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The Economic Impact of Vaccine Mandates on Traveling

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Abstract

This study will observe the impact that pandemic mandates have on tourism. I hypothesized the pandemic, as represented by covid cases and deaths, will have a negative effect on tourism. I also hypothesize that a quarantine mandate will have a negative impact on a country's tourism because of the inconvenience to travelers. The overall goal of this study is to measure the impact of the pandemic mandates and the tradeoff between the priority of safety and inconvenience to tourists. The hypothesis is tested using a fixed-effect panel regression including 77 countries from the years 2009-2020. The model found that tourists do value health & safety from the pandemic based on the negative impact of covid cases on tourism. In addition, it is found that tourists do not seem to blanche at having to follow pandemic mandates (quarantine).

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Introduction

The outbreak of the Covid-19 virus has impacted health, social, and economic sectors globally. The virus started in December 2019 in Wuhan, China where several patients were diagnosed with an unknown, pneumonia-like disease. The disease rapidly spread and on March 11, 2020 the World Health Organization declared a global pandemic (CDC). To contain the spread of the disease, countries implemented lockdowns, which demanded that people stay home and follow social-distance measures. The global lockdown lasted for many months and countries only lightened restrictions when cases started to decrease towards the end of 2020. However, spikes in cases and new variants led to reimplementing lockdowns, where restrictions varied depending on the number of cases. Covid-19 has devastated the world with over 250,000,000 current cases and over 5,000,000 deaths (John Hopkins). While the number of cases and deaths are decreasing, following the availability of a vaccine, Covid-19 infections are still recurring worldwide.

Covid-19 has had major consequences for the global economy. During lockdown periods, the pandemic caused economic contraction. Macroeconomic data from the World Bank clearly shows Covid-19's impact on the global economy. For example, GDP growth dropped by 6 % in 2020 as economies shrank and experienced negative growth. Other indicators such as a rise in unemployment rate, decreases in imports and exports, and increases in government debt show the economic duress. Many businesses have shut down during the pandemic due to the inability to withstand the drop in sales. These downward trends are also predicted to be long-lasting. The IMF hypothesizes that there will be "long economic hangovers of the pandemic" that could potentially persist for generations. Governments have enacted stimuli to encourage spending and

Central Banks have adopted low-interest-rate policies . The effects of the pandemic are not so simply reparable.

One industry greatly impacted by Covid-19 is travel. With lockdowns and travel restrictions in place for a majority of 2020 and 2021, travel has seen a significant decline. International tourist arrivals for the world decreased by 73% in 2020 (UNWTO). Governments set travel restrictions based on multiple factors, most notably number of current covid cases. A decrease in traveling can have major economic impacts. There are some countries that are reliant on tourism for employment and revenue for businesses and exports. For example, in the Caribbean, the total contribution of travel and tourism to GDP is estimated to be about 14%. If tourism declines it can have an even larger impact, as it did in 2020 where the drop in tourism lowered GDP by about $34 billion (WTTC). During the pandemic when travel was completely restricted, many people were out of work, and tourism-reliant businesses were no longer making profits. Because of the travel ban during the pandemic, countries experienced economic losses.

The introduction of the Covid-19 vaccine has allowed governments to start to lessen travel restrictions. There are currently three vaccines available in the US: Pfizer, Moderna, and J&J. According to the CDC, Covid-19 vaccines effectively reduce the risk of getting and spreading the virus and can also help those who do become infected from getting seriously ill. The vaccine has shown great success as a matter of public health (hospitalizations and deaths decreasing by 65%) and has allowed some countries to begin to open up and lessen restrictions gradually (Moghadas). At this time, 61% of the world is considered fully vaccinated, meaning they received both doses if needed (Holder). The vaccine began distribution in early 2021, and currently is still not available in every country. To stop the spread of Covid-19, the goal is for as

many people who are eligible for the vaccine to get it, to contain and eventually stop the spread of Covid-19.

