Travel Behavior in the United States Amidst COVID-19

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Introduction

As of 2017, the travel and tourism sector provided 7.8 million jobs and $1.62 trillion in output in the United States, or 2.8% of the country's GDP (NTTO, 2018). Travel disruptions such as natural disasters, terrorism, and health and safety crises profoundly impact tourism (Ghaderi and Henderson et al., 2013, Samitas et al., 2018). To curb the spread of COVID-19, lockdown (stay-at-home orders) and travel restrictions were implemented worldwide and in about 42 states in the United States since mid-March 2020 (CDC, 2020). These measures had enormous economic impacts, especially in the travel and tourism industry. The cumulative loss in the U.S. travel economy since March 2020 exceeds $500 billion ($1.75 billion daily losses over nine and a half months), resulting in a $64.4 billion loss in tax revenue at the federal, state, and local levels (U.S. Travel Association, 2020).

The study of health risk perceptions and behavior of individuals regarding travel is important from an economic standpoint but also for public health reasons as travel poses a threat for the spreading of infectious disease. Gössling et al. (2020) state that, about COVID-19, there is a need to "understand the behavioral demand responses of tourists in the short- and longer-term". Moreover, different types of travelers (e.g., business vs. leisure) perceive and assume health risks differently (Aro et al., 2009). In this work, we examine the factors that influence people's decision to cancel/postpone recreational travel within the United States amidst COVID-19. Our conceptual framework extends the Expected Utility Model, where individuals weigh the utility derived from traveling with the disutility of being infected to incorporate subjective norms and perceived behavioral control from the Theory of Planned Behavior (TPB) (Huang et al., 2020). Subjective norms are the perception of other people's approval of a particular behavior (Ajen, 1991), while perceived behavioral control refers to the perception of the capacity to perform the behavior (Bish et al., 2000). We hypothesize that, in addition to the risk perception of contracting COVID-19 while traveling, the decision to engage in recreational travel depends on subjective norms as well as perceived behavioral control. Our analysis tests the relative strength of these predictors.

Literature Review

Several studies have documented the impact of COVID-19 on the tourism industry (Kaushal and Srivastava, 2020, Yeh, 2020, Gössling et al., 2020, Hoque et al., 2020, Higgins-Desbiolles, 2020). Kaushal and Srivastava (2020) examined the challenges facing tourism and hospitality amidst the pandemic and the lessons the tourism industry can learn from COVID-19 conditions. Gössling et al. (2020) examined whether COVID-19 was an "unknowable risk" and assessed the reported impacts of COVID-19 on global tourism. Bae and Chang, 2020 used the Health Belief Model (HBM) and an extended Theory of Planned Behavior (eTPB) to examine the impact of risk perception of COVID-19 on behavioral intention towards 'untact' tourism.

In economics, the workhorse of decision-making under uncertainty is Expected Utility Theory (EUT), a rational choice model that postulates that rational agents choose the action with the highest expected utility. It is computed as a weighted average of the utilities of each possible outcome, where the weights are the outcomes' probabilities (Kahneman and Tversky, 1979; Shoemaker, 1982; Starmer, 2000; Harrison and Rutström, 2009). EUT, however, makes faulty predictions about people's decisions in many situations, not least because in many instances' decisions are influenced by other people relevant in one's life, such as family, friends, and by the perceived ability to perform the action (or perceived behavioral control).

The TPB incorporates attitudes, subjective norms, and perceived behavioral control to evaluate intentions to perform a behavior (Ajzen, 1991). Attitudes can be measured by aggregating the product of belief concerning an outcome and the value of the outcomes. Subjective norms are a product of normative beliefs and motivation to comply with relevant others, while perceived behavioral control is perceived personal capability over carrying out the behavior.

Many studies in tourism, leisure, and hospitality management research rely on the TPB, particularly to analyze consumer behavior (Joo et al., 2020, Petrescu and Bran, 2020, Ulker-Demirel and Giftci, 2020, Meng et al., 2020, Huang et al., 2020). However, we are aware of no empirical studies that contrast and combine EUT with TPB in this context. Borges et al., 2015 used TPB to extend EUT to explain farmers' decision to adopt innovations. Ours is the first study extending EUT with TPB to explain behavioral change towards travel decisions in the midst of the COVID-19 pandemic.

