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by

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Is Climate Change Altering Tourism Flows? Insights from Structural Gravity Estimation.

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Abstract

This paper examines the impact of key climate factors and extreme meteorological events on international tourism flows relative to domestic tourism flows. To achieve this, we estimate a structural gravity equation on a sample of 50 countries over the period 2008–2021. On average, temperatures do not exhibit a significant effect on the aforementioned relationship. However, this finding is critically influenced by the heterogeneity observed across countries, particularly the negative effects estimated for Canada and the United States. The number of hot days and heavy precipitations reduces the relative volume of international tourism, although this effect also varies depending on the country. Notably, the United States once again plays a pivotal role in driving the estimated average negative impact of extreme events on international tourism flows. At the global level, storms, landslides, wildfires, extreme temperatures and epidemics adversely affect international tourism.

Key words: Climate change, Domestic tourism, International Tourism, Gravity Equation, United States.

JEL classification: F64, L83

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I. Introduction

The impact of climate change on tourism has been extensively analysed in the literature for many years (Fang et al., 2018).[1] This is largely due to the strong dependence of various tourism activities (such as beach tourism, cycling, visits to natural reserves, or skiing) on climatic conditions, which, when altered, can affect the attractiveness of many destinations for both current and potential visitors.

Climate change primarily manifests in rising temperatures and an increased frequency of extreme weather events, along with the growing severity of their disastrous effects. However, the impact of these phenomena on domestic and international tourism is complex and depends on physical, geographical, sociological, and even psychological factors.

The consequences of a changing climate may include damage to tourism infrastructures, increased costs for mitigation efforts (such as cooling or heating), alterations to the essential environment of destinations, expenses associated with adaptation measures, and shifts in vacation characteristics, among others (Scott et al., 2012).

As stated, the literature on the impact of climate change is extensive, typically focusing on individual countries (Maddison, 2001; Becken, 2005;

[1] We also find reviews of the literature in Dubois and Ceron (2006), Pang et al. (2012), Kajan, E., and Saarinen (2013), Sharon et al. (2013) or Arabadzhyan et al. (2021).

Amelung and Nicholls, 2014) or specific regions (Scott et al., 2004; Hamilton and Tol, 2007; Cevik and Ghazanchyan, 2021; Carrillo et al., 2022). However, global analyses remain rare. One notable contribution in this area is Rosselló et al. (2020), which focuses on natural disasters. These authors estimate a gravity equation using a broad sample of 171 countries over the period 1995–2013. However, their study may be subject to bias for several reasons: the presence of heteroscedasticity due to the estimation of a log-linear equation, the omission of destination-year fixed effects, and the exclusion of domestic tourism flows.

To address these limitations, we estimate a structural gravity model using a sample of 50 countries over the period 2008–2021. Our study contributes to the literature in several ways. First, we account for all known biases in gravity equation estimations to ensure unbiased results. Second, we adopt a broader perspective on climate change by considering both climatic variables and extreme weather events. Finally, we conduct a country-specific analysis of impacts.

Our findings indicate that climatic variables have quite heterogeneous effects across countries. Overall, temperatures do not seem to affect international tourism in relation to domestic one. However, rising temperatures appear to favour international tourism in colder countries, with the notable exceptions of Canada and the United States, which significantly influence the overall result. On average, an increase in the number of hot days and heavy rainfall negatively affects international trade relative to domestic trade but, again, with strong heterogeneity.

With respect to extreme weather events, the United States also play a key role in driving the estimated average negative effect of these disasters on international tourism. By type of events, storms, landslides, wildfires, extreme temperatures and epidemics adversely impact on average international tourism.

The rest of the paper is structured as follows. In the next section, we present the methodology and data sources. Section III discusses the estimation results, while Section IV provides the conclusions.

II. Methodology and Data

In order to analyse the impact of climate change on tourism we are going to estimate a structural gravity equation taking into account all the known biases in the literature. This approach draws a parallel with the case of trade where the gravity model methodology as revealed as very successful.[2] This methodology has also been applied to the analysis of tourism flows previously and, in particular, relating the impact of climate change on tourism.[3] In this last case, see Rosselló

[2] Since the pioneering work of Tinbergen (1962), this methodology has been widely used in the analysis of trade flows.

