

Article

Asylum Migration, Borders, and Terrorism in a Structural Gravity Model

Federico Carril-Caccia^{1,2,*}, Jordi Paniagua^{3,4} and Francisco Requena³

¹ Department of Spanish and International Economics, Faculty of Economics and Business, University of Granada, Spain; E-Mail: federicocarril@ugr.es

² Deusto Business School, University of Deusto, Spain

³ Department of Applied Economics II, Faculty of Economics, University of Valencia, Spain; E-Mails: jordi.paniagua@uv.es (J.P.), francisco.requena@uv.es (F.R.)

⁴ Kellogg Institute for International Studies, University of Notre Dame, USA

* Corresponding author

Submitted: 29 April 2021 | Accepted: 25 July 2021 | Published: 28 October 2021

Abstract

In this article, we examine the impact of terrorist attacks on asylum-related migration flows. So far, the literature that examines the “push factors” such as terrorism that explain forced migration has omitted the fact that the vast majority of people forced to flee typically do so toward other locations within the country. The novel feature of our research is the estimation of a structural gravity equation that includes both international migration and internally displaced persons (IDP), a theoretically consistent framework that allows us to identify country-specific variables such as terror attacks. For that purpose, we use information on the number of asylum applications, the number of IDP, and the number of terrorist attacks in each country for a sample of 119 origin developing countries and 141 destination countries over 2009–2018. The empirical results reveal several interesting and policy-relevant traits. Firstly, forced migration abroad is still minimal compared to IDP, but globalization forces are pushing up the ratio. Secondly, terror violence has a positive and significant effect on asylum migration flows relative to the number of IDP. Thirdly, omitting internally displaced people biases downward the impact of terrorism on asylum applications. Fourthly, we observe regional heterogeneity in the effect of terrorism on asylum migration flows; in Latin America, terrorist attacks have a much larger impact on the number of asylum applications relative to IDP than in Asia or Africa.

Keywords

asylum migration; forced migration; internally displaced persons; structural gravity; terrorism

Issue

This article is part of the issue “Migration and Refugee Flows: New Insights” edited by Inmaculada Martínez-Zarzoso (University of Göttingen, Germany / Jaume I University, Spain).

© 2021 by the authors; licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

1. Introduction

According to the UN Refugee Agency, since the end of the 1990s, the number of forcibly displaced people has gradually increased; in 2019, the figure reached 79.5 million, 2.9 million of whom were asylum seekers (UN High Commissioner for Refugees, 2020). This phenomenon represents a social and economic challenge for both forced migrants’ countries and their final destination. Accompanying this trend is the recent surge of terrorism concentrated in developing nations. According to

the Global Terrorism Database, the number of terrorist attacks worldwide has doubled in the last 20 years, with 148 countries suffering at least one episode and 10 countries concentrating 75% of all terrorist attacks. Over the past decade, terrorists killed an average of 21,000 people worldwide each year.

How many of the world’s 79 million displaced people would have stayed at home with lower levels of terrorism? This article aims to contribute to the empirical literature on the determinants of international migration, examining the impact of terrorist attacks on international

forced migration. So far, the literature that examines the “push factors” such as terrorism that explain asylum migration has omitted the fact that the vast majority of people forced to flee typically do so toward other locations within the country. The novelty of our research is the use of the structural gravity model to estimate the effect of terrorism on forced international migration, i.e., asylum migration, accounting for internally displaced persons (IDP). Our sample contains 119 origin developing countries and 141 destination countries, 37 of which were developed economies during 2009–2018.

To the best of our knowledge, this article constitutes the first attempt to estimate forced international migration with a full-fledged structural gravity model. The gravity model of trade is the empirical workhorse of international economics. It is grounded in economic theory, and it is flexible enough to accommodate forced migration. Structural gravity refers to a particular theoretically driven estimation method of the gravity equation that delivers unbiased and theoretically consistent estimates. The structural gravity model contains several relevant features related to the empirical analysis of international flows. Firstly, the inclusion of a complete set of country and country-pair fixed effects controls for unobserved heterogeneity, multilateral resistance, and time-persistent country-pair characteristics. Secondly, the “border” effect stems from the inclusion of domestic flows in the dependent variable. Thirdly, the possibility to hedge collinearity with the fixed effects and include country-specific variables capitalizing on the “border” effect.

