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Tourism and migration: Identifying the channels with gravity models

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Abstract
As a result of the role played by migrants in supporting host economies, the interest in understanding the impact of migration is growing. However, the literature remains silent on the channels by which migration affects tourism. The present article aims to isolate the effect of migrant networks on tourism by exploring the role of information, travel costs, and demand for visiting friends and relatives. To this end, a theoretical framework that rests upon a structural gravity model is developed. The model allows not only a better understanding of the relationship between tourism and migration but also to overcome several empirical biases like the omission of multilateral resistance in tourism flows or controlling for endogeneity. The empirical analysis considered a sample of 34 OECD countries as destination/home and 157 origin/countries-of-birth for tourist arrivals/migration stock. A positive and robust effect of migration on inbound tourism is estimated and the three channels proposed to drive this nexus become relevant.

Keywords
gravity equation, migration, tourism

JEL codes: General (F20), International Migration (F22), Industry Studies: Services (L8)

Introduction

In the last few decades, globalization and advances in transportation and communication technologies have caused a substantial increase in migration and international tourism. Migrants and

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tourists share common travel traits; the difference between them has to do with time and attitude. A migrant, like a tourist, travels to a foreign destination, but usually, stays longer or permanently and has different motivations. Migrants can act as an information-revealing network since they understand the language, culture, values, and preferences about both the home and the host country. This article's main objective is to understand the impact that migration has on international tourist arrivals by exploring the channels that might be driving that relationship. Despite growing social and political interest, the current academic understanding of the effect of migration on tourism focuses on country case studies. There is also considerably less literature on the migration's effect on tourism than on trade or foreign direct investment (FDI). The tourism demand literature analyzed variables such as income levels, relative prices, and transport costs extensively, neglecting other potentially relevant factors, such as migration.[1]

The present article leaps forward in three ways. Firstly, with a theoretical model to explain how migration affects tourism. Secondly, the empirical strategy applies state-of-the-art gravity estimation techniques to overcome known caveats that bias estimates using the gravity model, namely multilateral resistance or remoteness, heteroskedasticity in the error term, and zeros in the dependent variable, over-aggregation and omitted variable bias, along with extensive robustness and validity checks. Lastly, the article identifies three distinct channels beyond the advertising effect for the migrants' home country. The empirical strategy aims to isolate an idiosyncratic effect of migrant networks: the effect that a migrant exhorts on tourism just by the fact of being a migrant. The theoretical and empirical developments of this article overcome the limitations of previous studies and offer new and compelling insights.

Although the conceptual relationship between migration and tourism seems to be well established in the tourism economic literature, few studies have attempted to model it with a formal model and empirically test the nexus between them. The existing empirical literature mainly focuses on case studies in countries like Australia (Dwyer et al., 2010, 2014; King, 1994; Seetaram, 2012), New Zealand (Feng and Page, 2000; Genc, 2013), and Italy (Etzo et al., 2014; Massidda and Piras, 2015). In general, their results reveal a positive relationship between migration and tourism. From a theoretical perspective, Nowak and Sahli (2007) incorporate migration to model the Dutch Disease in a single small island economy. However, this link appears to be underexplored in a multicountry panel setting.

To the best of our knowledge, only two papers study the tourism–migration link in a multicountry setting. On the one hand, Balli et al. (2016), using a gravity model, report a positive relationship between migration and tourist departures (push effect). On the other hand, Provenzano (2020), using complex-network analysis and gravity model, finds no relevant indirect causal relationship in the tourism–migration nexus. However, the current stance of gravity literature tends to favor theoretically consistent structural models to avoid empirical biases (Anderson, 2011; Baldwin and Taglioni, 2006; Yotov et al., 2016).

The present article contributes to literature in three ways. Firstly, this article starts by developing a model that disciplines the empirical analysis. The theoretical model contributes to the literature by modeling explicitly multilateral resistance terms relevant to estimate tourism flows in a gravity setting (Harb and Bassil, 2018). The model allows the interpretation of these terms directly as the remoteness of two country pairs to the rest of possible destinations. Consider two very remote islands in the middle of the Pacific Ocean, like Fiji and Tonga. Now take them closer to the rest of the world and place them in the Mediterranean. Gravity estimates without multilateral resistance would predict the same tourism flows between the Pacific and Mediterranean Fiji and

Tonga. Multilateral resistance corrects this bias since the Pacific islands would have more bilateral tourists than the Mediterranean ones, which are less remote (and have fewer travel costs to many other destinations).[2] Secondly, following the trade and FDI literature, this article explores mechanisms that drive the effect that migrants have on inbound tourism (pull effect) and classifies them into three groups.[3] (i) The *information channel* since immigrants advertise their host country to their compatriots and reduce bilateral informational asymmetries that facilitate trips. (ii) The *travel cost channel* since a large stock of migrants might reduce total travel costs because they intensify transport connections and help to finance compatriot's visits. (iii) The *demand channel* since a large stock of migrants creates awareness among compatriots to visit the country.

This channel is divided into visiting relatives and friends (VRF) demand and non-VRF demand (Dwyer et al., 2014). The trade literature identifies the latter sub-channel as the effect of migrant networks (Aleksynska and Peri, 2014).

Thirdly, the empirical analysis uses a panel data set of a large sample of (home and host) countries during 1995–2013 to explore the tourism–migration nexus. Indeed, due to migration data availability, 34 OECD countries are used as host/tourist destinations and 157 as home/source countries. Results reveal an idiosyncratic effect of migrant networks is significant and positive, after controlling for their ability to reduce information asymmetries (with education level), travel costs (financial costs), and increase VRF demand (cultural proximity).

The article is organized as follows. The second section presents the theoretical model defined to explore the tourism–migration nexus. The third section presents the empirical strategy and data used, while the fourth section presents the results of the empirical analysis. Finally, conclusions are discussed in the fifth section.

Theoretical framework

The model builds upon the gravity model of migration of Anderson (2011) modified to explain bilateral tourism, and it is augmented to incorporate knowledge about the destination country. First, l_j denotes the leisure at host location j where this leisure is understood to be the leisure income that foreign tourists receive when they visit country j. It is the "reward" that a tourist receives in terms of travel satisfaction when visiting the destination country. This reward is a countrywide measure and reflects the tourism industry's capacity to increase the utility of tourists. As it is standard in tourism models, tourists also pay a cost to travel. A representative tourist z who visits destination j from origin i faces a cost of travel modeled with iceberg cost $\tau_{ij} > 1$. An iceberg cost was defined by Samuelson (1954) as a fixed cost and is modeled as an ad valorem tax equivalent. When a certain good (or service, in this case) moves from one country to another, this good/service loses a fixed part of its value. Therefore, it can be an additional fixed mark up for traveling from one certain country to another. The presence of iceberg costs ensures that the model captures any correlation between product value and shipping costs. Additionally, tourists require information about destination j in order to travel.