This thesis will also explore how travel restrictions affect tourism. Since Covid-19 is still spreading, countries have not fully lifted travel restrictions. The pandemic has created a new health anxiety among tourists who therefore develop new preferences on where they choose to travel. Travelers who are health-conscious may only want to travel to a country with strict travel restrictions, such as quarantine mandates. Other travelers who are less health-conscious or place a priority on convivence when traveling would likely travel to places that have less restrictions. Since travel impacts the economy, governments may take their tourists' preferences into consideration when framing policies. This paper will measure how these restrictions have impacted tourism by regression analysis on tourism and the pandemic experience worldwide.

Literature Review

The Covid-19 pandemic is a recent event and the effects of it are still being analyzed. There are some studies done about the pandemic that give relevant background information on this public-health crisis. There are also numerous studies about the impacts on traveling and tourism that informed this research project.

Pandemic Effects on Tourism

Chetty, Friedman, Hendren, and Stepner (2020) analyze the economic impact of Covid-19, specifically focusing on the government policies enacted. Given the depressing effect of the pandemic on the economy, governments attempted to keep commerce flowing by enacting targeted policies. This paper estimates the effects of these policies in the US. It found that the economy was hit badly when high-income individuals reduced spending around the beginning of

the pandemic in mid-March with high rates of covid infection. It also found that the state-ordered reopening of economies did not recover this loss in spending and employment. Stimulus payments to low-income households were found to increase spending, but this did not contribute to the businesses who experienced most of the shock. Last, they found that loans to small businesses as part of the Paycheck Protection Program had small impacts on employment rates. Overall, the paper found that to financially recover from the pandemic, the government needs to restore consumer confidence by addressing health concerns.

Kim, Park, Kim, Lee and Sigala (2021) investigated how Covid-19 has impacted travelers' intentions and their desire to seek variety when traveling. If Covid-19 exposure is still a threat, it is reasonable to perceive that people would seek less diversity in their travel, due to health concerns. The authors disagree with this and hypothesize that travelers will participate in "revenge travel" to release pent-up travel desire. Their hypothesis is that traveler's variety-seeking intentions are higher when the threat of Covid-19 is higher, when the travelers have had previous travel experience, and when the crowdedness of the destination is lower. The author uses survey data from 2020 limited to the United States to reduce country-specific effects.The independent variable is measured by assessing the threat of Covid-19 by measuring the individual's perception of the threat of the virus. The dependent variable is variety seeking and is measured as the number of different activities within the travel occasion. They estimate the perceived threat against variety-seeking with controls (previous travel and crowdedness) and found significant correlations that supported all 4 of the above hypotheses.

Rahman, Gazi, Bhuiyan, and Rahaman (2021) analyze how tourist attractions correlate with tourist's risk assessment when traveling. The authors argue that because of the risk of exposure to Covid-19, travelers will be less willing to travel to some destinations because of

crowding, high case numbers, etc. They hypothesize that the pandemic will make travelers less likely to choose risky travel destinations because of the priority of health. The data was collected through a social-media questionnaire where participants where asking questions about the Covid-19 pandemic, travel risk and management perception, risk management, transportation patterns, hygiene and safety, etc. The study found that a relationship exists between risk management and the pandemic, which can have impacts on service delivery (avoiding eating at restaurants), size of traveling groups, avoidance of overpopulated destinations, etc.

Cakmakli, Demiralp, Kalemli-Ozcan, Tesiltas, and Yildirim (2021) address the absence of global vaccinations. There is a short supply of vaccinations and not all countries have the ability to access to them. This paper argues that countries with advanced economies and access to vaccines have an incentive to help developing economies because of trade connections. The paper's goal is to estimate the costs that advanced economies (AEs) pay for the lack of vaccination in developing countries solely due to trade and production linkages. Through their studies, they find that AEs can bear between 14%-49% of global economic costs due to lack of vaccinations. This shows the results of economic interdependence and how a drag in one country can have consequences in another because of an economic relationship. This raises the global incentive to get vaccinated.

Foo, Chin, Tan, and Phuah (2020) addresses the question of how Covid-19 impacted the tourism industry in Malaysia. The study found that because of restrictions, the airline industry has had such a dramatic loss of revenue that they are in high risk of bankruptcy. The hotel business was also greatly impacted, with a projected RM3.3 billion loss in revenue by June 2020. Also, 20% of workers have been laid off and 16% of workers faced pay cuts. The Malaysian

government plans to enact a stimulus package to relieve some of the losses and to promoted domestic tourism.