A structural gravity model opens the breadth of novel contributions of the study of the forced migration–terrorism link. Firstly, we find that the accumulation of terrorist attacks raises the number of asylum migration flows significantly. The estimates suggest that if terror attacks decreased by 10% in a sending country, forced international migration flows would be reduced by 2% on average. Secondly, the estimates reveal specific regional heterogeneity. For example, terrorist attacks have a larger effect in Latin America than in Asia or Africa. Thirdly, the article makes a preliminary attempt at estimating the border effect in asylum migration (i.e., the preference for internal migration). The estimates suggest that the border effect is larger than in trade and decreased in our study period.

The rest of the article is organized as follows. Section 2 briefly reviews the empirical literature on the terrorism–migration link. Section 3 describes the empirical method, i.e., the structural gravity model applied to forced migration. Section 4 describes the data, and Section 5 reports the results. Finally, Section 6 concludes.

2. Literature Review

Asylum-related migration refers to migration with the intended purpose of seeking international protection in a given country or ultimately results in an individual

applying for protection in the recipient country (UN High Commissioner for Refugees, 2020). There is a relative degree of consensus in the literature that violence is a significant underlying cause of forced migratory movements (i.e., asylum) using various categorizations, e.g., generalized violence, civil war, ethnic conflict, state-sponsored terror (Hatton, 2020). Violence in the homeland causes the movement of people away from the area of conflict, either moving somewhere within the country or trying to reach a foreign destination. Several papers provide evidence in favour of the hypothesis that violence in the homeland causes flight from home for asylum-seeking abroad.

Schmeidl (1997), Davenport et al. (2003), Moore and Shellman (2004), and Salehyan and Gleditsch (2006) use global samples of countries with data spanning from the 1950s to 2000s to identify the drivers of forced migration and conclude that “generalized violence” outweighed political and economic variables as the prominent driver of forced migration. Moore and Shellman (2006) investigate the circumstances that lead some countries to produce a large number of refugees and relatively few IDPs instead of a large number of IDPs and relatively few refugees. They find that civil wars tend to increase IDPs, whereas genocides tend to increase refugees.

Other papers have directly examined the determinants of asylum seekers’ applications from developing countries to Western European countries. Neumayer (2005) finds that economic reasons are more important than political reasons as determinants of the number of asylum seekers over 1975–1999. Among the political factors, restrictions on political rights and civil liberties emerge as crucial factors. Two recent papers suggest that political factors have become more relevant over time. Giménez-Gómez et al. (2019) find that wars, civil conflicts, violations of human rights, and oppressive regimes explain economic migration and forced displacement (asylum seekers) from 51 African source countries into 21 European destination countries between 1990 and 2014. Kang (2020) finds that political instability of the source country is the main factor explaining the determinants of the number of applications for asylum in seven EU countries from 145 origin countries in the 2008–2014 period. Paniagua et al. (2021) study the effect of well-being on forced migration in OECD countries and report that the impact of a composite indicator for safety (or absence of violence) containing two dimensions: assault rate and homicide rate. The authors find that the lack of violence acts as a positive pull factor and a negative push factor.

The number of papers using terrorism to evaluate the impact of violence on forced migration is scarce. Simsek (2006) uses time-series analysis to provide evidence of a positive effect of terrorist attacks on forced movements of people in Turkey, both internally and internationally. Dreher et al. (2011) examine the impact of terrorist attacks on international economic migration rates using a panel of 152 sending countries to six receiving

developed countries over the 1976–2000 period. They find a robust positive relationship between terrorism and skilled migration, but an absence of strong evidence that average emigration is related to terrorism, which indicates that the effect of terrorism on migration depends on the level of education. Hatton (2009, 2016) estimates the impact of a terror scale on asylum migration using a gravity-like model. This terror scale measures the extent of brutality, torture, and arbitrary imprisonment reported by the US State Department. He finds a positive a significant effect of this terror scale on asylum applications.

Several studies using the gravity equation highlight the negative effect of terrorism on international economic flows such as trade (Bandyopadhyay et al., 2018; Egger & Gassebner, 2015; Nitsch & Schumacher, 2004), tourism (Fourie et al., 2020; Santana-Gallego & Fourie, 2020), and foreign direct investment (Hogetoorn & Gerritse, 2020; Powers & Choi, 2012). However, none of the previous papers has estimated a structural gravity model of forced migration. The only exception is Carril-Caccia et al. (2019), who estimate the effect of terrorism on foreign direct investment with a structural gravity equation that includes internal investment and multilateral resistance terms. The following section explains the benefits of estimating a structural gravity model to quantify the impact of terrorism on forced migration.

