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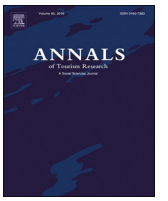

How pandemics affect tourism: International evidence

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Coronavirus (COVID-19) outbreak, which began in Wuhan, China, has expanded to almost everywhere. World Health Organization declared this outbreak a global pandemic. The number of infections and deaths has increased rapidly. This has forced governments to implement several restrictions such as travel controls, school closures, limitations on internal movement to contain the spread in the country. The tourism industry will be the most affected, as there are travel bans (both external and internal) and border closures. UNWTO (2020) forecasts a decrease of 20% to 30% (300 to 450 US$ billion) in tourist arrivals (in international tourism receipts) in 2020. These numbers are likely to increase as the spread of coronavirus increases.

The world has experienced several diseases and the literature explores how they affect tourism. Zeng et al. (2005) consider SARS as a short-term crisis, which has significant effects on tourism in China. Blake et al. (2003) show that the foot and mouth disease decreases tourism expenditures in United Kingdom. Kuo et al. (2008) explore the effects of two diseases, namely Avian Flu and SARS (severe acute respiratory syndrome), on tourist arrivals in Asia. They show that tourist arrivals decreased significantly in SARS-affected countries but no effect was observed for Avian Flu-affected countries. Likewise, McAleer et al. (2010) analyze the impact of these two diseases and find that the effect of SARS is higher compared to Avian Flu in terms of tourist arrivals. Rosselló et al. (2017) focus on Malaria, Yellow Fever, Dengue, and Ebola, and examine their impact on tourist arrivals in affected countries. By using dummy variables, it is shown that those diseases cause a significant decline in tourist arrivals, more specifically, Malaria risk in a country leads to 47% fewer tourists to arrive. Recently, Yang et al. (2020) develop a dynamic stochastic general equilibrium (DSGE) model to understand the effect of pandemic on tourism. The application of the model for the case of COVID-19 shows that tourism demand declines following the rising health risk.

In this study, we aim to examine how the pandemics measured by the newly developed index (Discussion about Pandemics Index) affects tourist arrivals. To our knowledge, we are the first to use this index, which is continuous, comparable across countries, and can be used in panel data analysis. While the previous studies use dummy variables and the number of infected/death, we use a new version of the World Economic Uncertainty index (Ahir et al., 2020) modified to capture pandemics effect by calculating the percent of the words related to pandemic episodes in the Economist Intelligence Unit (EIU) country reports. World Economic Uncertainty Index is developed by counting the frequencies of “uncertainty” (and its variants) in EIU country reports, however “Discussion about Pandemics Index” represents the percent of pandemic related words in those reports multiplied by 1000. The following keywords are searched in the Economist Intelligence Unit reports: “Severe Acute Respiratory Syndrome, SARS, Avian flu, H5N1, Swine flu, H1N1,

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Middle East respiratory syndrome, MERS (Middle East respiratory syndrome), Bird flu, Ebola, Coronavirus, Covid-19, Influenza, H1V1, World Health Organization, and WHO". We find that pandemics decrease tourist arrivals. Moreover, this effect exists only for low-income economies.

International tourist arrivals and macro-economic variables are obtained from the World Bank. Our main variable of interest is the "Discussion about Pandemics Index (PI)" developed by Ahir et al. (2020). The index is developed by counting the number of times pandemic-related words are used in the Economist Intelligence Unit country reports, which are available until the first quarter of 2020. Based on the availability of existing macro-economic and tourist arrival data, the final sample is composed of 129 countries for the period of 1996–2018. This index represents the percent of pandemic related words in those reports multiplied by 1000. A higher index value implies a higher discussion about pandemics and vice versa. The index is comparable across countries and can be used in a panel data format.[1] We use the following demand model (Demir et al., 2019; Santana-Gallego et al., 2020);

$$LnITA_{i,t} = \beta_0 + \beta_1 LnPI_{i,t} + \beta_2 LnGDPPC_{i,t} + \beta_3 LnOPEN_{i,t} + \beta_4 LnEXCH_{i,t} + \lambda_t + u_{i,t} \quad (1)$$