Normal Determinants of Tourism

H.G. Scarlett (2021) analyzes the economic impact of tourism on growth and other macro factors in anticipation of recovery from Covid-19. Its model shows that tourism does have an impact on the economy and gives advice on how countries should open back up, post-Covid-19. Scarlett's model uses panel data from 46 countries, spanning the years of 1995 to 2018 in a GMM estimation. The author's model uses two different measures of tourism, to see which one is a better measure. This strategy proved to be successful and inspired me also to include that in my model. The author found that the positive long-run effects of tourism on economic growth is about 50% higher if the measure for tourism is tourism receipts relative to GDP, as compared to tourist arrivals. The article also found that an increase in tourism is expected to expand the service and agriculture sectors and increase employment within the service and industry sectors. The empirical results and research the author completed resulted in their recommending that when countries are opening tourism back up to the public, that they focus on the quality of the tourism products and service to stimulate greater spending.

Cannonier and Burke (2019) demonstrate how much tourism can contribute to an economy. They specifically argue that tourism's contribution to economic output in the Caribbean is larger than average. They use a regression of real GDP on tourism to measure the correlation. Tourism is measured in several ways in this regression, including tourism receipts, exports of goods and services, nominal GDP, and tourist arrivals. The control variables are initial level of GDP, investment, trade, government final consumption, inflation, and life expectancy.

The findings are that a 10% increase in tourism is correlated with economic growth of 0.3-1% in GDP.

Zhang and Cheng (2019) examine whether tourism can stimulate an economy after a disaster shock. In May 2018, a magnitude-8.0 earthquake struck in Wenchuan County, China that resulted in 69,226 human deaths and destroyed buildings, environments, and infrastructure. The study performs a panel threshold regression technique to test the threshold effect of tourism development on economic growth of the 36 countries that were impacted by the earthquake. They perform a regression with the log of real GDP as the dependent variable regressed against tourist arrivals as a percent of local population. The impact of the earthquake was measured by a dummy variable (Y2008) and was found in the regression to correlate with 1% drop in economic growth variables measuring tourism were found to be statistically significant, confirming the authors' hypothesis. When repairing the tourism industry after natural disaster shock, the authors recommended that the governments exploit all potential resources for revenue, diversify tourism products, and improve transportation facilities to attract tourists.

Beekhuis (1981) explains the Caribbean's dependence on tourism. For the 5 Gulf states, $20 billion is spent by out-of-state visitors, which represents 7.5% of GNP. Tourism directly creates employment opportunities in the hospitality sector, retail trade, transportation operations, and government. Tourism also directly creates employment in construction, agriculture, fishing, and manufacturing. It is estimated that this totals over 1 million jobs, which is very important due to the Caribbean's high unemployment rates. It also talks about the risks of this dependence. The author argues that the role tourism plays can have issues such as seasonal layoffs, dependence on US markets, and too many low-level jobs.

Normal Determinants of Tourism

Chao, Hazari, Laffargue, Yu (2009) investigate the short- and long-run effects of tourism in the Hong Kong economy in a dynamic simulation model. Hong Kong was chosen specifically for this analysis because of its reliance on tourism for employment. The article investigates if an expansion in tourism creates more jobs in the local economies and if that improves the welfare of residents. In this model, the economy produced two goods (traded and non-traded good) in which international tourists only consume the non-trade good. The simulation finds that in the short run, an expansion of tourism will result in an increase in demand for the non-traded good, which raises its price and employment. This would increase overall welfare. In the long run, however, the higher price of the product, increases wages, which could have a negative impact on wages. This model shows that expansions in tourism may not always have positive impacts in the long run.