However, the information about the tourist destination is not perfect. As in Crase and Jackson (2000), the information asymmetries affect tourist's decisions in the spirit of Akerlof (1970). So, the knowledge about destination j is introduced and parameterized as $\phi_{ij} \geq 0$. When a tourist does not know of the existence of destination j, it implies that $\phi_{ij} = 0$ and she will not travel there. Higher values of ϕ_{ij} relate to more information about the destination. The key point is that reducing information asymmetries increases the leisure reward for the tourist. Therefore, the net travel leisure can be modeled as $l_j\phi_{ij}/\tau_{ij}$. Consequently, the tourist chooses to travel if

$$(l_j\phi_{ij}/\tau_{ij}) > l_i \tag{1}$$

where l_i is the leisure obtained at home (not traveling or traveling domestically). Equation (1) reads: A prospective tourist from country i will travel to destination j if the net travel leisure (satisfaction, information, and travel costs) is higher than the leisure from staycation.

Let us add more realism to the model and introduce now multiple destinations from which the tourist can choose. Among the alternative destinations, the rational tourist chooses the destination with the most extensive utility. For simplicity, assume that a tourist has a logarithmic utility. Then, the observable component of the touristic utility of traveling from i to j is

$$u_{ij} = \ln l_j + \ln \phi_{ij} - \ln \tau_{ij} - \ln l_i \tag{2}$$

Following McFadden (1973), the probability that a random tourist z picks a particular destination is modeled in the multinomial logit form. This kind of setup has allowed researchers to model migration flows, for example, Beine et al. (2011).

At a national level, the aggregate probability is the proportion of identical tourists from i that choose j. Then, the predicted aggregate flow of tourists from source country i to destination j is

$$T_{ij} = G(u_{ij})N_i \tag{3}$$

where $G(u_{ij}) = \frac{\exp(u_{ij})}{\sum_k \exp(u_{ik})}$ is the proportion of tourists that travel from i to j; k is any other destination than j; and N_i being the population of natives of i. With logarithmic utility, the tourist equation is

$$T_{ij} = \frac{\phi_{ij}l_j/\tau_{ij}}{\sum_k \phi_{ik}l_k/\tau_{ik}} N_i \tag{4}$$

Equation (4) resembles the structure of a constant elasticity of substitution (CES) demand function similar to those that underlie the gravity model of Anderson (2011). To derive a gravity model, the tourist market must be cleared.

Total leisure in all destinations is defined as $L_i = \sum_k \phi_{ik}l_k/\tau_{ik}$ as well as the total tourists arriving at j from all origins $s_J = \sum_i T_{ij}$. The total world's tourist are $N \equiv \sum_t T_i = \sum_j S_j$

When the tourist market clears

$$S_j = l_j \sum_i \frac{\phi_{ij}/\tau_{ij}}{L_i} N \tag{5}$$

Then

$$l_j = \frac{s_j}{\Omega_j N} \tag{6}$$

where $\Omega_j = \sum_i \frac{\phi_{ij}/\tau_{ij}}{L_i}\frac{N_i}{N}$. Substituting equation (5) into L_i

$$L_i = \sum_k \frac{\phi_{ij}/\tau_{ij}}{\Omega_k}\frac{S_k}{N} \tag{7}$$

Now substituting the leisure equation in equation (4) with equation (6) yields a structural gravity equation for tourism

$$T_{ij} = \frac{S_j N_i}{N} \frac{\phi_{ij}/\tau_{ij}}{\Omega_j L_i} \tag{8}$$

Thus, this setup derives a gravity equation analogous to that of trade or migration as in Anderson (2011). The first term $\frac{S_j N_j}{N}$ represents the patterns of tourism in a frictionless world. In this flat world, tourists are distributed in equal proportions to their shares of total tourists in all destinations. The second term $\frac{\phi_{ij}/\tau_{ij}}{\Omega_j L_i}$ represents tourist frictions. Higher travel costs and information asymmetries reduce tourism. Conversely, increasing information (when $\phi_{ij} > 0$) increases bilateral tourist flows. The interpretation of ${}_j$ and L_i is linked to the multilateral resistance terms in a gravity model of trade, as in Anderson and Van Wincoop (2003), where outward multilateral resistance L_i gives the origin's incidence on tourist costs, and inward multilateral resistance Ω_j represents the host's incidence of tourism costs. Implying that tourists' decision to visit a certain destination also depends on the remoteness of those destinations. Without considering those multilateral resistance terms, it would not be easy to interpret that two very remote islands have more tourism flows than two equivalent countries close to a large continent or alternative destinations. A tractable log-linear equation from equation (8) can be obtained as

$$\ln T_{ij} = \ln \phi_{ij} - \ln \tau_{ij} + \lambda_i + \lambda_j \tag{9}$$

where λ_i and λ_j are country fixed effects that bundle all origin and destination fixed variables (including multilateral resistance terms).

Isolating migrant networks

The estimation of the empirical equation (9) is challenging in several ways. The model rests on information asymmetries, which are not directly observable by the econometrician. However, it is well established in the literature that migration reduces information symmetries on both bilateral flows of trade (e.g. Head and Ries, 1998; Peri and Requena, 2010) and FDI (e.g., Cuadros et al., 2019; Javorcik et al., 2011). Nonetheless, the migrant stock is an imperfect measure of informational asymmetries, since migration can increase knowledge, but also reduce travel costs and increase travel demand via migrant networks (VFR channel). The *VRF demand channel* is the most directed one. People travel to visit their relatives and friends that previously migrated to a foreign country. Moreover, permanent migrants might promote their new homeland among their acquaintances who might decide to travel to the host country (Dwyer et al., 2014). This causal nexus between migration and VRF tourism has been documented by King (1994), Feng and Page (2000), and Williams and Hall (2002), among others. In general, these papers found a positive link between both flows, but the evidence is mainly limited to country case studies. Nevertheless, more recent research has provided empirical evidence of the existence of migration on other tourism demand components such as leisure or business tourism (Etzo et al., 2014), and that migrants affect international tourism for different reasons beyond VRF tourism (Dwyer et al., 2010; Seetaram, 2012). For instance, the existence of a stock of immigrants enrich cultural life and tourist attractions at destinations, increase the supply of tourism services (accommodations and restaurants) and promote trade between home and host countries, stimulating leisure and business travel.