3. A Structural Gravity Model of International (Forced) Migration

This study applies the structural gravity model to estimate the effect of the degree of terrorism suffered by origin countries on international forced migration. Intuitively, the gravity equation builds on the idea that bilateral flows are directly proportional to the size of the host country's economy and inversely proportional to economic, cultural, and political barriers.

The gravity model is the flagship method of empirical research on international economic flows for two main reasons. Firstly, it offers solid theoretical foundations for several economic flows starting with trade (Anderson & Van Wincoop, 2003) and foreign direct investment (Anderson et al., 2019), but also that stemming from migration (Bertoli & Fernández-Huertas Moraga, 2013), tourism (Santana-Gallego & Paniagua, 2020), and more recently asylum migration (Paniagua et al., 2021).

Secondly, the gravity model offers an empirical toolkit that delivers consistent and unbiased estimates of the variables of interest. The gold standard for gravity estimates aligns with the theory above by including a complete set of fixed effects, namely origin-time and destination-time and country-pair dummies (Head & Mayer, 2014; Piermartini & Yotov, 2016). Country-pair fixed effects reduce endogeneity by controlling for unobservable heterogeneity and time-invariant determinants of migration at the country-pair level. The home

and host country fixed effects are doubly relevant since they control multilateral resistance and any possible country-specific variable. Therefore, the inclusion of a full set of fixed effects absorbs the usual gravity covariates (distance, common language, GDP, etc.) and isolates the impact of the independent dyadic time-varying variables of interest.

Identifying terror attacks, which occur predominantly in sending countries, is a challenge. To estimate the effect of country-specific variables such as terrorism, we capitalize on a second important feature of structural gravity: the inclusion of observations of domestic flows. Other studies that applied the gravity equation to study forced migration omitted the origin-year fixed effects to identify these types of variables (Hatton, 2009, 2016). However, to obtain a closed-form solution of the gravity equation, the gravity model of trade imposes a market clearing condition: All produced goods are consumed domestically or abroad, as Anderson (2011) shows. Paniagua et al. (2021) show that this theoretical condition also applies to obtaining a gravity equation for asylum migration: Displaced people either seek asylum in a third country or move domestically for any given year. However, they did not include domestic forced displacements in their empirical analysis.

Including IDP in the dataset opens three interesting empirical possibilities. Firstly, we can measure the “border effect” (or “home bias”) or the relative importance of asylum seekers to IDP. Secondly, by controlling for the change of the border effect over time, we can measure the variation in unobserved costs of international migration relative to domestic costs, which is generally attributed to globalization (Bergstrand et al., 2015). However, applying for asylum is not always possible for displaced people; illegal immigration is part of the reality of forced migration. Consequently, our dependent variable may understate the extent of forced migration when using asylum applications as a proxy. Therefore, the time-varying border effect also captures any changes in the amount of illegal immigration.

Thirdly, we can hedge the limitation imposed by the fixed effects due to the collinearity with country-specific variables (Beverelli et al., 2018; Heid et al., 2021). Therefore, we can estimate the effect of time-varying country-specific variables such as terrorism and origin-year fixed effects within the structural gravity framework. To this aim, we estimate the following gravity equation:

$$FM_{ijt} = \exp\left(\text{terror}_{it} I_{ij} + X_{it} I_{ij} + Z_{ijt} + B_{iit} + \alpha_{it} + \alpha_{jt} + \alpha_{ij}\right) \times \varepsilon_{ijt} \quad (1)$$

where FM is forced migration, including IDP, for origin country i , destination country j in year t .

Our variable of interest, terror_{it} , is the number of accumulated terrorist attacks in the origin country i in the three previous years. For identification, this variable is interacted with I_{ij} , an international indicator variable

that takes the value of 1 whenever forced migration is international ($I_{ij} = 1 \forall i \neq j$). We can do so because the interaction between the border international dummy (I_{ij}) and country-level variables is not collinear with the set of origin-year (α_{it}), destination-year (α_{jt}), and country-pair (α_{ij}) fixed effects included in the regression. These host country fixed effects control any country-specific time-varying variables that affect both IDP and asylum migration, such as GDP per capita (GDPpc), population, and immigration policy in host countries.