[3] See Rosselló and Santana (2022) for an overview about the use of gravity equations in tourism.

(2014) for an overview for different methodologies and Rosselló et al. (2020) for a specific application of the gravity equation in this field.

Originally, the gravity model explained bilateral trade flows between countries as being directly proportional to their respective economic size and inversely proportional to the distance between them, drawing a parallel with the Newtonian law of gravitation. In the context of trade, economic size is typically measured by GDP. However, when analyzing the movement of people, such as in tourism, population size is a more appropriate measure.

Beyond these key variables, the model was later expanded to include other factors related to transaction costs, such as shared language, land borders, or colonial ties. With this basic structure, research has often focused on assessing the impact of additional factors, as for instance, membership in a regional trade agreement or institutional quality.

Over time, theoretical advancements in the gravity model have rendered the explicit inclusion of such traditional variables unnecessary. Instead, they have been replaced by a set of fixed effects that account for potential biases in estimation.

First, Anderson and van Wincoop (2003) highlighted the need to incorporate "price" effects into the gravity equation (referred to as multilateral resistance) which captures the trade barriers faced by both origin and destination countries in relation to all their trade partners (including themselves). To properly account for multilateral resistance, the inclusion of country fixed effects for both the origin and destination is necessary. In a panel data setting, however, multilateral resistance varies over time. As a result, country-year fixed effects (CYFE) must be included. By incorporating these dummies, the model effectively controls for country-specific factors that change over time, such as population size in the context of tourism flows.

Second, in panel data settings, it is highly recommended to introduce country-pair fixed effects (CPFE) to control for unobserved heterogeneity between partners, which may otherwise lead to endogeneity issues (Baier and Bergstrand, 2007; Baldwin and Taglioni, 2007). These fixed effects also account for pair-specific factors influencing flows between countries, such as geographical distance, shared language, and historical ties.

Third, estimating the gravity equation in a log-linear form can lead to bias in the presence of heteroscedasticity and fails to account for zero values in the dependent variable. To address this issue, Santos Silva and Tenreyro (2006) recommend using a Poisson Pseudo Maximum Likelihood (PPML) estimator, which provides more robust and consistent estimates.

Finally, when referring to trade flows, the adequate estimation of trade creation and diversion effects needs for the inclusion of intra-national flows.[4] The inclusion of domestic flows has an additional important implication. When considering only international flows, the full set of fixed effects restricts estimation to variables that are pair-specific and vary over time (such as regional trade agreements), but not to country-specific variables (such as those measuring climate change). To analyze the impact of climate change on tourism using a gravity equation with only international tourism data, we face two alternatives. One option is to omit some fixed effects, which would introduce bias. The other is to artificially construct a pair-specific variable that changes over time, such as the average temperature of a country pair, which may not be meaningful.

Because of that, we include domestic tourism flows to properly estimate the impact of climate change on tourism. Moreover, this inclusion provides an additional advantage. To identify the effects of our climate change variables, we interact them with a dummy variable for international tourism (*int*), which equals one for international flows and zero for domestic flows.[5] This approach additionally prevents endogeneity issues because, as shown by Nizalova and Murtazashvili (2016), consistent estimates are obtained because the international

[4] See Yotov (2012) or Yotov et al. (2016).

[5] See, for instance, Beverelly et al. (2023) referring to national institutions.

flows dummy is exogenous, ensuring in our particular case no correlation between tourism flows and our climate change measures.

Obviously, this decision comes with certain trade-offs. First, the sample of selected countries with sufficient data on both domestic and international tourism flows is relatively limited, consisting of 50 countries (see Table A1 in the Appendix). However, the majority of the world's key tourism origin and destination countries are included. Second, the available time period for analysis, after careful inspection, is not particularly long, covering 2008–2021. Nevertheless, during this period, our key variables of interest (temperatures, hot days, precipitation, and extreme weather events) have exhibited enough variation to allow for meaningful estimation of their effects. Third, our estimations capture the impact of climate change on international tourism but only relative to domestic tourism. To the best of our knowledge, no previous study has incorporated domestic tourism flows to obtain unbiased estimates of the impact of climate change on tourism using a gravity equation.