Regarding the *travel cost channel*, migrants reduce travel costs since they increase the provision of accommodation and help finance the cost of the trip, acting as an implicit subsidy for their compatriots to finance travel expenses. Moreover, in an interconnected world, a sizable foreign-born community shapes the supply of air routes, reducing costs and fares for inbound tourism. For instance, Lisbon's airport has a direct flight with Luanda in Angola (a former Portuguese colony) twice a day, or there is a direct flight twice a week between the Sao Miguel Islands (Azores) and the Toronto airport. In both cases, this connection relies on the sizable Angolese colony in Portugal and Azorean emigrants in Canada.

Finally, regarding the *information channel*, previous research has also obtained that the skills of migrants matter for their effect on trade and FDI flows(Cuadros et al., 2019; Felbermayr and Jung, 2009; Javorcik et al., 2011). Since the effect of immigrants on inbound tourism will depend on the migrant's capability to reduce travel costs and to share information and create social networks, skilled migrants should impact substantially inbound tourism. Following Cuadros et al. (2019), high-educated individuals may have the language skills, cultural sensitivity, and a more in-depth understanding of customer behavior, so skilled migrants have a more significant capability to share information, advertise their host country, and reduce searching costs. So, migrants act as foreign knowledge brokers, sharing information about the language and culture of potential tourists in the home country, with a potential effect on tourism (Paniagua and Sapena, 2013).[4]

In line with these arguments, the log of migrant stock of country *i*-born natives living in country *j* ($\ln m_{ij}$) is used as a measures the degree of informational asymmetries to parameterize jointly the knowledge about destination (ϕ_{ij}) and travel costs (τ_{ij})

$$\ln \phi_{ij} - \ln \tau_{ij} = \alpha_1 \ln m_{ij} - \alpha_2 \ln d_{ij} + \varepsilon_{ij} \tag{10}$$

where d_{ij} is the bilateral distance between countries as a standard proxy for the travel cost and $\varepsilon_{ij} \sim N(0, \sigma_\varepsilon^2)$ is an unobserved i.i.d. error term.

Finally, this leads to a tractable baseline empirical equation

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln m_{ij} - \alpha_2 \ln d_{ij} + \lambda_i + \lambda_j + \varepsilon_{ij} \tag{11}$$

The next challenge is to identify correctly three ways or channels by which migration affects tourism: travel costs, demand, and information channels. Thus, the migration–tourism equation is augmented with credit constraints, cultural affinity, and education level.

Travel costs: Credit constraints

Several studies have identified financial costs as a significant impediment to tourism. Smeral (2009) highlighted the impact of the recent financial crisis on tourism in Europe. More recently, Khalid et al. (2020) studied the effect of several financial factors (inflation crisis, stock market crash, debt crisis, and banking crisis) on international tourism. The present article considers credit constraints that followed the banking crisis to identify the travel cost channel. According to Khalid et al. (2020), banking crises in the host country reduce inbound tourism. The authors discuss that the banking crisis leads to a credit crunch, investor confidence, a decrease in consumer spending, and a heightened level of economic uncertainty.

When the crisis happens in the host/tourist destination country, it becomes less attractive to tourism. These authors provide empirical evidence that financial crises in the destination country depress inbound tourism since, in the event of a banking crisis, less efficient banks are more likely to collapse, and interest rates on loans increase sharply as risk premium rises.

The empirical analysis follows a similar approach as in Cuadros et al. (2016), who developed and estimated a model that revealed that one of the effects of migration comes through finance. They show that credit constraints moderate the positive influence of migrants on FDI. The hypothesis is that during periods of financial crises, financial constraints (higher unemployment, less access to credit, etc.) faced by immigrants would reduce their capacity to help to finance the cost of the trip of friends and relative. Therefore, the expected result is that credit constraints would reduce the positive impact of migration on inbound tourism. This link is important since it would indicate that cost considerations underlie the migrant–tourism link. The following equation captures the influence of finance on the effect of immigrants on tourism flows

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln m_{ij} - \alpha_2 \ln d_{ij} + \alpha_3 (Dcrisis_i \times \ln m_{ij}) + \lambda_i + \lambda_j + \varepsilon_{ij}. \tag{12}$$

where $Dcrisis_i$ is a dummy variable that takes the value of 1 if country i experiences a systemic banking crisis (i.e. extreme credit constraints) and 0 otherwise. This way, the interaction $Dcrisis_i \times m_{ij}$ captures the financial component of migration. A negative sign of parameter α_3 indicates that when migrants face financial constraints, their positive impact on tourism decreases.

VFR demand channel: Cultural affinity

Moving on to study the demand channel, cultural proximity between the host and home country becomes relevant. The underlying idea is that visits to friends and family are related to culturally close migrant diasporas. As suggested by Fourie and Santana-Gallego (2013), immigrant stocks create the awareness or affinity for visiting places where a large pool of compatriots exists. Consequently, the effect of migration on inbound tourism should be higher in culturally similar countries.

Cultural affinity can be measured using many different proxies such as the same language spoken, similar religious beliefs, or colonial ties in the past. Gravity models make an extensive use of these variables. For example, Yang et al. (2019) explore the role of cultural distance on bilateral tourism movements and obtain a negative and significant effect of cultural distance on international tourist flows. To that respect, Fourie et al. (2015) estimate a sizable positive effect of religious similarity on inbound tourism. The analysis uses religious affinity as a proxy for cultural distance, although results are robust to alternative measures such as common language or colonial ties.

The effect of migrants on inbound tourism depending on the cultural proximity between the host and home country is measured in terms of religious affinity as in Fourie et al. (2015).[5]

In particular

$$\begin{aligned} \ln T_{ij} = \alpha_0 + \alpha_1 \ln m_{ij} - \alpha_2 \ln d_{ij} + \alpha_3 (Dcrisis_i \times \ln m_{ij}) \\ + \alpha_4 (ComRel_{ij} \times \ln m_{ij}) + \lambda_i + \lambda_j + \varepsilon_{ij} \end{aligned} \tag{13}$$

where $ComRel_{ij}$ is a dummy that identifies if countries i and j have a common religion. In equation (13), the interaction $ComRel_{ij} \times m_{ij}$ identifies marginal effects of migration on tourism related to VRF. In this specification, the base category for the migration coefficient is migrant networks from countries without credit constraints and different religions. Therefore, the coefficient α_1 is a cleaner VRF demand channel since its effect is free from travel costs or cultural affinity.

Information channel: Education level

It is plausible that part of the information channel still hides in the error term of equation (13). To further disentangle the information channel, the strategy follows a similar approach as in Javorcik et al. (2011) for FDI and Aleksynska and Peri (2014). These authors rely on the fact that skilled migrants have a substantial effect on reducing informational asymmetries than unskilled migrants. The increasing effect of migration by education level is a well-established fact on the trade and FDI literature (e.g. Cuadros et al., 2019; Docquier and Lodigiani, 2010). High-skilled migrants dispose of higher levels of information and influence, and therefore, the information signal of these individuals is higher than their less-educated peers.