The specification also includes other country-specific control variables X_{it} (interacted with I_{ij}) and dyadic control variables (Z_{ijt}) that are not collinear with the fixed effects (α_{it} , α_{jt} , α_{ij}). As a country-specific control variable, we include the country of origin's "Voice and Accountability," an index that captures perceptions of the extent to which a country's citizens can participate in selecting their government and freedom of expression, freedom of association, and free media. The dyadic control variables are: i) a dummy which takes one whenever a pair of countries have signed a regional trade agreement and zero otherwise; and ii) the stock of fellow citizens granted with the refugee status in the destination country lagged three years.

Lastly, B_{ii} is a dummy variable taking the value of 1 for IDP and 0 otherwise, which controls for country-specific intra-national migration costs and "home-bias" effects and any other country-specific time-invariant characteristics that may drive a wedge between internal and international forced migration as does the aforementioned illegal migration. To control for a parsimonious change in these variables, we interact B_{ii} with 3-year period dummies, $B_{iit} = \sum_t B_{ii} \times PERIOD_t$. These variables measure the evolution of the border effect as a measure of all these border effects.

The empirical equations are estimated using the Poisson Pseudo Maximum Likelihood estimator. Silva and Tenreyro (2006) show that Poisson Pseudo Maximum Likelihood allows one to overcome the two main limitations of estimating the gravity equation with Ordinary Least Squares, not accounting for the zeros present in bilateral statistics and heteroskedasticity problems. Finally, robust standard errors are multi-way clustered at the origin and destination country (Egger & Tarlea, 2015). Due to the significant number of fixed effects in our models, we use the Poisson Pseudo Maximum Likelihood high dimensional fixed effects estimators proposed by Correia et al. (2020).

4. Data

In the present analysis, we employ an unbalanced panel covering the 2009–2018 period, 119 origin developing countries, and 141 destination countries, 37 of which are developed economies according to the UN Conference on Trade and Development's classification (the country sample is available in Table A.1 in the Supplementary File).

Our primary interest is the impact of terrorism on international forced displacement after considering that terrorism also causes the domestic movement of individuals. Thus, our dependent variable comes from two databases. Forced international migration, proxied by the number of asylum applications, is retrieved from the UN Refugee Agency. By adding the number of IDP, we have a complete matrix of displaced persons moving domestically or abroad. The number of IDP is retrieved from the Internal Displacement Monitoring Centre, being the number of IDP in a given year due to violence and conflicts. Our main explanatory variable is terrorism in the origin country, whose indicators were obtained from the Global Terrorism Database (LaFree, 2010; The National Consortium for the Study of Terrorism and Responses to Terrorism, 2018). We carry out our primary analysis using the number of terrorist attacks, and we use alternative measures (number of casualties and material damages) in the robustness part of the article.

Figure 1 shows the evolution of the number of asylum seeker applications. In 2009 there were about half a million asylum applicants worldwide; by 2018, this number had doubled. Compared to the number of domestic IDP, the number of asylum seekers is small though it grows faster: the share was 3.5% in 2009 and 10 years later rose to 5.5%.

The evolution of the indicators of terrorism over the period 2009–2018 is displayed in Figure 2. The three indicators (attacks, deaths, and material losses) exhibit similar trends. Terrorism has increased over time, with a peak in 2014. Terrorist attacks concentrate in a few countries: 20 countries have accumulated 90.6% of the world's terrorist attacks, most being in the Asian continent (see Figure 3). Interestingly, the correlation between the number of asylum seekers and the three measures of terrorism is high for the 10-year period (0.80). When we use disaggregated data by country, we observe a clear positive correlation between asylum applications and terrorist attacks (Figure 4) again.

As additional control variables to those typically used in the asylum migration literature, we include a variable that controls for the migrant network in the host country ("lagged stock of refugees") and a variable of governance in the country of origin ("Voice and Accountability"). The former captures the importance of diasporas and local migrant communities in destination countries as facilitators of the new arrival of refugees (Hatton, 2016). The latter captures perceptions of the extent to which a country's citizens can participate in selecting their government, have freedom of expression, freedom of association, and free media. The home country index ranges from -2.5 (the lowest score) to 2.5 (Kaufmann et al., 2011), with higher values indicating more participatory democracy and citizens' accountability.