Ayeh and Lin (2011) identify the variables that influence demand for tourism in China to generate forecasts of tourism patterns. The author generates the forecasting models for tourism arrivals to China from 5 of the most tourism-generating countries (Australia, Canada, Germany, United Kingdom, and the United States) and then they are used to generate forecasts of the demand from 2010-2015. This article was useful when making the empirical model that will be used in this paper. They first explain the advantages of using a panel model in comparison to a time series model by claiming that it offers researches with more valuable insights and that is permits forecasters to assess the direction and magnitude of tourist's response to changes in determining factors. The author's model measures tourism demand by using tourism arrivals from origin country and uses CPI and a price of tourism variable which refers to the weighted

average of the CPI measured by the exchange-rate adjusted CPI. The author found these variables has a significant impact tourism demand, which was in influence to incorporate CPI and the exchange rate into my model.

Valle and Rebello (2008) estimate a model of the determinants of tourism return behavior. The main objective of the article is to identify the key aspects, aside from satisfaction, that influence the probability of a tourist returning to a destination. The author's research specifically focuses on the repeat traveling of Portuguese tourists to Brazil by using a survey on new and repeat tourists in 2004. The author uses a logit-regression model that relate the probability of Portuguese tourists returning to Brazil to a set of independent variables measuring motivations, travel-related characteristics, and sociodemographic features. The dependent variable in this model is a binomial variable that asks "Are you returning to the destination" in which 1=yes and 0=no. What the authors found were insignificant to determining tourism return behavior was interesting. The author found that travel cost, facilities, and landscape features were all insignificant with a tourist's probability of returning to a destination. The authors found that returning behavior depends more on emotional motivations. This is important information when making a model measuring tourism that includes both new and return arrivals.

Li and Song (2017) study the effects of weather variability on seasonal tourism demand. The authors wish to measure the correlation between climate and tourism demand with empirical evidence by using the demand for Mainland Chinese tourism among Hong Kong residents. They use 3 different regression equations to study the effects of home climate, destination climate, and climate difference on seasonal tourism. All three models were found to have a significant impact on Hong Kong residents demand for tourism in Mainland China. This shows that temperature

can be a determinant of tourism and supports reasoning for including an average-temperature variable in a model to measure tourism.

Phakdisoth and Kim (2007) study the determinants of inbound tourism in Laos. The authors choose Laos because of the lack of research on explaining tourism demand in developing countries. The independent variables that are regressed against tourist flows are grouped as origin-specific (income in countries of origin, relative price), destination-specific (transportation, communication, Laotian rule-of-law), and both origin-and-destination-specific (bilateral trade, distance from originating countries to Laos). The authors found significant impacts of communication and transportation infrastructure, bilateral trade, distance between Laos and countries of origin, which are the main long-run determinants of tourism (the destination specific and origin/destination specific variables).

Zhang (2009) investigates the determinants of a region's international inbound tourism and discusses its spatial pattern. The authors select China as the country to observe how inbound tourism is impacted by several independent variables. A spatial panel of 31 provinces in China are used in the paper over the period of 1989-2005. The dependent variable used as a measure of inbound tourism is international tourism receipts of each region. The spatial interaction is measured by the error term ε. The paper finds that development level, openness, tourism resources, tourism facilities, and tourism organizations are significantly and positively correlated with the dependent variable. They also found high spatial effects, meaning that a rise in tourism in one region can benefit others surrounding it.

Data

The data used in this study is panel data, which contains observations about a cross section over time. Data was collected from different countries to include multiple observations to get a more accurate analysis on how the pandemic mandates impacted travel. Figure 1 shows the locations of all 77 countries that were used in this study. Data was collected from the 196 countries posted by the World Bank, but the sample was limited to 77 based on what data was available for the variables needed. For example, when the model includes the exchange rate, the sample is reduced to the 47 countries for which it is available in addition to the other covid variables. The years 2009-2021 were used because it provided that most observations for the countries selected. Having a wide range of time for the data helps to clarify the impact that the pandemic had on travel and distinguish it from other trends.

Figure 1

Source: constructed by author using Slidescarnival.

In some equations, the dependent and GDP coefficients are logged. Logging variables helps make the error terms more "normally" distributed, making the statistical results more valid.

Because this study uses a large amount of data, logging variable helps to get reduce outliers. The goal is to improve the statistical results and accuracy. The variables that are logged will be the dependent variable (Arrivals per capita or Tourism Share) and GDP per capita. Other variables could not be logged since they had 0 values (covid) or were dummy variables (lockdowns). It is expected that by including the logged forms where possible, the summary statistics will improve.