Skilled migrants should have a larger effect on tourism flows due to their higher information signaling. According to the UNWTO (2009), skilled migrants have a higher purchasing capacity than unskilled migrants, and so they make more intensive use of transport connections to travel to their countries of birth and have a higher capacity to receive friends and relatives, for instance by helping them finance the trip. Moreover, this type of immigrant presents a higher potential to create business and ethnic networks and promote the destination to other professionals and countrymen upon their return (call effect). Finally, skilled immigrants potentially contribute diversity and expertise to the supply of tourism services in the destination. For all these reasons, it is plausible that educated immigrants have a substantially larger effect on tourist arrivals than unskilled immigrants.

Introducing migrants by education level is particularly important for our identification strategy. Indeed, it can be distinguished between migrant networks (VRF demand), travel costs, and information by estimating the following equation

$$\ln T_{ij} = \alpha_0 + \alpha_{0L} Shm_{ij}^{L} + \alpha_{0H} Shm_{ij}^{H} + \alpha_1 \ln m_{ij} - \alpha_2 \, ln\, d_{ij} + \alpha_3 (Dcrisis_i \times ln\, m_{ij}) \\ + \alpha_4 (ComRel_{ij} \times ln\, m_{ij}) + \lambda_i + \lambda_j + \varepsilon_{ij} \tag{14}$$

where Shm_{ij}^{L} and Shm_{ij}^{H} are respectively the shares of low-skilled and high-skilled migrants in migrant stocks. Now the total stock of migrants captures the noninformation effect of migrant networks (Javorcik et al., 2011), which for tourism is associated with VFR. This specification identifies clearly the information channel (via the shares), the demand channel (via migrant stock and cultural affinity), and travel cost channel (via financial costs). In this specification, the base category for migration coefficient is migrant networks from countries without credit constraints and different religions. After controlling for the migrant's information signaling (with the education shares), the coefficient α_1 is the closest estimate to an idiosyncratic demand-driven network channel.

Estimation method and data

The gravity equation

The gravity equation is widely used to estimate bilateral cross-border flows of goods, capital, and people (Anderson, 2011; Bergstrand and Egger, 2011). Its popularity relies on its solid theoretical foundations and coherent estimation procedures that yield consistent estimates of the determinants of bilateral trade, FDI, migration, and tourism flows.

The new gold standard in gravity models is a gravity equation that includes structural forces or high-dimensional fixed effects to capture multilateral resistance terms (Anderson and Yotov, 2012). In particular, structural gravity includes home-year and host-year fixed effects (HH*Year FE) to account for any unobservable heterogeneity at the country level that varies with time (e.g. GDP or population), and country-pair fixed effects (Pair FE) that control for unobserved factors at the country-pair level. The usual gravity controls, like distance or common language, are collinear with country-pair FE and do not appear in the regression. This model includes the maximum number of fixed effects that panel data allows for and thus allows only the estimation of the effect of variables that vary at the dyadic level over time, like migration stocks.

The question of whether the multilateral resistance terms are captured adequately by home-year and host-year fixed effects is resolved by Fally (2015), who demonstrates it by using a theoretical property of the pseudo-Poisson maximum likelihood estimator (PPML) by Santos-Silva and Tenreyro (2006). Additionally, PPML overcomes known biases when estimating gravity equations by ordinary least squares (OLS), namely existence of heteroscedastic residuals and zeros in the dependent variable.[6] The iterative PPML algorithm developed by Correia et al. (2019) flexibly accounts for multilateral resistance, pair-specific heterogeneity, and correlated errors across countries and time. Standard errors are adjusted by clustering observations on dyads. In sum, structural gravity with PPML is the standard and preferred gravity estimation method.

Endogeneity

It is also important to note that there is a plausible endogeneity bias in the empirical analysis that stems from the possibility that similar factors underlie the driving forces of tourism and migration. Therefore, reverse causality could be a potential issue affecting the validity of the previous results. Several authors have raised this concern regarding estimates of the effect of migration and trade (Hatzigeorgiou, 2010; Mundra, 2014; Steingress, 2015). However, this concern has been overlooked by previous studies that analyzed the effect of migration on tourism (e.g. Balli et al. 2016).

Previous research suggests various empirical strategies to deal with potential endogeneity. First, the dependent variable, tourist arrivals, is measured as flows while migration is in stocks, reducing the contemporaneous effects of migration on tourism.[7] The second approach is to use instrumental variables (IVs) that remain uncorrelated with tourism. Researchers tend to choose instruments based on the fact that foreigners tend to migrate to countries where other people from their country of birth have previously migrated (see, e.g., Burchardi et al., 2019; Card, 2001; Mundra, 2014; Peri et al., 2004; Peri and Requena, 2010). The historical stocks will strongly determine current migration stocks, but the ancestor distribution from centuries ago is relatively random and should have a weak relationship with today's tourism patterns. Thus, the instrument is the share of the year 2000 population in every country descended from people in different source countries in the year 1500 (Putterman and Weil, 2010). The last strategy to deal with endogeneity applies the generalized method of moments (GMM) that performs two simultaneous equations, one in levels with lagged first differences of the dependent variable as an instrument, and one in first differences with lagged levels of the independent variables as instruments.

Data

The data set is defined for the period 1995–2013 and includes the 34 OECD countries as tourist destinations/host country and 157 as source countries/country-of-birth. The dependent variable (T_{ijt}) is the number of tourist arrivals to country *i* from country *j* at year *t*, while the variable of interest m_{ijt} comprises data for migration stock. The sample selection is limited by migration data availability since the OECD's migration database reports data on migration stock only in the 34 OECD countries. In any case, unbalanced panels pose no issues on gravity model estimates (Balazsi et al., 2018). To estimate the migrants with skill heterogeneity, equation (14) uses data on the migrant stock by the level of education (i.e. primary, secondary, and tertiary education). The extended version of OECD's migration data set (DIOC-E) reports data on migrants' level in 2005 and 2010, allowing a short 2-year panel.

The variables used in the analysis, sources, descriptive statistics, and year coverage are presented in Table 1. Online Appendix reports the full list of countries and a correlation matrix of the variables.

The spatial correlation between tourism and migration is readily seen in Figure 1, which shows two heat maps. The upper panel depicts the aggregate intensity of tourism arrivals of each of the 157 countries in our sample to OECD countries. The lower panel repeats the same exercise for migration stock (in thousands). The country heat distribution shows a similar pattern; with some exceptions, the darker countries tend to be alike in both graphs.

Results

Baseline and cost and VFR channels

Table 2 presents the estimate of the effect of the migration stock on tourist arrival using PPML estimation procedures with dyadic and country-year fixed effects. The dependent variable is tourism arrivals from the migrants' (home) country of birth *i* to the OECD destination (host) country *j*.