Methodology

Data

We collected primary data through an online survey designed to gather information on the impact of COVID-19 on travel sentiment and behavior of a representative sample of U.S. residents and administered by Qualtrics. Data collection was in two waves: wave 1, from June 23 to July 1, 2020 (about 3 months after the first state in the U.S. declared a mandatory stay-at-home order), with 541 respondents; and wave 2, from October 1 to October 15, 2020, with 913 respondents. Data collection at different time periods during the pandemic allows us to examine travelers' behavioral changes as the severity of the pandemic measured by the total numbers of confirmed cases varies over space and time and as people developed coping strategies over time.

To measure *behavioral change*, one question on the survey asked: "For 2020, did you cancel or postpone any recreation or leisure overnight trips throughout the U.S. after learning about the COVID-19 threat?" with answers "Yes-cancel", "Yes-Postpone", "No". Other questions on the survey gathered *socio-economic information* (such as age, marital status, employment); *risk perceptions* ("What is the probability that traveling within the U.S. in the next six months will lead you to: 1. Be around others with COVID-19, 2. Contract COVID-19, 3. Be hospitalized with COVID-19?", with responses on the scale of not probable, somewhat improbable, neutral, somewhat probable, and very probable); *subjective norms* (level of agreement in a 5-point Likert scale with the following statements: 1. Most people who are important to me think I should travel within the U.S. in the near future, 2. The people in my life whose opinions I value would approve of me traveling within the U.S. in the near future. 3. Most people who are important to me would travel within the U.S. in the near future); *perceived behavioral control* (level of agreement with the 5-point Likert scale with the following statements: 1. "It is easy for me to travel within the U.S. in the near future" 2. "Whether or not I travel within the U.S. in the near future is completely up to me" 3. "If I wanted to, I could travel throughout the U.S. in the near future". 4. "I have complete control over traveling throughout the U.S. in the near future" 5. "It is possible for me to travel throughout the U.S. in the near future". *Transmitting to others* ("in your decision to cancel or postpone your US overnight recreation or leisure trips, which factors played a role"? concern of inadvertently transmitting COVID-19 to people at the destination or to relatives and friends upon my return. *Health Risk* ("in your opinion, how serious do you think the health risks of COVID-19 are to you? *Financial Risk* ("in your opinion, how serious do you think the financial risks of COVID-19 are to you? With responses on a 5-point Likert scale, not at all serious, slightly serious, moderately serious, very serious, extremely serious. The responses were recoded into two categories of "not serious" and "serious".

Questions construct for each of the key variables of interest correlate with each other; one way to tackle the correlation while retaining as much information as possible is by converting the data into an index. The common method in statistics to do the decorrelation is principal component analysis (PCA), and PCA reduces the dimensionality of the data (Jolliffe and Cadima, 2016). Therefore, we used PCA for the question construct of risk perception, subjective norms, and perceived behavioral control.

Methods

In our application of EUT, there are two states C = {C_1 = get COVID-19, C_2 = not get COVID-19} and two actions T = {t_1 = yes, travel, t_2 = no, do not travel/postpone}, where the subjective probability of a state is contingent on the decision to travel $P\left(C_j \middle| t_k\right)$. We assume that $P(C_2|t_2) > P(C_2|t_1) > P(C_1|t_1) > P(C_1|t_2)$, i.e., the probability of not getting COVID is larger if the individual does not travel. It is perceived to be larger than the probability of getting COVID even if the individual chooses to travel.