There are other measures included to improve the validity of this study. Potential problems with using panel data is that there can be heteroskedasticity, due to cross-section differences, and autocorrelation over time; both are tested for and are controlled for. Also, a Hausman test confirmed the need to control for fixed effects to remove omitted-variables bias. By including these measures, the results of the regression will be more reliable.

Empirical Model

To measure how Covid-19 travel restrictions will impact tourism, it is possible to run two multiple regressions. The regression will be set up with the dependent variable (Tourism) being regressed against the main explanatory variables and controls.

The main explanatory variables are the pandemic variables. The first two, covidcases and coviddeaths, are included to show the severity of the pandemic. These two variables will show if a fall or rise in in tourism was correlated with the pandemic. Both of these variables were obtained from CNN Health's Covid Tracker. CovidCases measures the total cases reported divided by total population. Similarly, CovidDeaths measures the Total deaths reported divided by population. Population is controlled for in these two variables (rates are used) for comparative purposes since the study includes various countries of different sizes. It is expected for these variables to be negative meaning the worse the pandemic is, the less people will travel there.

The next pandemic variables are quarantine mandate and closed border. These variables will measure how tourism varied with the strictness of Covid guidelines and regulations. The goal in looking at these two measures is to observe the tradeoff between health/safety and convivence. Are travelers willing to follow a quarantine mandate because they value safety, or are they less willing because of the inconvenience? Both variables are dummy variables. QMandate will receive a value of 1 if incoming tourists must quarantine when arriving in a country, and 0 if not. Similarly, CLBords will receive a value of 1 if the country has closed borders, and 0 if not. This variable is likely to be negative and discourage traveling but the regression estimates will show by how much.

There are also variables included in the regression as controls: real exchange rate and GDP per capita. All of these variables could have effects on tourism that could skew the results of the regression if not included. By including them in the regression, the impacts of the pandemic variables are clearer. The data used for real exchange rate and GDP are obtained from the World Bank. Average temperature was also collected to be included in the regression because people often travel towards warmer places. However, it was only readily available for the most recent year, so it was not included in the model.

The theoretical equation is:

$$\text{Tourism} = \beta_0 + \beta_1 \text{CovidCases} + \beta_2 \text{CovidDeaths} + \beta_3 \text{QMandate} + \beta_4 \text{CLBoards} + \beta_5 \text{realexchangerate} + \beta_6 \text{GDPpercap} + u \text{ (error term)}$$

Where u is assumed to be normally distributed. The dependent variable in this regression is tourism. The goal is to show how the pandemic variables affected tourism, controlling for other factors.

Tourism can be measured in two different ways, so there are two sets of regression-equation estimates. The first measures tourism by international arrivals. This is defined by

"number of tourists who travel to a country other than their usual residence for a period not exceeding 12 months and whose main purpose in visiting is other than any activity remunerated from within the country visited" (World Bank). International arrivals specifically provide the number of tourists for each country over time; it was divided by population to reduce heteroskedasticity. The other measure for tourism is international tourism receipts. This variable is defined by "expenditures by international inbound visitors" (World Bank). Tourism receipts measure the money spent by tourists in a country each year over time; it was measured relative to GDP to reduce heteroskedasticity. The data for both measures of tourism are from the World Bank.

Figure 2: Correlation Matrix for Sample w/o Exchange rate

	arrivp~p	toursh~e	arrive~g	toursh~g	gdpper~p	gdp_log	covidc~p	covidd~p	qmandate	clbords
arrivpercap	1.0000									
tourshare	0.5403	1.0000								
arriveperc~g	0.6667	0.4592	1.0000							
tourshare_~g	0.4158	0.8743	0.5042	1.0000						
gdppercap	0.2511	-0.1590	0.4465	-0.1896	1.0000					
gdp_log	0.3460	-0.0725	0.6268	-0.1038	0.8905	1.0000				
covidcases~p	-0.0728	-0.1202	-0.0952	-0.1692	0.0382	0.0625	1.0000			
coviddeath~p	-0.0616	-0.0956	-0.1713	-0.2171	-0.0682	-0.0644	0.3258	1.0000		
qmandate	-0.0280	-0.0569	-0.0450	-0.0742	0.0021	0.0141	0.2622	0.1215	1.0000	
clbords	-0.1003	-0.1477	-0.2159	-0.2395	-0.0311	-0.0333	0.5782	0.4021	0.2575	1.0000