Column 1 reports the baseline estimates. Regarding the variable of interest, the estimated coefficient for the effect of the immigrant stock on tourist arrivals is significantly positive at the 1% level. Since this variable in logarithms, its interpretation is an elasticity. Thus, the estimated coefficient of migration would suggest that increasing by 1% the stock of migrants in country *j* would increase tourist arrivals of country *j* in the country *i* by 0.16% on average. Another way to reproduce previous results is to estimate the effect of the migrant stock in the country of origin. It is observed in column 2 that the coefficient is barely significant and lower than the stock in the country of destination (0.029). However, including this variable reduces the sample to flow within OECD counties. Additionally, the stock of migrants in the country of origin would include only an information channel, since it could not include the VRF channel. In sum, there is evidence that the stock of migrants in the OECD countries promotes tourist arrivals from the migrants' country of birth. The last two columns in Table 2 explore the new insights discussed earlier regarding the channels. Firstly, regarding the cost channel, the effect of financial restrictions on the destination/host countries is not significant, albeit the negative sign. Here, it is relevant to mention that the episodes of systemic banking crisis during the period from 1995 to 2013 mainly happened in OECD countries following the 2007 financial crisis. Secondly, cultural affinity has a positive and significant effect (the VFR demand channel). As previously discussed, the effect of migration on tourism is larger for culturally similar countries. Furthermore, the coefficient of migration in column 4 is 0.142, significantly lower than when the controls for costs and VFR are not included,

Table 1. Summary statistics and data sources.

Variable	Mean	SD	Min.	Max.	Years	Description	Source
T_{ijt}	246	1558	0	54,000	1995–2013	Tourist arrivals to country *i* from country *j*	UNWTO (2017)
m_{ijt}	31.4	252.8	0	12,000	1995–2013	Migrants stock in country *i* from country *j*	
$Primary_{ijt}$	0.26	0.21	0	1	2005; 2010	Migrants stock with primary education (stock) and over total stock of immigrants (share)	OECD (2017)
$Secondary_{ijt}$	0.35	0.17	0	1	2005; 2010	Migrants stock with secondary education (stock) and over total stock of immigrants (share)	
$Terciary_{ijt}$	0.40	0.22	0	1	2005; 2010	Migrants with tertiary education (stock) and over total stock of immigrants (share)	
$ComRel_{ij}$	0.14	0.34	0	1	1995–2013	Common religion: Dummy variable that takes value of 1 if religious similarity index between country *i* and *j* is greater than 0.5, 0 otherwise	CIA (2017)
$Dcrisis_{it}$	0.03	0.18	0	1	1995–2013	Dummy variable that takes the value 1 if there is a systematic banking crisis in country *i*, 0 otherwise	Laeven and Valencia (2013)

Note: Tourism and migration data are in thousands.

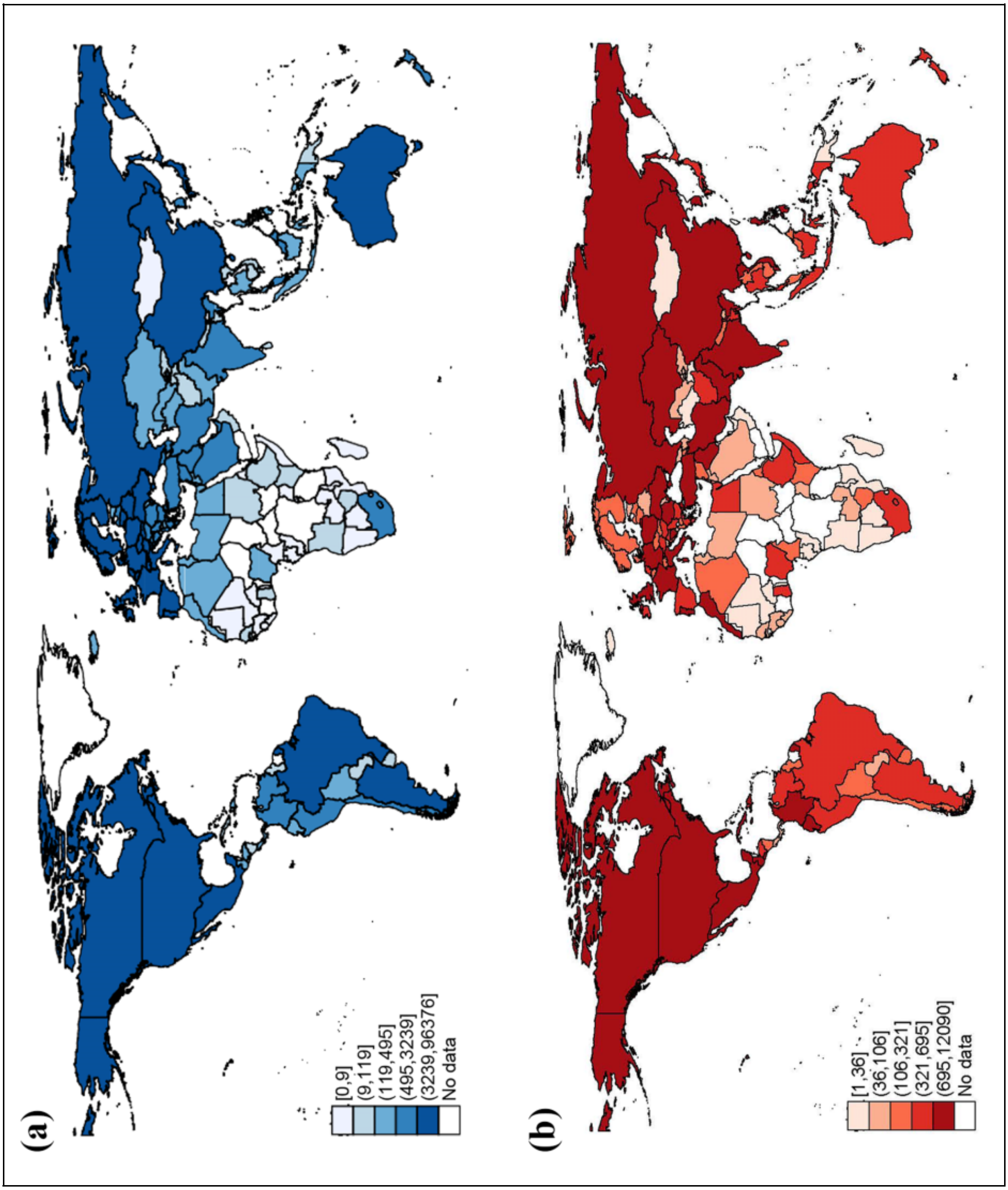

Figure 1. Heat maps. The spatial correlation among both variables is readily seen. (a) Tourism arrivals to OECD countries (2013) and (b) migration stock in OECD countries (2013).