Total utility is assumed to be additive and to depend on $U\left(C_j\right)$, the utility of state j, and $U(t_k)$, the utility derived from travel so that $U\left(C_j, t_k\right) = U\left(C_j\right) + U(\ t_k)$. The expected utility can be written as

$$E[U|t_k] = \sum_{j=1}^{2} P\left(C_j \middle| t_k\right) U(C_j, t_k), \tag{1}$$

where action k = 1: travel, 2: don't travel/postpone and state j = 1 (get COVID-19), 2 – not get COVID-19. That is:

$$E[U|t_1] = \sum_{j=1}^{2} P(C_j\ |t_1) U\left(C_j,\ t_1\right) \tag{2}$$

$$E[U|t_2] = \sum_{j=1}^{2} P(C_j\ |t_2) U\left(C_j,\ t_2\right) \tag{3}$$

We note that the sign of $E[U|t_1]$ and $E[U|t_2]$ in equations (2) and (3) is ambiguous, as it depends on the relative magnitudes of the utility of traveling versus nontraveling, on the impacts that getting sick or not has on the general utility, and on the subjective probability of getting COVID-19 or not while traveling.

We extend the EUT model by adding two additional variables: *subjective norms* ($U_{others}(t_k)$), and *perceived behavioral control* (PBC) from TPB, where $U(t_1)$ is a function of PBC, that is, an individual utility derived from travel is also dependent on their PBC, i.e., $U(t_1|PBC)$. With this extension, equations (2) and (3) become.

$$E[U|t_1] = \sum_{j=1}^{2} P(C_j\ |t_1)(U\left(C_j\right) + U(\ t_1|PBC) +\ U_{others}(t_1))\ ) \tag{4}$$

$$E[U|t_2] = \sum_{j=1}^{2} P(C_j\ |t_2)(U\left(C_j\right) + U(\ t_2) +\ U_{others}(t_2))) \tag{5}$$

In equations 4 and 5, *subjective norms* can be positive or negative depending on whether the approval/disapproval reinforces or contradicts the individual's decision to travel or not.

Moreover, the effect that the "utility" of others has on an individual's decision to travel, $U_{others}(t_k)$, could be further decomposed into two parts: the first component is the approval/disapproval of friends and family of the travel behavior itself $U_f(t_k)$ while the second component is the negative externality that traveling might have on others, i.e., in terms of infecting others and increasing community transmission, $U_{infectothers}(t_k)$.

$$E[U|t_1] = \sum_{j=1}^{2} P(C_j\,|t_1)(U(C_j) + U(\,t_1|PBC) + U_f(t_1) + \ U_{infectothers}(t_1))\,) \tag{6}$$

$$E[U|t_2] = \sum_{j=1}^{2} P(C_j\,|t_2)(U(C_j) + U(\,t_2) + \ U_f(t_2) + \ U_{infectothers}(t_2))) \tag{7}$$

For the empirical application, we assume, as it is common in the literature, that the decision to travel can be modeled by a sigmoid function, e.g., a logistic function (Harrison and Rutström, 2009, Chakravaty and Roy, 2009). Thus, we estimated a binary logistic regression model:

$$T_{ird} = \frac{exp(Z_{ird})}{1+exp(Z_{ird})} + \varepsilon_{ird}, \tag{8}$$

where T_{ird} is the probability of canceling or postponing travel for individual *i* in region *r* on survey date *d*. 1 is assigned to individuals who canceled or postponed and 0 otherwise. Z_{ird} is a linear combination of potential determinants of travel: $Z_{ird} = \alpha + \gamma RP_{ird} + \delta SN_{ird} + \upsilon PBC_{ird} + \theta X_{ird} + \eta_r + \eta_{dy}$, where RP_{ird} measures individual risk perceptions. SN_{ird} is the subjective norm and PBC_{ird} is the perceived behavioral control. X_{ird} is a vector of socio-economic variables (age, gender, education, income, race, marital status, having children, employment status). η_r denotes region fixed-effects, and η_{dy} are day-of-week dummies.

Results

The results from the logistic regression displayed in Table 1 is for the baseline model (equations 2 and 3) derived from a EUT framework, where the decision to travel is based on the perceived probabilities of contracting COVID-19, and the extended model (equations 4 and 5), which in addition includes subjective norms and perceived behavioral control components. While equations 6 and 7 were not included in the regression because the variable *Transmitting to others* is perfectly correlated with the outcome variable (*travel decision*). Therefore, a cross-tabulation explaining additional variable in equations 6 and 7 are shown in Table 2. Table 1 presents the results for wave 1 and wave 2 data separately. The regression coefficients represent the marginal effect of the variables of interest. That is the marginal effect of the risk perception, subjective norms, and perceived behavioral control on the decision to cancel/postpone recreation travel.