Figure 3: Correlation Matrix for Sample w/ Exchange Rate

	arrivp~p	toursh~e	arrivp~g	toursh~g	gdpper~p	covidc~p	covidd~p	qmandate	clbords	exchge~e
arrivpercap	1.0000									
tourshare	0.6422	1.0000								
arrivperca~g	0.7040	0.4705	1.0000							
tourshare_~g	0.4896	0.8677	0.5170	1.0000						
gdppercap	0.1405	-0.2027	0.3315	-0.2554	1.0000					
covidcases~p	-0.0929	-0.1344	-0.1559	-0.1955	0.0136	1.0000				
coviddeath~p	-0.0932	-0.1368	-0.1709	-0.2071	-0.0149	0.9278	1.0000			
qmandate	-0.0316	-0.0483	-0.0391	-0.0577	-0.0075	0.3258	0.3032	1.0000		
clbords	-0.1079	-0.1413	-0.2283	-0.2207	-0.0431	0.5603	0.5346	0.2527	1.0000	
exchgerate	0.0408	0.0909	-0.0089	0.1182	0.0754	0.0026	-0.0037	-0.0157	-0.0177	1.0000

Econometric Results and their Interpretation

Table 1 shows the results using Arrivals per capita as the dependent variable, while Table 2 shows the results using Tourism Share as the dependent variable. The equations are both fixed-effects models and controlled for heteroskedasticity and autocorrelation using the VCE (robust) command in Stata.

Table 1
Regression Results for Arrivals per Capita

Explanatory Variables	1	2(Logged)	3(Logged)	4(Logged)	5(Logged)	6(Logged)
Covid Cases	-19.159***	-11.532***	-11.889***	-14.333***	-15.039***	-15.037***
	(-4.52)	(-5.21)	(-5.27)	(-2.59)	(-3.08)	(-6.60)
Covid Deaths	13899.7**	-4557.323		-26.271	0.113	
	(2.30)	(-1.50)		(-0.10)	(0)	
Qmandate	-1.101	-0.400***	-0.401***	-0.446***	-0.465***	-0.465***
	(-1.36)	(-2.89)	(-2.93)	(-2.65)	(-2.78)	(-2.79)
CLBorders	-0.214	-0.851***	-0.880***	-0.747***	-0.762***	-0.762***
	(-1.02)	(-10.03)	(-11.14)	(-8.01)	(-8.34)	(-8.36)
GDPperCap	0.00005**	0.797***	0.799***	0.830***	1.166***	1.166***
	(-2.22)	(6.41)	(6.43)	(4.98)	(7.29)	(7.15)
Exchange Rate					-0.010**	-0.010**
					(-2.39)	(-2.38)
Intercept	0.3	-8.077***	-8.096***	-8.384***	-10.631***	-10.631***
	-0.7	(-6.99)	(-7.01)	(-5.16)	(-7.29)	(-7.16)
R-squared:						
Within	0.24	0.61	0.60	0.61	0.63	0.63
Between	0.06	0.42	0.42	0.25	0.25	0.25
Overall	0.07	0.43	0.43	0.27	0.27	0.27
F-Statistics	9.13	98.21	119.58	67.10	104.55	109.61
n	77	77	77	47	47	47

