35-49 years old	1.118 (0.949-1.318)	1.197** (1.013-1.414)	1.043 (0.870-1.251)	1.376** (1.133-1.671)	1.177* (0.993-1.395)
50-64 years old	Ref				
<i>Gender</i>					
Female	1.620*** (1.409-1.862)	1.334*** (1.158-1.536)	0.951 (0.816-1.108)	0.812** (0.693-0.950)	0.869* (0.754-1.003)
Male	Ref				
<i>Chief income earner</i>					
Breadwinner=Yes	1.394*** (1.196-1.624)	1.544*** (1.322-1.802)	1.542*** (1.302-1.827)	1.418*** (1.193-1.686)	1.338*** (1.144-1.565)
Breadwinner=No	Ref				
<i>Marital status</i>					
Married/ Domestic Partnership	1.235** (1.073-1.420)	1.288*** (1.118-1.484)	1.208** (1.036-1.410)	1.100 (0.940-1.287)	1.114 (0.965-1.286)
Otherwise	Ref				
<i>Employment status</i>					
Employed	0.906 (0.770-1.065)	0.979 (0.830-1.155)	0.884 (0.739-1.058)	1.081 (0.892-1.310)	0.966 (0.817-1.143)
Student	0.890 (0.678-1.168)	1.111 (0.845-1.461)	0.979 (0.722-1.328)	1.134 (0.841-1.531)	0.845 (0.635-1.124)
Unemployed or retired	Ref				
<i>Social Media Usage</i>					
Daily	1.249** (1.055-1.480)	1.414*** (1.190-1.681)	1.515*** (1.246-1.841)	1.638*** (1.335-2.009)	1.555*** (1.298-1.861)
Weekly	1.312** (1.057-1.629)	1.631*** (1.311-2.027)	1.498** (1.177-1.906)	1.424** (1.102-1.838)	1.775*** (1.418-2.222)
Monthly	1.007 (0.779-1.302)	1.084 (0.833-1.411)	1.243 (0.931-1.658)	1.105 (0.808-1.510)	1.249 (0.955-1.633)
Never	Ref				
<i>Country</i>					
Australia	2.009*** (1.651-2.446)	2.496*** (2.041-3.052)	1.440** (1.172-1.770)	1.785*** (1.444-2.205)	1.478*** (1.216-1.795)
Germany	1.155 (0.946-1.410)	1.348** (1.101-1.650)	0.897 (0.723-1.112)	0.824 (0.655-1.037)	0.749** (0.610-0.919)
Japan	0.658*** (0.529-0.819)	0.705** (0.563-0.883)	0.388*** (0.298-0.505)	0.515*** (0.395-0.672)	0.419*** (0.331-0.529)
USA	1.687*** (1.385-2.055)	2.379*** (1.948-2.907)	1.074 (0.869-1.327)	1.255** (1.009-1.562)	1.134 (0.931-1.381)
France	Ref				
Cox and Snell R-square	0.067	0.090	0.052	0.065	0.060
$\chi^2/df$	293.666/14	395.581/14	224.514/14	280.721/14	246.608/14

\*\*\*Significant at 1%, \*\*Significant at 5%

$$\text{Odds ratio} = \frac{P_{\text{Participate (Target)}}}{P_{\text{Non-participate (Ref)}}$$

In terms of cross-national differences, the results largely re-confirm the descriptive analysis with the additional insight that there are significant issues remaining after controlling for the measured socio-demographics. Taking France as the reference, Australia and the USA have a significantly higher WtP across all five survey methods. This is most pronounced for the online and paper methods and less so for the other methods. Germans are significantly more WtP in paper/online surveys, but significantly less likely to participate in GPS-based surveys than their French counterparts. The Japanese are less likely to participate than the French across all survey methods. All five models with predictors (for each survey method) are better than an intercept-only model with the general model being significant at the 99% level of confidence using a Chi-squared test.

### 4.3. Reasons for non-participation

It is also insightful to examine the reasons why people might choose not to participate in surveys (Bruggen et al., 2011). Figure 4 summarises the reasons selected by respondents for non-participation – note, they could select more than one reason and the data shown are for the five selected countries. Evidently, there is a trade-off between perceived effort and privacy. For example, respondents who declined to participate in paper and online surveys did so because these methods sound too time-consuming, but this does not seem to be an issue for mobile-based technologies. In contrast, privacy concerns weigh more for respondents who declined to participate in survey methods that use real-time location tracking. In the case of a face-to-face interview, respondents who refused participation are wary of having a stranger interview them at their home.



Figure 4: Reasons for non-participation in each survey method



willingness to participate (France, Germany, and Japan) ranked higher in the Hofstede's uncertainty avoidance index, while Australia and US who have lower aversion towards uncertainty have higher willingness to participate.

It is also critical to understand the barriers to participation. Evidently there is trade-off between the required effort and privacy concerns in a respondent's participation decision using a specific method. Conventional methods tend to require more effort but because the respondents can control what they log in the diary, they feel in control of the data that they share. Conversely, respondents may perceive technology-based surveys to require less effort but some find it to be more intimidating due to privacy concerns. Specifically, location tracking may be deemed a 'big brother' activity – an invasion of privacy by the government. Such a result is in contrast with the findings by Assemi et al. (2018) in Queensland, Australia stating that the perceived risk or privacy is not a significant determinant of intention to participate in smartphone travel surveys.

## **6. Conclusions**

This paper explores if/how the preferences for various types of travel survey approaches varies across socio-demographics and countries. Drawing from a unique survey of over 17,000 participants from 24 countries, the first insight to be drawn is that survey non-response appears likely to remain a major issue with more than half of participants indicating an unwillingness to complete a survey irrespective of method. However, evidently the method is highly significant in influencing levels of response, with overall a preference for diary-based methods, whether they be online or traditional paper-based. New technological approaches may offer promise in terms of convenience, less response burden, and greater data accuracy, but continue to be undermined by concerns over privacy. Results suggest significant demographic differences with younger respondents and those making heavy use of social media indicating a greater willingness to participate in travel surveys regardless of the method, while females are more likely to prefer diary-based methods than mobile-based methods. Intriguingly, there is also a suggestion that willingness to participate in travel surveys per se varies markedly by country (after controlling for demographics) ranging from as low as 14% in Japan to 59% in India, with most nations in the 30% - 40% range. We can only speculate as to the reasons why, but evidently there may be genuine cultural issues at play here around willingness to divulge one's (travel) behaviour.

As with any study of this nature, there are cautionary notes on interpretation. First, this was an Internet-based convenience sample, which despite increasing ubiquity excludes certain population segments and varies markedly by country. This may have also influenced the apparent popularity of online survey methods, although it is notable that the traditional paper methods were just as popular. Second, while every effort was made to translate questions precisely, we cannot guarantee they were interpreted the same across countries. Third, stated willingness to participate provides no assurance that this would be converted into actuality. Lastly, the survey was limited in the extent to which the actual burden faced by respondents could be described, hence as much as the willingness to participate might be based on effort or burden, is actually based on perceived effort and burden which may differ from what they might feel in a properly and detailed explanation as would be the case in a real Household Travel Survey.

Nonetheless, the results suggest that that there is no 'one size fits all' methodology for travel surveys, with designers needing to carefully consider both socio-demographic and cultural differences.

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