Taking into account the above considerations, we estimate by PPML the following gravity equation:

$$\mathrm{T_{ijt}} = \exp^{(\beta_1 \mathrm{PTA_{ijt}} + \sum_{2008}^{2021} \beta_t Glob_{ijt} + \beta_2 \mathrm{climate_{i(j)t}} + \beta_2 \mathrm{events_{i(j)t}} + \mu_{ij} + \delta_{it} + \gamma_{jt})} \mathrm{u_{ijt}} \tag{1}$$

where T_{ijt} are number of tourists (domestic and international) from origin "i" to destination "j" in time "t", *PTA* is a dummy for Preferential Trade Agreements, *Glob* measures globalization (Bergstrand et al., 2015) and consists of a dummy variable for international trade (taking the value 1 for international flows and 0 for domestic ones, labelled as 'int') interacted with year dummies (excluding 2008 to avoid multicollinearity), *climatic* encapsulates the set of climatic variables interacted with *int*, *event* is the number of *extreme weather* events (implicitly interacted with *int*), μ_{ij} are CPFE and δ_{it} and γ_{jt} are CYFE for the exporter and the importer, respectively.

It is important to note that this methodology do not allows us to discern in our variables of interest between the origin (i) and the destination (j) and they can be used indistinctly. This is the reason why the notation for climate and events is i(j).

The variable *climate* encompasses two key climate factors: temperature and heavy precipitation. Specifically, we use the annual average temperature of each country (*temp* in the tables) and the number of days per year when precipitation exceeds 20 mm (*precipitation* in the tables). Additionally, as an alternative to *temp*, we include the number of days in which the maximum temperature surpasses 30 degrees Celsius (*hot_days_30* in the tables). Furthermore, we have considered the following events: storms, landslides, floods, wildfires, extreme temperatures, epidemics, and droughts.

Tourism data were obtained from the United Nations World Tourism Organization (UNWTO), while data on Preferential Trade Agreements (PTA) were sourced from the Dynamic Gravity Dataset (DGD), developed by the United States International Trade Commission (USITC).[6] This database provides data up until 2019, so we filled the gap to 2021 using information from the World Trade Organization (WTO) website.

With respect to our variables of interest, on the one hand, climates variables come from the Climate Change Knowledge Portal (CCKP, World Bank).[7] On the other hand, extreme weather events come from the International Disasters Database (EM-DAT), Center for Research on the Epidemiology of Disasters.

III. Results

We first estimate Equation 1 by including, in addition to the control variables, the climate variables: *temp* and *precipitation.* The results are presented in Column 1 of Table 1. As shown, preferential trade agreements (PTA) do not have a significant impact on tourism flows on average. In contrast, our measure

[6] See Gurevich & Herman (2018).

[7] The Climate Change Knowledge Portal considers four essential climate variables: average maximum-temperatures, average minimum-temperature, average mean temperatures and precipitations.

of globalization clearly indicates a trend of increasing international tourism flows relative to domestic ones along the period, with the notable exceptions of the years 2020 and 2021.[8] These exceptions are a clear reflection of the severe mobility restrictions during the COVID-19 period, which affected international travel more than domestic mobility.

Regarding our variables of interest, change in temperatures do not appear to influence on average international tourism flows differently from domestic ones. However, precipitation levels seem to reduce international flows relative to domestic ones, although the impact is relatively small. In particular, on average, an increase of 1 unit of this variable (100 additional days with rain > 20mm) implies a relative reduction of international flows of around 9.6%.[9] In other words, an additional day of heavy rain reduces international tourism by approximately 0.096% relative to domestic tourism.

Our dataset allows us to distinguish whether PTAs focussed exclusively on goods, services, or both. We leveraged this distinction to assess whether the type

[8] The reference year is 2008. The coefficient for 2009 is also negative, most likely reflecting the ongoing consequences of the financial crisis.