Table 2. Baseline and channels.

	(1) T_{ijt}	(2) T_{ijt}	(3) T_{ijt}	(4) T_{ijt}
ln m_{ijt}	0.161***	0.107***	0.162***	0.142***
ln m_{jit}	(0.03)	(0.03) 0.029* (0.02)	(0.03)	(0.03)
$Dcrisis_i \times \ln m_{ijt}$			−0.010 (0.01)	−0.009 (0.01)
$ComRel_{ij} \times \ln m_{ijt}$				0.063*** (0.02)
Observations	10867	2758	10867	10867
R^2	0.995	0.996	0.995	0.995
Method	PPML	PPML	PPML	PPML
HH*Year FE	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes

Note: PPML: pseudo-Poisson maximum likelihood estimator; HH*Year FE: home-year and host-year fixed effects; Pair FE: country-pair fixed effects. Robust standard errors in parentheses.
*$p < 0.10$, ***$p < 0.01$.

as in column 1 in Table 2. This is an expected result since the coefficient of migration is isolated from the other channels.

Information channel: Education

The effect of different types of migrants according to their education level (skilled and unskilled) on bilateral tourism flows is reported in Table 3. The first three columns include the log of migrant stock by educational level (primary, secondary, and tertiary). As expected, results reveal that the effect of migration on tourism increases with their educational level. More specifically, the marginal effect of migrants with college education more than doubles migrants' effect with primary education.

All three levels of education are included in column 4 to test for the effect of change in the composition of migrant flows. This way, each category's marginal effect is interpreted as an increase in each level in the educational composition of tourism stocks. In other words, this specification is equivalent to the estimate of each educational level's share while maintaining constant the total migration stock.

Interesting results surface: increasing the share of low-skilled migrants harms tourism. This result is not uncommon in the trade and FDI literature. Cuadros et al. (2019) review the empirical studies that report the negative effects of low-skilled migrants in trade and FDI and provide a theoretical explanation for this result. If the effect of migration is more substantial for skilled migrants, increasing the share of low-skilled migrants decreases the share of high-skilled migrants by definition. Therefore, the negative effect of low-skilled migrants piles up evidence supporting an information channel and its effect via high-skilled migrants.

Columns 5–7 of Table 3 present the proposed specification in the empirical section, with the shares of migrants by education rather than their stocks. The results in shares are very similar to that in column 4, the effect of low-skilled shares is negative; the share of secondary education is positive, and tertiary is nonsignificant. However, more importantly, now the estimated coefficient

Table 3. Migrants by education level, years 2005 and 2010.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Primary (stock)	0.063** (0.03)			−0.064* (0.04)			
Secondary (stock)		0.123*** (0.03)		0.222*** (0.08)			
Tertiary (stock)			0.159*** (0.05)	−0.032 (0.08)			
Primary (share)					−0.524** (0.26)		
Secondary (share)						0.731** (0.30)	
Tertiary (share)							−0.279 (0.28)
ln m_{ijt}					0.170*** (0.05)	0.094** (0.04)	0.091* (0.06)
Observations	822	822	822	822	822	822	822
R^2	0.997	0.997	0.997	0.997	0.997	0.997	0.997
Method	PPML	PPML	PPML	PPML	PPML	PPML	PPML
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HH*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: PPML: pseudo-Poisson maximum likelihood estimator; HH*Year FE: home-year and host-year fixed effects; Pair FE: country-pair fixed effects. Robust standard errors in parentheses, clustered by country pair. Stock of migrants in logs.

*p < 0.10, **p < 0.05, ***p < 0.01.

Table 4. Migrants by education level, quantile regression.

	(1) Q(0.10)	(2) Q(0.25)	(3) Q(0.50)	(4) Q(0.75)	(5) Q(0.90)
Tijt→	89	778	11,735	81,269	361,657
Primary (stock)	0.019 (0.06)	−0.075** (0.03)	−0.081*** (0.02)	−0.120*** (0.04)	−0.218*** (0.05)
Secondary (stock)	−0.065 (0.08)	0.050 (0.05)	0.047** (0.02)	0.095** (0.04)	0.256*** (0.05)
Tertiary (stock)	0.490*** (0.04)	0.500*** (0.04)	0.566*** (0.02)	0.610*** (0.03)	0.610*** (0.04)
$Dcrisis_i \times \ln m_{ijt}$	−0.391*** (0.07)	−0.318*** (0.03)	−0.329*** (0.02)	−0.329*** (0.02)	−0.261*** (0.04)
$ComRel_{ij} \times \ln m_{ijt}$	0.212*** (0.04)	0.212*** (0.03)	0.225*** (0.02)	0.255*** (0.03)	0.321*** (0.05)
Observations	822	822	822	822	822
Pair FE	Yes	Yes	Yes	Yes	Yes
HH*Year FE	Yes	Yes	Yes	Yes	Yes

Note: HH*Year FE: home-year and host-year fixed effects; Pair FE: country-pair fixed effects. Bootstrapped standard errors in parentheses.
**p < 0.05, ***p < 0.01.

of the total stock of migrants has a lower effect than in the previous results indicating how powerful the information channel is (with a coefficient of 0.731 in the share of migrants with secondary education) in comparison to the combined cost and demand channel (0.094 in column 6). Therefore, the coefficient can be interpreted as increasing the share of high-school migrants by one point increases tourism flows by 0.731%.

It is a known fact in the gravity literature that PPML tends to underestimate the coefficients of interest (Esteve-Pérez et al., 2019; Yotov et al., 2016). Head and Mayer (2014) point out that the PPML estimator puts more weight on country pairs with large expected levels of trade, which might be true for tourism.

Additionally, it is puzzling that tertiary education does not affect tourism arrivals. It might be plausible that many jobs in tourism require secondary education rather than tertiary. The strategy to overcome both issues is to apply the high-dimensional gravity quantile regression proposed by Myburgh and Paniagua (2016). Several authors have used similar methods to estimate the effect of migration on FDI and trade (Cuadros et al., 2019; Figueiredo et al., 2016).[8] This method controls the importance of tourism in each country pair and reduces the over-aggregation bias highlighted by Anderson (2011: 150).

The results reported in Table 4 reveal several novel insights that were hidden in the PPML average estimates. Firstly, tertiary education's effect is positive, significant, and higher (in absolute value) than the stock of primary and secondary educated migrants. Secondly, the effect of migrants increases with the intensity of tourism in the country pair. For country pairs with a low number of tourists (below the first quartile or 778 yearly tourists), the stock of tourists with secondary education is not significant, and those with primary education are barely significant and have a shallow negative effect. As the number of tourists increases, the effect of this type of migrants increases. Conversely, the effect of tertiary education remains constant. Thus, the effect of high-skilled migrants might be related to pure information signaling, while the effect of less-educated migrants might also contain some a labor dimension that accrues with tourism intensity.