The results are presented in six columns where columns 1 and 2 are the estimates from the baseline and the extended model for wave 1 data, and columns 4 and 5 show the parameters estimates of wave 2 data for the baseline and the extended model. Columns 3 and 6 present a robustness check of our estimation, where the risk perception variable is replaced with a different category of risk perception, i.e., health and financial risks. For wave 1, the baseline model estimate for risk perception is 0.0586, which is statistically significant at 1%. This indicates that an additional increase in respondents' risk perception of getting COVID-19 leads to a 5.86% probability to cancel/postpone overnight trips within the U.S.. Column 2 shows the estimates of the extended EUT model; it is only risk perception that is statistically significant at 1%, with interpretation similar to column 1 explanation, however with a coefficient of 0.0606, which is not far from 0.0586, and there is no statistically difference between the two. The results from column 2 show that regarding COVID-19, risk perception plays a significant role in canceling/postpone recreation trips. At the same time, subjective norms and perceived behavioral control do not affect the reasons for canceling trips in June and July 2020. The AIC and BIC from both columns 1 and 2 show that the extended model is preferred because the BIC and AIC numbers are lower for the extended model.

For wave 2, Column 3 shows the risk perception is significant at 1%; this reveals that an increase in risk perception will bring about a 2.42% increase in probability to cancel/postpone recreation trips among U.S. travelers. These results demonstrated that individual probability of canceling/postponing recreation travel given their risk perception of getting COVID-10 decreases in wave 2. It implies that even though the pandemic is still ongoing, people are more willing to take recreational travel in October 2020 compare to June-July 2020. Column 4 shows that both risk perception and subjective norms are statistically significant at 1%. This indicates that as risk perception increases, the probability of canceling/postponing recreation trip increase by 2.88%.

The coefficient estimates of subjective norms indicate that as rates individuals agree with important others approve of them not to go for recreational travel increases, their probability of canceling/postponing recreation trips increases by 2.73%. This result illustrates that in the thick of the pandemics when there is not so much information about COVID-19, the traveler's decision to cancel or postpone recreation trips (in June-July 2020) is based on risk perception. While details about COVID-19 increase, both risk perception and subjective norms influence people's decisions for recreation trips (in October 2020). The AIC and BIC are lower for the extended model in wave 2, suggesting the extended EUT model has been preferred.

In our extended model, we further decomposed the subjective norms into two variables, i.e., the relevant others' perception and the negative eternality of traveling on others (base on equations 6 and 7). The variable use to proxy for this is *Transmitting to others* variable. The cross-tabulation of the decision to cancel/postpone travel and the *Transmitting to others* is shown in table 2. It indicates for both wave 1 and wave 2, those concerned about transmitting COVID-19 decided to cancel their recreational travel.

Most of the regression result testing the empirical application of our theory shows that risk perception is a vital factor that led U.S. residents to cancel/postpone recreation trips due to COVID-19. This shows risk perception is dominating in each of the models. Therefore, we used a proxy variable for risk perception in another regression model. The proxy variable is "health risk" and "financial risk". The regression results for the proxy variable are displayed in columns 3 and 6 of table 1. In wave 1 and wave 2, the health risk coefficient is significant at 1% and 5% level while the financial risk is not significant; this implies that health risk is greater in people's decision to cancel/postpone recreation trips amidst COVID-19.

In general, the proposed extended EUT model performs better than the baseline as proposed in our hypothesis. The proposed developed EUT model with TPB is used to explain travelers' behavior during COVID-19; however, it can be extended to other behavioral changes by specifying the states and actions.

Table 1. Logistic Regression Result of the Decision to cancel or postpone recreation overnight travels within the U.S.