[9] We have escalated the original variable by dividing the values by 100. It is usual that this variable reports a value higher than 365 because the calculations consider intense precipitation events at each considered point of the territory as independent, even if they occur on the same day in different locations. Therefore, when the results are averaged or summed across the entire country, the total may exceed 365. This approach reflects the spatial variability of the climate rather than a simple count of days.

of preferential agreement influences tourism flows. The results are presented in Column 2. Interestingly, and somewhat unexpectedly, only PTAs focused exclusively on goods positively affect international tourism. Upon further analysis, we found that these agreements often involve countries that were not previously deeply integrated economically. Therefore, we conclude that trade integration can also foster the movement of people, facilitating international tourism.

The data source includes a set of variables related to temperatures that may better capture the effects of climate change than temperature averages alone. Among these variables, we selected the number of days with maximum temperatures exceeding 30°C (referred to as *hot_days_30* in the tables). This variable is highly correlated with average temperatures (correlation coefficient: 0.84) but exhibits a much stronger upward trend during the analysis period. This trend is illustrated in Graph 1, which depicts temperatures alongside hot days in index numbers. In the two linear regressions, the slope coefficient is significant; however, the slope for hot days shows a much steeper upward trend, further underscoring its strong ability to reflect the effects of climate change.

We, therefore, include the number of hot days instead of temperatures in the regression analysis (column 3). As shown, a higher occurrence of discomforting temperatures discourages international tourism. Specifically, an additional day with temperatures exceeding 30°C reduces international tourism in relative terms by approximately 1.1% on average.

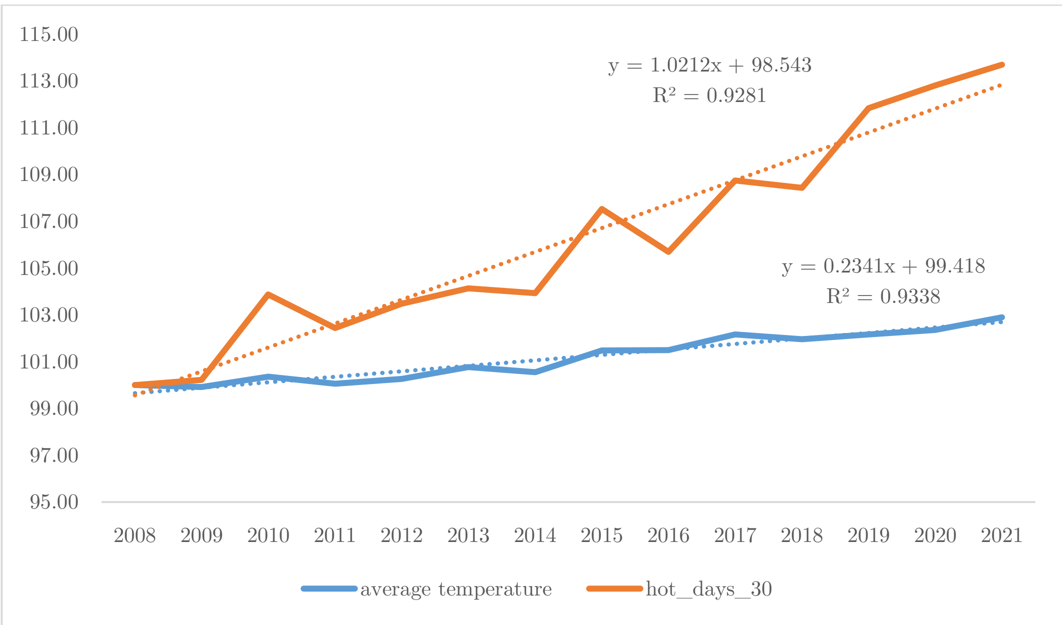
The next step is to consider the inclusion of extreme events, which is reflected in column 1 of Table 2. As observed, disastrous events also deter international tourism. Each additional event reduces international tourism by around 0.7%. The breakdown by type of events is presented in column 2 of Table 2. As shown, five of the seven types of events considered, storms, landslides, wildfires, extreme temperatures, and epidemics negatively impact international tourism (relative to domestic) by approximately 0.9%, 2.3%, 4.2%, 1.9%, and 4.7%, respectively, for each additional occurrence. The other two remaining types of phenomena (floods and droughts) do not appear to significantly affect international tourism on average.