Although the overall effect of credit constraints was not significant as presented in Table 2, in the quantile regression, this channel becomes relevant. It is also worth highlighting that credit constraints are less relevant for countries with many tourists. The negative sign of the interacted

Table 5. Migrants by education level, years 2005 and 2010.

	(1) Q(0.10)	(2) Q(0.25)	(3) Q(0.50)	(4) Q(0.75)	(5) Q(0.90)
Tijt→	89	778	11,735	81,269	361,657
Tertiary (share)	0.815*** (0.12)	0.598*** (0.07)	0.631*** (0.08)	0.576*** (0.06)	0.780*** (0.08)
ln m_{ijt}	0.430*** (0.02)	0.514*** (0.02)	0.533*** (0.01)	0.601*** (0.01)	0.617*** (0.02)
$Dcrisis_i \times \ln m_{ijt}$	−0.304*** (0.07)	−0.348*** (0.03)	−0.342*** (0.04)	−0.345*** (0.03)	−0.378*** (0.03)
$ComRel_{ij} \times \ln m_{ijt}$	0.220*** (0.04)	0.216*** (0.03)	0.231*** (0.02)	0.265*** (0.04)	0.319*** (0.04)
Observations	822	822	822	822	822
Pair FE	Yes	Yes	Yes	Yes	Yes
HH*Year FE	Yes	Yes	Yes	Yes	Yes

Note: HH*Year FE: home-year and host-year fixed effects; Pair FE: country-pair fixed effects. Standard errors in parentheses.
***p < 0.01.

coefficient is larger in the lower quantiles because countries with less tourism tend to have lower economies of scales (i.e. exotic destinations) and higher financing costs. Conversely, cultural affinities tend to potentiate the effect of migrants in the higher quantiles.

Thus, regarding the cost channel, the moderating effect of credit constraints can be appreciated. In line with the results of Cuadros et al. (2016), credit constraints have an offsetting effect. Overall, the results presented in Table 4 suggest that the financial channel is a relevant mechanism for explaining the link between migration and tourism. Therefore, cost-related mechanisms should be considered together with other channels. Moreover, this result suggests that immigrants act as an implicit subsidy for tourism, helping finance the trip. So, when they face credit constraints in the host country, the positive impact of migration decreases being more relevant for lower quantiles). Furthermore, migrants' effectiveness to adequately lower financial information is reduced by systemic crises in their adoptive countries.

To further disentangle the effect of the three channels, the last and preferred empirical equation (14) is estimated. Table 5 reports the results of the quantile regression for tertiary education.[9] Overall, it is obtained the signaling effect via tertiary education is positive, significant, and with similar magnitude as the stock in the previous table. However, the pattern across quantiles is quite different. The effect of the share of tertiary education is now highest in the left tail of the distribution. The difference lies in the fact that the specification is stocks captures both signaling and networking. Recall that the base category for the migration coefficient is migrant networks from countries without credit constraints and different religions. Therefore, the estimates in Table 5 effectively separate the idiosyncratic marginal effect of migrant networks (captured by ln m_{ijt}) from the information signaling effect (captured by the share of tertiary education).

In other words, ln m_{ijt} now captures the effect that migration exhorts on tourism just by the fact of being a migrant and not related to other factors like the ability to transmit information, facilitate finance or share a cultural background. Many other individuals have these traits, and on top of those characteristics, migrants still have a significant and mild significant effect on tourism. Further, in line with the defined theoretical propositions, the information that the migrants transmit to the prospective tourist surfaces as the most crucial channel to foster tourism related to migration. Interestingly, the information channel appears to be more reliable when the rest of the channels are weaker: for those destinations with less tourism.

Table 6. Endogeneity.

	(1)	(2)	(3)	(4)
ln m_{ijt}	0.592*** (0.10)	0.079*** (0.01)		
ln $Tijt - 1$		0.291*** (0.02)		
ln $mijt - 1$			0.143*** (0.02)	
ln $\tilde{m}_{ijt}$				0.099*** (0.02)
Observations	8835	9046	9669	8791
R^2	0.654	—	0.995	0.061
Method	IV-2SLS	GMM	PPML	PPML
HH*Year FE	Yes	No	Yes	Yes
	No	Yes	Yes	Yes

Note: PPML: pseudo-Poisson maximum likelihood estimator; GMM: generalized method of moments; IV: instrumental variable; 2SLS: two-stage least squares; HH*Year FE: home-year and host-year fixed effects. Robust standard errors in parentheses, clustered by pair. IV-2SLS includes distance, border, language, and colony variables. In column 4, variables have been transferred to eliminate common trends.
$^{***}p < 0.01$.

Robustness and validity

Endogeneity. It is informative to check if previous findings are robust after controlling for potential endogeneity. Column 1 of Table 6 reports the IV results using a two-stage least squares (2SLS) estimator. The instrument used is the percentage of the country of origin ancestors in the host country, as compiled by Putterman and Weil (2010).

The estimation results confirm the positive and significant effect of migration on tourism with this IV. Results are robust, with a varied array of fixed effects.

However, since the ancestor data are constant at the country-pair level, it might be the case that unobservable heterogeneity at the country-pair level is biasing the results.

To prevent this issue, column 2 applies the GMM version for linear dynamic panel-data Pair FE models (Arellano and Bond, 1991). The results show that this lagged value is positive and significant, indicating the importance of tourism inertia in explaining tourism flows. Regarding the variable of interest, the result shows that migration is positive and significant even after controlling for unobservable heterogeneity at the country-pair level and the country level.

Column 3 includes migration stocks lagged by one period along with all fixed effects in PPML to exclude the possibility of reverse causality. As expected, the estimated coefficient is positive, significant, and with a magnitude not statistically different from baseline estimates. In column 4, both tourism and migration variables are transformed to eliminate common trends as suggested by Wooldridge (2010: 374–381). This procedure prevents the bias that stems from common trends. Interestingly, all the estimates of the parameter for the migration stock are positive and significant. Therefore, estimates are robust and valid after controlling for endogeneity and common trends.

Bias of omitting multilateral resistance. To assess the bias of performing a theoretically inconsistent estimation, Table 7 excludes the country fixed effects that control for multilateral resistance. Two main biases can surface: First, the magnitude of the estimated coefficients double those obtained in the structural setting. The estimated effect of migration on tourism is higher since there is no control for the remoteness of the country pairs involved.

Table 7. Bias.