The rest of the gravity-type variables include economic and political enhancers or inhibitors of the free movement of people abroad. Population and GDPpc come from the World Bank's World Development

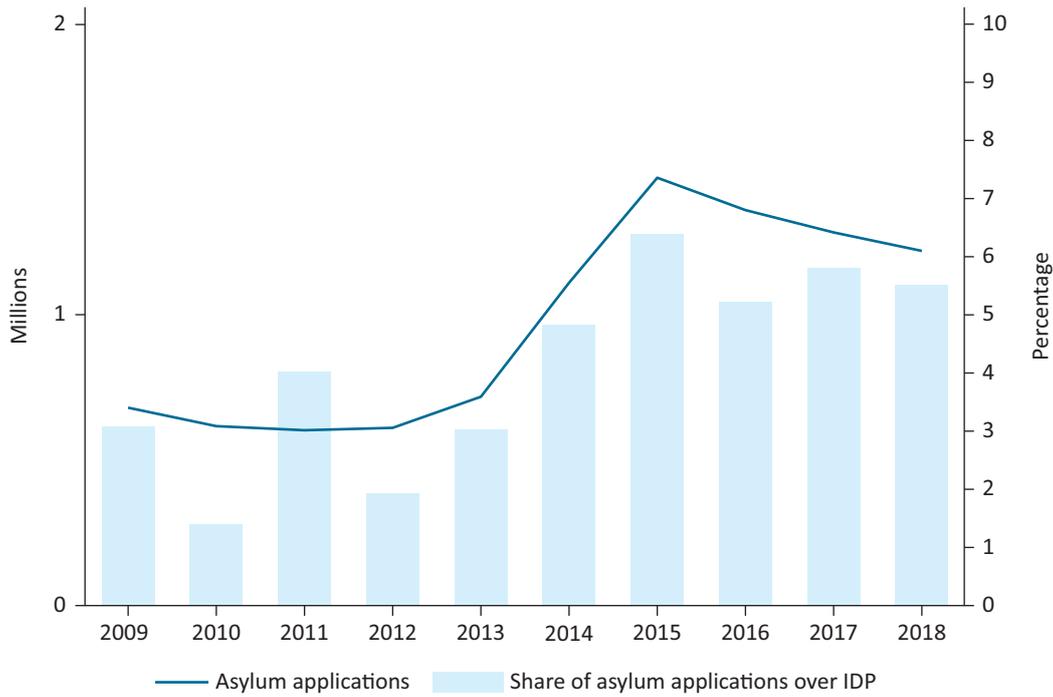


Figure 1. Evolution of asylum application and their share over IDP. Source: Authors’ own elaboration using UN High Commissioner for Refugees and IDP databases.

Indicators. We expect that large countries of origin have less relative international migration mobility and more developed economies receive relatively more asylum applications. Bilateral distance and a shared border between two countries capture time-invariant transportation costs. The costs of migrating are also lower

if a pair of countries share a common language, which reduces barriers to entry and increases the likelihood that a migrant will secure employment or housing. A similar argument is valid for countries that share a colonial history, share a common legal origin, or have a religious affinity. For example, individuals in countries that share