It is important to note that these estimates are derived from a pooled sample of countries. However, specific phenomena (e.g. a persistent rise in temperatures, frequent heavy rain episodes, or severe wildfires) may have vastly different impacts on international versus domestic mobility depending on the country and its unique circumstances.

For instance, warmer climates in traditionally cold regions could extend the seasons for outdoor activities such as hiking, camping, and lake visits, encouraging residents to vacation domestically rather than traveling abroad.

Domestic tourists might prefer to take advantage of improved weather conditions to avoid the costs associated with international travel. At the same time, these regions may become more attractive to international tourists, who can enjoy a more comfortable climate. However, such areas are often valued for activities tied to colder conditions, such as skiing. If temperatures rise, the duration of these seasons may shorten, reducing interest from international tourists seeking these experiences.

Graph 1: Evolution of temperatures and hot days in the sample.



When considering extreme events, numerous factors come into play. Events like wildfires, hurricanes, and heatwaves, can render some destinations less appealing or even unsafe for international visitors. On the other hand, international tourists may perceive these events as distant or unlikely to disrupt their planned trips, particularly if they are traveling to unaffected areas. Domestic tourists, however, may feel a stronger emotional connection to regions impacted by such events, leading to heightened concern for safety, environmental damage, or disruptions. Consequently, domestic tourists may be more inclined to avoid affected areas. In contrast, international tourists might view these phenomena as exotic, potentially increasing their interest in visiting to witness or learn about their effects.

Given these considerations, we believe it is highly valuable to examine the specific impact of each climatic phenomenon on individual countries. To this end, we performed regressions (one for each country and phenomenon) that split the variable of interest into two components: one representing the values specific to the country under consideration and the other encapsulating the values from the rest of the countries. The results for *temp*, *precipitation, hot_days_30* and *events* are presented in Table 3a. We illustrate the results of our estimations showing how each variable of interest influences (if it is the case) different countries, either increasing international tourism relative to domestic tourism or vice versa.[10]

[10] The set of regressions is large. We will provide them upon request.

By the inspection of table 3a we can see that, as expected, we find countries for which a similar phenomenon impacts international tourism relative to domestic tourism in different directions. In any case, some relevant comments are in order both for climatic variables as well as for events.

In the first case, relating temperatures (which average coefficient is not significant) we see that the number of countries for which international tourism increases relative to domestic tourism is clearly higher than the opposite. A great part of these countries is composed by cold countries (most European) who probably benefit for more friendly temperatures to attract foreign visitors. In the other group of countries, it seems reasonable that Australia, India or Philippines discourage international tourism when temperatures increase but there are two notable exceptions: Canada and the USA. In fact, if we isolate these countries from the general variable, the coefficient for the pool of the rest of the countries is positive and significant.[11] For the particular case of Canada and the USA, one of the factor may be the impact of climate change on the ski industry (Scott and Steiger, 2024).

[11] For the USA case, the coefficient for USA is -0.573 (standard deviation 0.264) and for the pool of rest of countries the coefficient is 0.180 (standard deviation 0.061). For the Canada case, the coefficient for Canada is -1.327 (standard deviation 0.166) and for the pool of rest of countries the coefficient is 0.248 (standard deviation 0.067). Regression will be provided upon request.

Regarding hot days, the parallelism with temperatures is quite evident, as the former is a direct reflection of the latter. In this case, however, international tourism is further negatively impacted in countries where heat stress is already a reality, such as Laos, Malaysia, South Africa, and Thailand, among others. Finally, as it is observed, the increase in heavy rains has very heterogeneous effects by countries.

Concerning events as a whole, we find that they impact (in a sense or another) international vs domestic tourism for half of the countries of our sample. Moreover, international tourism is negatively affected with respect to domestic tourism more frequently (2/3 vs 1/3). In any case, we have to take into account that these are rare phenomena for the majority of the countries and that the average effect may obscure particular impacts for specific periods. The analysis by countries reveals another interesting result: the impact of events in the United States is key to the observed negative impact for the entire sample.[12] It is important to note that this country experiences the highest number of events in the selected period (355) followed by China (320) Philippines (218) and India (204).