	(1)	(2)	(3)
ln m_{ijt}	0.290*** (0.06)	0.293*** (0.05)	0.293*** (0.05)
$Dcrisis_i \times \ln m_{ijt}$		−0.001 (0.00)	−0.001 (0.00)
$Drel_{ij} \times \ln m_{ijt}$			−0.017 (0.03)
Observations	11,465	11,465	11,465
R^2	0.989	0.989	0.989
Method	PPML	PPML	PPML
HH*Year FE	No	No	No
Pair FE	Yes	Yes	Yes

Note: PPML: pseudo-Poisson maximum likelihood estimator. Robust standard errors in parentheses, clustered by pair.
***$p < 0.01$.

Table 8. Departures.

	(1)	(2)	(3)
ln m_{jit}	0.094*** (0.03)	0.191*** (0.03)	0.192*** (0.03)
$Dcrisis_j \times \ln m_{jit}$			−0.006 (0.02)
$ComRel_{ij} \times \ln m_{jit}$			−0.003 (0.00)
Observations	5397	5489	5489
R^2	0.995	0.996	0.996
Method	OLS	PPML	PPML
HH*Year FE	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes

Note: PPML: pseudo-Poisson maximum likelihood estimator. Dependent variable tourism departures; in logs in OLS and levels in PPML. Robust standard errors in parentheses, clustered by pair.
***$p < 0.01$.

Second, the covariates controlling for the rest of the channels display no significant effect.

Tourism departures. Finally, Table 8 provides a sensitivity analysis using tourism departures instead of tourism arrivals as in Balli et al. (2016). Migrants' stock is those of the country of origin to ensure that the results are comparable. Tourist arrivals and migrants in the destination country offer a larger set of countries to the data set; with tourism arrivals, the number of observations is approximately halved. Nonetheless, the results reveal a positive and significant effect of migration using OLS in column 1 and PPML in column 2. Using a different specification, Balli et al. (2016) obtained a lower impact of migration on tourist departures of around 0.03–0.04%. The estimated coefficients' magnitude is in line with the baseline results; however, the rest of the controls appear not to be significant.

Conclusions

This article presented a comprehensive analysis of the effect of migrants on inbound tourism. This article went beyond the existing literature by identifying the channels that drive that link between tourism and migration. The structural gravity model cleared the way to understand the role of multilateral resistance terms on tourism flows and guides the empirical exercise. The study explored mechanisms that explain the link between migration and tourism with three takeaways.

Firstly, the idiosyncratic effect of migrant networks on tourism. After controlling for multilateral resistance terms, country-pair observable heterogeneity, financial and religion covariates (travel cost and VRF channels), and skill level (information channel), the migration stock (network channel) still had a positive and significant effect on tourism flows. Moreover, the IV approach increased the validity of the results and prevented endogeneity bias.

Secondly, the detailed additional channels that drive the tourism–migration nexus. The effect of migration interacted significantly with relevant factors like travel finance and cultural affinities. This article was novel in investigating the role of finance and credit constraints on tourism. Results show that credit constraints at the source country inhibit the positive effect of migration on tourism. Additionally, the study explored the role of religion (as a proxy for cultural similarity). Estimates showed that cultural proximity augments the effect of migration on tourism.

Thirdly, the larger effect of skilled migrants. This finding might be useful in designing better policies related to tourism and migration. The empirical results align with the theory to show that skilled migrants (measured by the level of education) have a significantly higher effect than less-skilled migrants. Further, the effect of high-skilled migrants remained constant across the whole distribution of country pairs, whereas less-skilled migration was concentrated on countries with higher tourism intensity. Isolating the skill effect from the networking or labor effects reveals that increasing the skilled composition on the migration stock had the largest effect on tourism. Both findings combined reveal the importance of the signaling channel and the relevance of migration policies aimed to attract foreign talent for the economy in general and tourism in particular.

For all these reasons, understanding the role that migration has on international tourism flows has important policy implications. Inbound tourism helps generate foreign revenues and is a relevant engine for many countries' economies, but also it has indirect impacts that may be amplified through migration. For instance, as discussed by Piva et al. (2018), business tourism is an effective mechanism to improve productivity, resulting in a strategic mechanism and prospective policy tool to foster economic growth. Therefore, policy makers and stakeholders might use this insight when defining policies and management strategies for the tourism sector. Moreover, in the current context after the COVID-19 outbreak and the subsequent lockdown worldwide, an essential challenge for countries reopening to international flows of citizens. Policies aimed to restrict student, and H1-B visas for specialized workers might prove harmful for tourism. Consequently, the present research could be useful for future research that explores how to reopen essential tourism corridors if it takes into account the link between migration and tourism.

A limitation of the study is related to the fact that some migrants might be working on the touristic sector. Ideally, this common group should be excluded from the sample. However, the use of quantile regression and skill heterogeneity might mitigate to some extent this potential bias. Future research in this area might find appealing avenues by identifying the sectors and profession of the migrants.

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Supplemental material

Supplemental material for this article is available online.

Notes

1. See Genc et al. (2011) and Hatzigeorgiou and Lodefalk (2015) for a comprehensive summary of the literature on the migration–trade nexus and Tomohara (2017) for the FDI-migration link.
2. Anderson and Van Wincoop (2003) are the first to coin and highlight the relevance of multilateral resistance for trade gravity models. Fally (2015) resolves the issue of introducing these terms in an empirical equation by showing that multilateral resistance terms are captured perfectly by country fixed effects.
3. The present article borrows from the well-established relationship between goods, capital flows, and migration. Starting with Gould (1994), several papers have found evidence of the empirical link between migration and trade using gravity models(Blanes, 2005; Felbermayr and Toubal, 2012; Menard and Gary, 2017; Parsons and Vézina, 2018; Peri and Requena, 2010; Rauch, 1999).
4. For the case of Spanish regions, de la Mata and Llano (2013) showed that social networks are relevant in explaining trade in services linked with tourism. Moreover, cultural affinity is a relevant factor that explains tourism demand. As suggested by Fourie and Santana-Gallego (2013), the stock of immigrants increases awareness about destinations with cultural or ethnic similarities.
5. Data on religious affiliation were obtained from The World Factbook created by the Central Intelligence Agency (CIA, 2017).
6. However, a drawback of tourism data compiled by UNWTO (2017) is that it is not possible to discriminate between zero tourism flows and missing values. For this reason, as proposed by Neumayer and Plumper (2016), the PPML estimator is only applied for positive bilateral tourism flows. Thus, the sample size is reduced to around 12,000 observations
7. Lagging migration stocks for several years has also been tested with similar results.
8. Additionally, as Figueiredo et al. (2016) show, the Jensen's inequality does not apply to quantile regression, and therefore zeros can be easily dealt adding one to the logarithm of tourism.
9. The effects of primary and secondary education reveal expected patterns and are not reported for brevity.

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