Significant at: ***1% level, **5% level, *10% level

Table 2
Regression Results for Tourism Share

Explanatory Variables	1	2(Logged)	3(Logged)	4(Logged)	5(Logged)	6(Logged)
Covid Cases	-0.379**	-5.839**	-6.534***	-11.258***	-11.669**	-9.264***
	(-1.96)	(-2.55)	(-2.83)	(-2.26)	(-2.51)	(-4.38)
Covid Deaths	379.820**	-8881.094**		102.885	118.256	
	(2.09)	(-2.27)		(0.41)	(0.50)	
Qmandate	-0.275*	-0.436***	-0.436**	-0.536***	-0.548***	-0.548***
	(-1.89)	(-2.67)	(-2.60)	(-3.15)	(-3.21)	(-3.17)
CLBorders	-0.019***	-0.683***	-0.740***	-0.575***	-0.584***	-0.581***
	(-3.93)	(-8.16)	(-9.20)	(-6.75)	(-7.26)	(-7.18)
GDPperCap	0.0000004	0.055	0.059	0.206**	0.402**	0.397**
	(1.12)	(0.37)	(0.40)	(1.30)	(2.34)	(2.35)
Exchange Rate					-0.006	-0.006
					(-1.31)	(-1.31)
Intercept	0.038***	-3.993***	-4.030***	-5.523***	-6.832***	-6.791***
	(5.32)	(-2.90)	(-2.93)	(-3.57)	(-4.52)	(-4.56)
R-squared:						
Within	0.28	0.47	0.46	0.50	0.52	0.52
Between	0.05	0.01	0.03	0.07	0.08	0.08
Overall	0.0004	0.05	0.04	0.001	0.01	0.01
F-Statistics	8.96	45.37	51.91	28.51	26.30	30.41
n	77	77	77	47	47	47

Significant at: ***1% level, **5% level, *10% level

Firstly, it is shown in the table how the summary statistics improve from when using the logged equations (Eq 2, 3, and 5). When using logs, there are more significance in the variables and the R-squares are higher. Statas provides 3 R-squared values, within, between, and overall. "Within" measures how much of the variance within the country units the dependent variable accounts for, while "between" measures how much of the variance between separate countries does the dependent variable account for. "Overall" captures the weighted average of the two. For example, looking at Table 1 equations 1 and 2, the only difference is the logging, and the within R-square changes from 0.24 to 0.61 and the overall changes from 0.07 to 0.43. That can be interpreted as 43% compared to 7% of the variability observed in the dependent variable is explained by the model. Similar results are shown in Table 2 and within different equations. The logged variables provide a better fit for the model.

There were good results when using both measures of tourism (Table.1 and Table 2). When using arrivals per capita as the dependent variables, there was a slight increase in

significant results with GDP per capita and exchange rate. The coefficients for CovidCases were also higher, but that correlates with the fact that they are being measured against different units (people vs dollars). In contrast, when using tourism share as the dependent variable, there was a slight increase in significance with Qmandate, Closed Borders, and Covid Deaths.

As stated before, including the exchange rate limited the sample size to 47 countries, so it was not included in all equations. The effect of the exchange rate can be shown by comparing different equations in the tables (1 and 4, 2 and 5). In Table 1, adding the exchange rate did increase the impact of CovidCases from -19.159 to -33.396. It made slight modifications to other variables coefficients in the equations. It did not change the significance of the variables much as well.

Looking specifically at the different explanatory variables, we can observe the coefficients, consistency, and significance. CovidCases shows consistent results of being negative and significant. This is what was originally expected. CovidDeaths, however, is not as stable. While typically insignificant in explaining Tourism Arrivals, it earned both negative and positive statistically significant signs in Tourism Receipts equations. Presumably, the unstable coefficients reflect multicollinearity. By looking at equation 3 and 6 when CovidDeaths was excluded, the rest of the model did not change much, including the R-squareds. In Table 1, equations 5 and 6 are almost exactly the same. This shows that Covid deaths did not have much of an effect beyond the impact of CovidCases. It was tested with its correlation with other variables in Figures 2 and 3. Because deaths and cases are highly correlated at 0.93 in one sample, it was excluded in further analysis.

Quarantine Mandate and Closed Borders show very similar results. They are both consistently negative and significant. This is what was originally expected of them; however,

their coefficient size is relatively small. The results can be interpreted as quarantine mandates only accounting for a 0.3% decrease in tourism. The results were more significant in the logged equations (2,3,5), especially in Table 1. All in all, quarantine mandate had significant results that can be interpreted.