[12] The coefficient for USA is -0.023 (standard deviation 0.006) and for the pool of the rest of countries -0.002 (standard deviation 0.004). Regression will be provided upo request.

The next step is to analyze the impact of each of the seven events considered for each country (Table 3b). To achieve this, we disaggregate the variable representing the events of each specific country into the relevant types of disasters under consideration. To prevent collinearity issues, we calculated the correlation among the occurrence of the seven events for each country and removed any collinear variables as necessary.[13]

International tourism in a great part of the countries of our sample are affected by storms, floods or extreme temperatures in one sense or another, and only in this last case international tourism behaves worse than domestic tourism for more countries.[14] The rest of the events, less frequent, impact only some countries being landslides and epidemics the phenomena that clearly discourage international tourism in relative terms. Focussing on the most interesting case, the USA, we see that storms, floods, landslides and droughts are responsible for the negative effect detected.

[13] We have considered that a correlation value higher than 0.7 could potentially create collinearity issues. In practice, there are many few cases. For instance, in the US case floods and wildfires have a correlation coefficient of 0.75. We have deleted the “wildfire” variable.

[14] Storms (917) and floods (836) are by far the most frequent phenomena followed by extreme temperatures (150).

IV. Conclusions

In this paper, we have estimated using a structural gravity equation the impact of climate change on tourism flows on a sample of 50 countries over the period 2008-2021. We have focussed on climatic variables (temperatures, number of hot days and heavy precipitations) and the occurrence of weather events (storms, landslides, floods, wildfires, extreme temperatures, epidemics and droughts). On average, the number of hot days, heavy precipitations and weather events negatively affect international tourism flows relative to domestic ones. However, as expected, there is a high heterogeneity across countries.

In particular, although the average coefficient is not statistically significant, there is a notable number of countries (particularly colder ones) where rising temperatures have a positive effect on international flows relative to domestic ones. This effect is offset by Canada and the USA, where the negative impact outweighs the positive effect observed in the pool of the rest of the countries. The USA is also a key country in driving the average negative impact detected with respect to extreme events. In terms of specific event types, storms, landslides, wildfires, extreme temperatures, and epidemics all negatively affect international tourism relative to domestic tourism.

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Table 1. Climate change and Tourism. Impact of climate variables. Period 2008-2021.

	(1)	(2)	(3)
Dependent Variable	**Tourism flows**	**Tourism flows**	**Tourism flows**
PTA_{ijt}	0.046		
	(0.035)		
PTA_goods_{ijt}		0.212^{***}	0.204^{***}
		(0.052)	(0.054)
$PTA\_services_{ijt}$		-0.123	-0.131
		(0.236)	(0.235)
$PTA\_goods\&services_{ijt}$		0.034	0.029
		(0.035)	(0.036)
$temp_{i(j)t}$	0.081	0.091	
	(0.078)	(0.079)	
$precipitation_{i(j)t}$	-0.101^{**}	-0.082^{**}	-0.117^{***}
	(0.051)	(0.042)	(0.042)
$hot\_days\_30_{i(j)t}$			-0.010^{**}
			(0.004)
$Glob_{ij2009}$	-0.042^{***}	-0.046^{***}	-0.042^{***}
	(0.015)	(0.015)	(0.015)
$Glob_{ij2010}$	0.037^{**}	0.036^{**}	0.062^{***}
	(0.017)	(0.018)	(0.021)
$Glob_{ij2011}$	0.067^{***}	0.066^{***}	0.082^{***}
	(0.024)	(0.024)	(0.025)
$Glob_{ij2012}$	0.064^{***}	0.063^{***}	0.085^{***}
	(0.025)	(0.025)	(0.025)
$Glob_{ij2013}$	0.082^{***}	0.080^{***}	0.112^{***}
	(0.030)	(0.029)	(0.032)
$Glob_{ij2014}$	0.150^{***}	0.148^{***}	0.180^{***}
	(0.034)	(0.034)	(0.034)
$Glob_{ij2015}$	0.160^{***}	0.164^{***}	0.228^{***}
	(0.034)	(0.035)	(0.039)
$Glob_{ij2016}$	0.184^{***}	0.187^{***}	0.241^{***}
	(0.036)	(0.037)	(0.041)
$Glob_{ij2017}$	0.200^{***}	0.203^{***}	0.278^{***}
	(0.035)	(0.036)	(0.042)
$Glob_{ij2018}$	0.227^{***}	0.231^{***}	0.301^{***}
	(0.034)	(0.034)	(0.039)
$Glob_{ij2019}$	0.244^{***}	0.246^{***}	0.340^{***}
	(0.036)	(0.036)	(0.040)
$Glob_{ij2020}$	-0.664^{***}	-0.664^{***}	-0.580^{***}
	(0.063)	(0.063)	(0.075)
$Glob_{ij2021}$	-0.800^{***}	-0.800^{***}	-0.704^{***}
	(0.077)	(0.077)	(0.089)
Constant	20.570^{***}	20.554^{***}	20.650^{***}
	(0.068)	(0.064)	(0.026)
Observations	26,103	26,103	26,103
Country pair FE	Yes	Yes	Yes
Importer-year and Exporter year FE	Yes	Yes	Yes
Domestic tourism	Yes	Yes	Yes
Pseudo R2	0.99	0.99	0.99