Dependent variable: Travel Decision		Wave 1			Wave 2	
VARIABLES	Baseline Model (1)	Extended Model (2)	Robustness Check (3)	Baseline Model (4)	Extended Model (5)	Robustness Check (6)
Risk Perception	0.0586***	0.0606***		0.0242***	0.0288***	
	(0.0199)	(0.0204)		(0.00612)	(0.00501)	
Subjective Norms		0.00105	-0.00511		0.0273***	0.0258**
		(0.0176)	(0.0175)		(0.0100)	(0.0126)
Perceived Behavioral Control		0.0111	0.00821		-0.00307	-0.00207
		(0.0141)	(0.0143)		(0.00305)	(0.00229)
Health Risk			0.0635***			0.0948**
			(0.0164)			(0.0468)
Financial Risk			0.00503			-0.0256
			(0.0457)			(0.0342)
Demographic Variables	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Day-of-week	Yes	Yes	Yes	Yes	Yes	Yes
Observations	541	541	541	913	913	913
Log Likelihood	-290.44708	-290.08711	-296.45977	-486.98276	-484.60697	-485.09065
Pseudo-R-Squared	0.1773	0.1784	0.1603	0.1512	0.1553	0.1545
AIC	586.8942	586.1742	598.9195	979.9655	975.2139	976.1813
BIC	599.7744	599.0545	611.7998	994.4157	989.6642	990.6315

*** $p<0.01$, ** $p<0.05$, * $p<0.1$, Standard errors in parentheses.
The logistic regression outputs in the table are the marginal effect values.
Standard errors are clustered at the region level. All the models control for covariate such as demographic variables (age, income, education, marital status, gender, employment status, children, and race). Also, dummies for region and day-of-week are included, and this controls for the unobserved differences across regions and day of the week. Risk perception, subjective norms, and perceived behavioral control variables used in the analysis are the single indices calculated using principal component analysis of the group of questions that provide each variable.

Table 2. Cross-tabulation of transmits concern and travel decision.

concern of inadvertently transmitting COVID-19 to people	indicate whether the respondent cancel or postpone any recreation or leisure trip		
	1=No	1=Yes	Total
Wave 1			
no	347	96	443
yes	0	98	98
Total	347	194	541
Wave 2			
no	619	152	771
yes	0	142	142
Total	619	294	913

Conclusion and Discussion

Understanding what factors play a role in people's decisions to travel during a pandemic is essential to public health officials as well as to stakeholders in the travel and tourism industry in the United States and worldwide as we recover from COVID-19. Our analysis results show that risk perception is a significant factor influencing traveler's decisions in the US to cancel or postpone recreation trips in June-July 2020. However, by October 2020, where more information about COVID-19 is available, and COVID-19 fatigue has set in, and people have developed coping plans and strategy, travel risk perception to cancel recreation trips reduced and was also influenced by the subjective norms. Further investigation into the nature of the travel risks suggests that the health risk perception changed the traveler's decision rather than financial risk. This is consistent with Jonas et al. (2011) study results that health risk perception ranks high among other types of risk perception among tourists traveling to low-income countries.

Overall, the risk perception and subjective norms were found significant to influence traveler's decisions toward recreation travel during the COVID-19 pandemic, while perceived behavioral control is not found to be significant. This reveals that perceived behavioral control is irrelevant under travel decisions involving elevated risk, such as the COVID-19 pandemic.

This study result suggests that there is a possibility that other factors influence U.S. residents in canceling/postponing recreational trips aside from their risk perception and subjective norms. One of these factors includes the concern of transmitting COVID-19 to others which is illustrated in the survey results that individuals concern about transmitting COVID-19 canceled or postponed recreational trips in both wave 1 and wave 2. These results can help stakeholders in the tourism and travel industry in the United States and worldwide in the strategic planning on recovery from COVID-19. Specifically, by focusing on recovery strategies that will improve how individuals perceive their risk towards recreational travel, building strategy around tourist destination trust. One example of such actions can be promoting safety measures and precautions of COVID-19 at the hotel, tourist places, etc. Further study is needed to enumerate other potential factors that affect how U.S. residents behave in their recreation travel decision as we recover from the pandemic. This study contributes to decision-theoretic literature by extending expected utility theory and the emerging literature on COVID-19 by quantifying how individual risk perception, subjective norms, and perceived behavioral control affects their decision to travel.

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