Conclusion

What we can conclude from this study is that the pandemic does have an impact on travel. Based on the results, it is shown that CovidCases per capita are negatively correlated with tourism. This was shown by having consistently negative and significant results for both dependent variables. CovidCases results can be interpreted as tourist being less likely to travel to a country with higher Covid rates. This parallels the original hypothesis that tourists' preferences are evolving and that they value health and safety highly.

The results for the variable CovidDeaths are not as easy to interpret. The regression showed inconsistent coefficients and significance. When CovidDeaths was taken out the equations, the model was barely impacted. This shows that CovidDeaths does not have the explanatory power as CovidCases does, even though they were both included as measuring the severity of the pandemic. It is interesting to point out that deaths lag infection by about 8 days (longer for younger people) (Jin) and also, if someone feared they might be vulnerable to death by Covid, they would most likely not travel. CovidDeaths was originally expected to be negative but was positive at sometimes. Since a greater number of Covid deaths would not attract any tourism, the way a positive coefficient could be interpreted would be that higher Covid deaths correlates with less restrictions and an easier travel experience – in other words, it is collinear with those other regressors. The fundamental conclusion is that excluding CovidDeaths in no

way impairs the strength of the model. Given its correlation with CovidCases, this is not surprising in itself.

Quarantine mandate was shown to be negatively correlated with tourism, however, not by much. As stated before, the results only showed that a quarantine mandate decreased tourism by 0.3%. This does suggest that tourists are not as opposed to following mandates as originally hypothesized and did prioritize health and safety when traveling. This result is interesting because it shows how tourists' preferences are adapting to the pandemic. When tourists are deciding when to travel and also when countries are beginning to open up, they should consider pandemic rates and rules to make tourists feel safer to accommodate this new priority.

Future Studies

This study originally planned to include vaccine mandates and data from 2021 into the model. However, because of limitations on available data and delays from the pandemic, it was not able to be included at this time. In the future, it would be very interesting to add a vaccine factor into this same study to observe how vaccine mandates are impacting tourism. Since there has been debates on people's willingness to get vaccinated, this adds an interesting piece to the study. The question can be proposed as to whether a country implementing a vaccine mandate on their incoming visitors increases travel because of a concern for safety, or decreases travel because people are unwilling to get vaccinated? Based on the results from this study, I hypothesize that it will increase travel based on the new concern for and priority of health and safety.

APPENDIX

I. Data Description

Variable	Description	Mean	Standard Deviation	Source
Arrivals per Capita	# of incoming international arrivals / Population	1.198	2.087	World Bank
Tourism Share	International Tourism Receipts / GDP	0.044	0.045	World Bank
Covid Cases	Total cases reported / Population	0.002	0.009	CNN

Covid Deaths	Total deaths reported / Population	0.0000006	0.000005	CNN
Quarantine Mandate	Country mandated quarantine to incoming arrivals (yes=1,no=0)	0.015	0.122	Al Jazeera
Closed Borders	Country did not allow incoming arrivals (yes=1, no=0)	0.064	0.245	Al Jazeera
GDP per Capita	Gross domestic product (current US$) / Population	20520.796	21418.169	World Bank
Real Exchange Rate Index	Nominal effective exchange rate / Price deflator	98.973	11.062	World Bank

II. List of Counties

Armenia*	Australia*	Austria*	Azerbaijan	Belgium*	Bulgaria*	Bahamas*	Bosnia	Bolivia*
Canada*	Switzerland*	Chile*	Colombia*	Costa Rica*	Cyprus*	Czech Republic*	Germany*	Denmark*
Dominican Republic*	Ecuador	Spain*	Estonia	Finland*	Fiji*	France*	United Kingdom*	Georgia*
Gambia*	Guatemala	Honduras	Hungary*	Indonesia	India	Iceland*	Italy*	Japan*
Kenya	Lithuania	Latvia*	Moldova*	Mexico*	North Macedonia*	Malta*	Montenegro	Mongolia
Mauritius	Netherlands*	Norway*	Nepal	New Zealand*	Peru	Philippines*	Poland*	Portugal*
Saudi Arabia*	Singapore*	El Salvador	Serbia	Slovenia	Sweden*	Thailand	Trinidad*	Tunisia*
Turkey	Ukraine*	United States*	South Africa*					

*Countries that are included in the sample with the exchange rate

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