Note: *significant at 10% level, ** significant at 5% level, ***significant at 1% level.
Standard errors are clustered by country-pair.

Table 2. Climate change and Tourism. Impact of weather events. Period 2008-2021.

	(1)	(2)
Dependent Variable	**Tourism flows**	**Tourism flows**
PTA_goods$_{ijt}$	0.212***	0.215***
	(0.054)	(0.056)
PTA_services$_{ijt}$	-0.128	-0.133
	(0.234)	(0.235)
PTA_goods&services$_{ijt}$	0.032	0.037
	(0.037)	(0.037)
precipitationi$_{(j)t}$	-0.123***	-0.120***
	(0.042)	(0.039)
hot_days_30$_{i(j)t}$	-0.011***	-0.011**
	(0.004)	(0.004)
events$_{i(j)t}$	-0.008**	
	(0.003)	
storms$_{i(j)t}$		-0.011**
		(0.005)
landslides$_{i(j)t}$		-0.023*
		(0.014)
floods$_{i(j)t}$		0.004
		(0.005)
wildfires$_{i(j)t}$		-0.043***
		(0.014)
extreme temperatures$_{i(j)t}$		-0.021***
		(0.009)
epidemics$_{i(j)t}$		-0.048*
		(0.027)
droughts$_{i(j)t}$		-0.004
		(0.016)
Constant	20.650***	20.646***
	(0.026)	(0.025)
Observations	26,103	26,103
Country pair FE	Yes	Yes
Importer-year and Exporter year FE	Yes	Yes
Domestic tourism	Yes	Yes
Pseudo R2	0.99	0.99

Note: *significant at 10% level, ** significant at 5% level, ***significant at 1% level.
Standard errors are clustered by country-pair.
To save on space, the variables for globalization have been omitted in the table.

Table 3a. Climate change and Tourism. Impact of climatic variables and events by countries. Period 2008-2021.