where $LnITA_{i,\ t}$ and $LnITA_{i,\ t-1}$ is the natural logarithm of tourist arrivals at time t and t-1 for country i, respectively; $LnPI_{i,\ t}$ is the natural logarithm of the Pandemics Index; $LnGDPPC_{i,\ t}$ is the natural logarithm of GDP (Gross Domestic Product) per capita; $LnOPEN_{i,\ t}$ is the natural logarithm of ratio of sum of exports & imports to GDP; $LnEXH_{i,\ t}$ is the natural logarithm of domestic currency per $. Year fixed effects ($\lambda_t$) are included to control for trends and common shocks to countries. We estimate Eq. (1) by a panel fixed effects technique in order to absorb country time invariant characteristics (Santana-Gallego et al., 2020). We also estimate the base model with difference Generalized Method of Moments (GMM) as fixed effects model may be affected from endogeneity problem. The endogeneity issues can be solved by using instrumental variable methods such as GMM. We couldn't run GMM model for country income levels as the number of countries in the sample is less than the instrumental variables. GDP per capita is used as a proxy for economic and tourism development in estimating inbound tourism demand in a cross-country framework. GDP per capita of a country represents the living standards and economic performance, which indicate the government's affordability to invest, develop, and maintain infrastructures for tourism (Yap & Saha, 2013; Saha et al., 2017). Therefore, a higher GDP per capita in a country will increase the inbound tourism demand. When a country's currency depreciates, the travel cost will be relatively cheaper, and therefore the country can attract more international travelers. Trade openness measures the level of economic ties with the rest of the world, which can promote inbound tourism. Pandemics Index data is available quarterly, and we use the yearly average of quarterly values, value at the fourth quartile, and weighted average of quarterly values in this study. Moreover, we also examine the effect of pandemics on tourist arrivals for countries at different income levels. Descriptive statistics along with variable definitions data sources are shown in Table 1.

Table 2 shows the fixed effect and generalized method of moments estimations for the impact of different measures of the Pandemics Index on tourist arrivals. In fixed effect estimations, we find that two measures of pandemics (yearly average of four-quarter value and the weighted average of four quarters) negatively affect tourist arrivals. As there is high persistency in tourist arrivals, we perform linear dynamic model estimation – GMM and it is shown that all pandemics measures are statistically significant and negatively related with tourism arrivals.

We find that lag of tourism arrivals has a statistically significant and positive effect implying that there is high-level persistence in inbound tourism. Columns 7–9 represent the estimations according to different income levels. The negative effect of the pandemics on tourist arrivals disappears for emerging and advance economies, and it exists only for the case of low-income economies. The lacking transparency and poor health infrastructure can be the main drivers of the decreasing tourism demand in low-income economies. The previous pandemics in recent history were mostly regional and lead to fewer infections and deaths compared to coronavirus. Therefore, the health systems of advanced and emerging economies were able to cope with the pandemics. Moreover, there were no widespread travel bans or implementation of curfews. However, the world has become more global so viruses spread rapidly to the entire world. For the case of COVID-19, the number of deaths and infections is rising exponentially and countries are implementing travel bans, quarantines, and curfews. The health system of almost all countries are about to collapse and the aim is to flatten the COVID-19 curve. UNWTO (2020) argues that the effect of COVID-19 is like no other and therefore, the previous experiences provide limited evidence to predict the possible effects on tourism.

In terms of the control variables, GDP per capita is positively associated with tourist arrivals in all estimations. An increase in GDP per capita leads to a rise in tourist arrivals. The exchange rate has a positive effect on tourist arrivals. Those findings are in line with the previous studies (Demir et al., 2019). Trade openness has a positive effect on tourist arrivals implying that integration with the world helps countries to attract more tourists. Table 3 examines the lagged effect of pandemics on tourism. We do not find any lagged effect for all estimates. As the previous pandemics were short-lived, they didn't have long-term effects on tourist arrivals.

We document the negative effect of pandemics on tourist arrivals by using data for 129 countries for the period of 1996–2018. This effect is valid only for the case of low-income economies. A 10% percent increase in "Discussion about Pandemics Index" will lead to a 2.1% decrease in tourist arrivals. During the pandemics periods, there is a sharp increase in the index value therefore, countries are economically affected from the decreasing tourist arrivals. Moreover, the impact of pandemics on fast and slow tourism growing countries will be different.

It should also be noted that the effect of COVID-19 is hard to predict, as the world has not experienced such a global pandemic before. The governments are implementing travel bans and border closures. Therefore, our findings based on the previous pandemics will have limited power to predict to possible effects of COVID-19 on tourism. Future studies can examine the short-run and long-run

[2] The index is made online on April, 4, 2020 and presented in the IMF as chart of the week.

Table 1
Descriptive Statistics and Variable Definition.