Temperatures		**Hot_days_30**	
↑ International/domestic	↓ International/domestic	↑ International/domestic	↓ International/domestic
Austria	Armenia	Belarus	Armenia
Belarus	Australia	Bulgaria	Australia
Bulgaria	**Canada**	Colombia	Canada
Colombia	Chile	Croatia	Chile
Croatia	Estonia	Czech Republic	Finland
Czech Republic	India	Ecuador	India
Germany	Norway	Greece	Laos
Greece	Philippines	Hungary	**Malaysia**
Hungary	**United States**	Italy	Philippines
Italy		Latvia	South Africa
Japan		Lithuania	Switzerland
Kyrgyzstan		Netherlands	Thailand
Latvia		Portugal	Trinidad and Tobago
Lithuania		Romania	Turkey
Netherlands		Saudi Arabia	United States
Poland		Slovenia	Zimbabwe
Portugal			
Romania			
Slovakia			
Slovenia			
Precipitations		**Events**	
↑ International/domestic	↓ International/domestic	↑ International/domestic	↓ International/domestic
Armenia	Australia	Belarus	Belgium
Austria	Bulgaria	Chile	Bulgaria
Belarus	Canada	Colombia	Cambodia
Croatia	India	Luxembourg	Canada
Czech Republic	Italy	Philippines	Croatia
Ecuador	Kazakhstan	Saudi Arabia	Estonia
Estonia	Kyrgyzstan	Switzerland	Hungary
Finland	Laos	Trinidad and Tobago	India
Greece	Norway	Zimbabwe	Italy
Hungary	Portugal		Kyrgyzstan
Latvia	Romania		Laos
Lithuania	Spain		Malaysia
Luxembourg	Switzerland		Portugal
Netherlands	Trinidad and Tobago		South Africa
Poland	Turkey		Thailand
Slovakia	Vietnam		United Kingdom
Slovenia			**United States**
United Kingdom			

Table 3b. Climate change and Tourism. Impact of the types of events by countries. Period 2008-2021.

Storms		**Landslides**	
↑ International/domestic	↓ International/domestic	↑ International/domestic	↓ International/domestic
Australia	Armenia	Italy	Armenia
Canada	Cambodia	Korea	Colombia
Croatia	France	Philippines	Ecuador
Czech Republic	India		India
Germany	Laos		Japan
Greece	Luxembourg		Kyrgyzstan
Hungary	Malaysia		Norway
Italy	Netherlands		Turkey
Korea	Philippines		United States
Poland	Portugal		
Romania	Thailand		
Saudi Arabia	Turkey		
Slovenia	United States		
Floods		**Wildfires**	
↑ International/domestic	↓ International/domestic	↑ International/domestic	↓ International/domestic
Austria	Australia	Colombia	Australia
Belarus	Bulgaria	Greece	Canada
Cambodia	Czech Republic	Latvia	Ecuador
Canada	Estonia	South Africa	India
Colombia	Hungary		Portugal
Croatia	India		
Ecuador	Italy		
France	Lithuania		
Luxembourg	Malaysia		
Poland	Portugal		
Romania	South Africa		
Saudi Arabia	United Kingdom		
Trinidad and Tobago	United States		
Extreme temperatures		**Epidemics**	
↑ International/domestic	↓ International/domestic	↑ International/domestic	↓ International/domestic
Armenia	Austria	Korea	Ecuador
Australia	Belgium		India
Greece	Belarus		Philippines
Japan	Bulgaria		South Africa
Kazakhstan	Canada		
Korea	Croatia		
Portugal	Hungary		
Switzerland	Italy		
	Latvia		
	Lithuania		
	Poland		
	Romania		
	Thailand		
	United Kingdom		
Droughts			
↑ International/domestic	↓ International/domestic		
India	Australia		
Italy	Kazakhstan		
Lithuania	Kyrgyzstan		
	South Africa		
	United States		

Appendix

Table A1

List of countries

ARMENIA	KYRGYZSTAN
AUSTRALIA	LAOS
AUSTRIA	LATVIA
BELARUS	LITHUANIA
BELGIUM	LUXEMBOURG
BULGARIA	MALAYSIA
CAMBODIA	NETHERLANDS
CANADA	NORWAY
CHILE	PHILIPPINES
CHINA	POLAND
COLOMBIA	PORTUGAL
CROATIA	ROMANIA
CZECH REPUBLIC	SAUDI ARABIA
ECUADOR	SLOVAKIA
ESTONIA	SLOVENIA
FINLAND	SOUTH AFRICA
FRANCE	SPAIN
GERMANY	SWITZERLAND
GREECE	THAILAND
HUNGARY	TRINIDAD AND TOBAGO
INDIA	TURKEY
ITALY	UNITED KINGDOM
JAPAN	UNITED STATES
KAZAKHSTAN	VIETNAM
KOREA, REPUBLIC OF	ZIMBABWE