Variables	Definition	Data source	Mean	Standard deviation	Min.	Max.
LnITA	Natural Logarithm of Number of Tourist Arrivals	World Bank, WDI	14.29	1.93	6.55	18.31
LnPI_Avr	Natural Logarithm of Discussion about Pandemics Index – yearly average	Ahir et al. (2020) (https://worlduncertaintyindex.com/data/)	0.37	0.92	0	6.08
LnPI_Q4	Natural Logarithm of Discussion about Pandemics Index – Q4 value	Ahir et al. (2020) (https://worlduncertaintyindex.com/data/)	0.22	0.89	0	6.51
LnPI_WAvr	Natural Logarithm of Discussion about Pandemics Index – weighted average value calculated as (Q1*1 + Q2*2 + Q3*3 + Q4*4)/10	Ahir et al. (2020) (https://worlduncertaintyindex.com/data/)	0.37	0.92	0	6.08
LnGDPPC	Natural Logarithm of GDP per capita (constant 2010 US$)	World Bank, WDI	8.32	1.56	5.23	11.43
LnEXCH	Natural Logarithm of exchange rate (Domestic currency per US$)	World Bank, WDI	3.41	2.79	−6.62	22.63
LnOPEN	Natural Logarithm of the sum of exports and imports of goods and services (BoP, current US$) measured as a share of gross domestic product (current US$).	World Bank, WDI	−0.356	0.51	−2.11	1.49

Table 2
Estimations for the effects of pandemics on tourist arrivals.

	All countries (FE)	All countries (FE)	All countries (FE)	All countries (GMM)	All countries (GMM)	All countries (GMM)	Advanced economies	Emerging economies	Low-income economies
L.LnITA				0.8955***	0.8963***	0.8911***			
				(0.0154)	(0.0154)	(0.0151)			
LnPI_Avr	−0.0212**			−0.0135***			−0.0133	−0.0021	−0.0307**
	(0.0095)			(0.0021)			(0.0129)	(0.0177)	(0.0152)
LnPI_WAvr		−0.0178*			−0.0147***				
		(0.0095)			(0.0021)				
LnPI_Q4			−0.0104			−0.0118***			
			(0.0102)			(0.0022)			
LnGDPPC	0.5010***	0.4867***	0.4892***	0.0611***	0.0605***	0.0644***	0.2692***	0.5591***	0.3659***
	(0.0381)	(0.0373)	(0.0373)	(0.0134)	(0.0135)	(0.0133)	(0.0764)	(0.0548)	(0.0738)
LnEXCH	0.0823***	0.0846***	0.0844***	0.0218*	0.0212*	0.0221**	0.4367***	0.0418**	0.1479***
	(0.0137)	(0.0137)	(0.0137)	(0.0112)	(0.0113)	(0.0112)	(0.1220)	(0.0165)	(0.0329)
LnOPEN	0.3272***	0.3380***	0.3367***	0.1655***	0.1664***	0.1635***	0.6581***	0.2561***	0.3327***
	(0.0461)	(0.0475)	(0.0476)	(0.0164)	(0.0163)	(0.0165)	(0.0876)	(0.0790)	(0.0744)
Constant	4.3659***	9.846***	9.8259***				12.1735***	9.7598***	9.3696***
	(0.8866)	(0.2722)	(0.2721)				(0.8895)	(0.4137)	(0.4412)
Observations	2378	2378	2378	2128	2128	2128	405	1146	824
Within R^2	0.58	0.58	0.58				0.72	0.59	0.58
Wald-chi^2				31,795.35	31,564.33	30,624.51			
AR(1) Test *p*-value				0.001	0.001	0.001			
AR(2) Test p-value				0.500	0.496	0.467			

Notes: Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Estimated by Panel Fixed Effects (FE), Year FE are included but not reported.

Table 3
Lagged effect of pandemics on tourist arrivals

	All countries	Advanced economies	Emerging economies	Low-income economies
LagLnPI_Avr	−0.0121	0.0019	−0.0058	−0.0165
	(0.0094)	(0.0130)	(0.0174)	(0.0153)
LnGDPPC	0.4895***	0.2833***	0.5423***	0.3888***
	(0.0389)	(0.0825)	(0.0557)	(0.0770)
LnEXCH	0.0917***	0.4209***	0.0569***	0.1368***
	(0.0148)	(0.1296)	(0.0182)	(0.0336)
LnOPEN	0.3129***	0.6436***	0.2838***	0.3106***
	(0.0471)	(0.0910)	(0.0800)	(0.0779)
Constant	4.6901***	12.0300***	9.9492***	9.2766***
	(0.9091)	(0.9687)	(0.4233)	(0.4552)
Observations	2280	381	1103	796
Within R^2	0.58	0.72	0.59	0.57

Notes: Standard errors are given in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Estimated by Panel Fixed Effects (FE), Year FE are included but not reported.

effects of pandemics on tourist arrivals by using quarterly/yearly data in a single country or a group of countries by using the autoregressive distributed lag model approach (Song et al., 2019).

Author statement

Mehmet Huseyin Bilgin: Conceptualization, Writing - Review & Editing.
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Asli Cansin Doker: Visualization, Methodology.
Gokhan Karabulut: Conceptualization, Supervision, Writing - Review & Editing, Methodology.

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