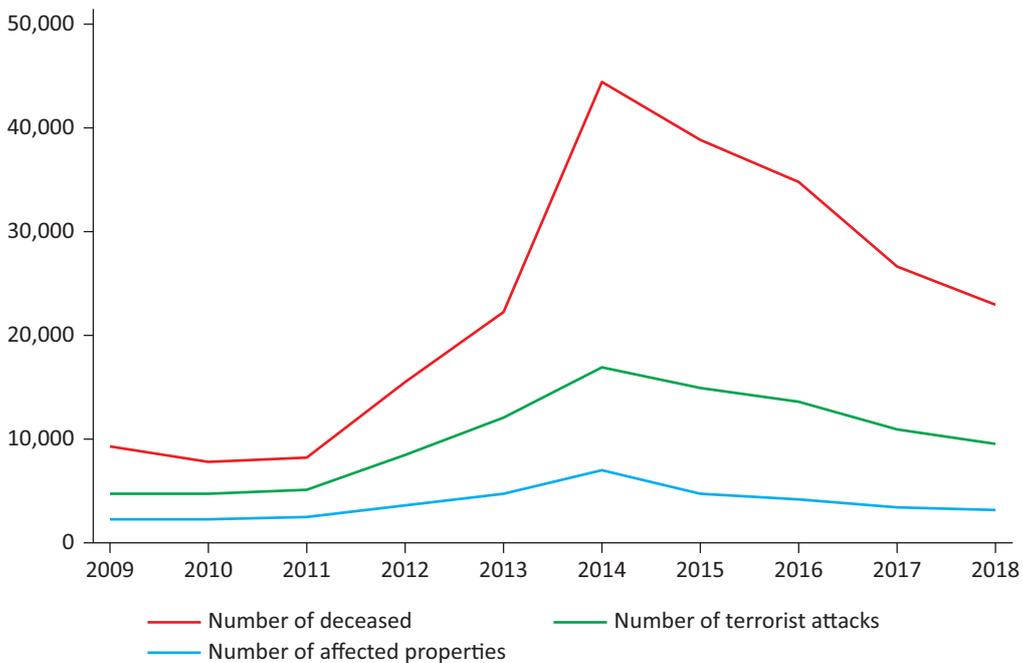


Figure 2. Evolution of terrorism, 2009–2018. Note: The three variables refer to the count of cases in a given year: number of deceased due to terrorism, number of attacks, and number of affected properties. Source: Authors’ own elaboration based on the Global Terrorism Database.

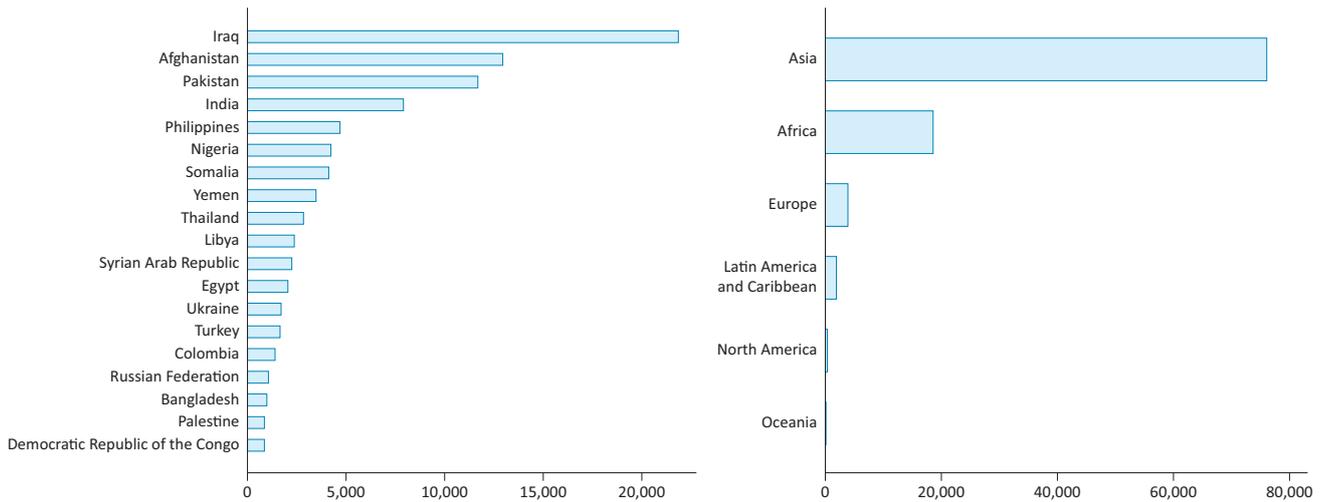


Figure 3. Geographic distribution of all terrorist attacks, 2009–2018. Source: Authors’ own elaboration based on the Global Terrorism Database.

a colonial past with a potential destination will have better information about the country’s institutions, culture, and economy and will be more likely to migrate. These variables come directly from CEPII (Head & Mayer, 2014). Regional trade agreements come from Mario Larch’s Regional Trade Agreements Database (Egger & Larch, 2008). Descriptive statistics and source links are provided in Table A.2. in the Supplementary File.

5. Results

The results of our empirical analysis, including IDP in the dependent variable, are reported in Table 1. As IDP is present in the dependent variable, the interpretation of the estimated coefficients is the impact of the inde-

pendent variable relative to IDP. Column (1) of Table 1 reveals the magnitude of the “border” effect, that is, how many more times displaced persons move internally than abroad. The border coefficient reveals that there are 2,540 (= $\exp[7.84]$) internally displaced people for every asylum seeker. To the best of our knowledge, this is the first estimate of the border effect of (forced) migration. Our estimated border effect of forced migration is larger than trade’s, ranging between 10 and 30 (Head & Mayer, 2014). We expected, however, a larger magnitude for forced migration since the relative difficulty of movement (domestic vs. international) is larger for distressed migration than for goods.

To estimate the time-invariant border effect (B_{ij} , described in Section 3), we have to sacrifice the country-

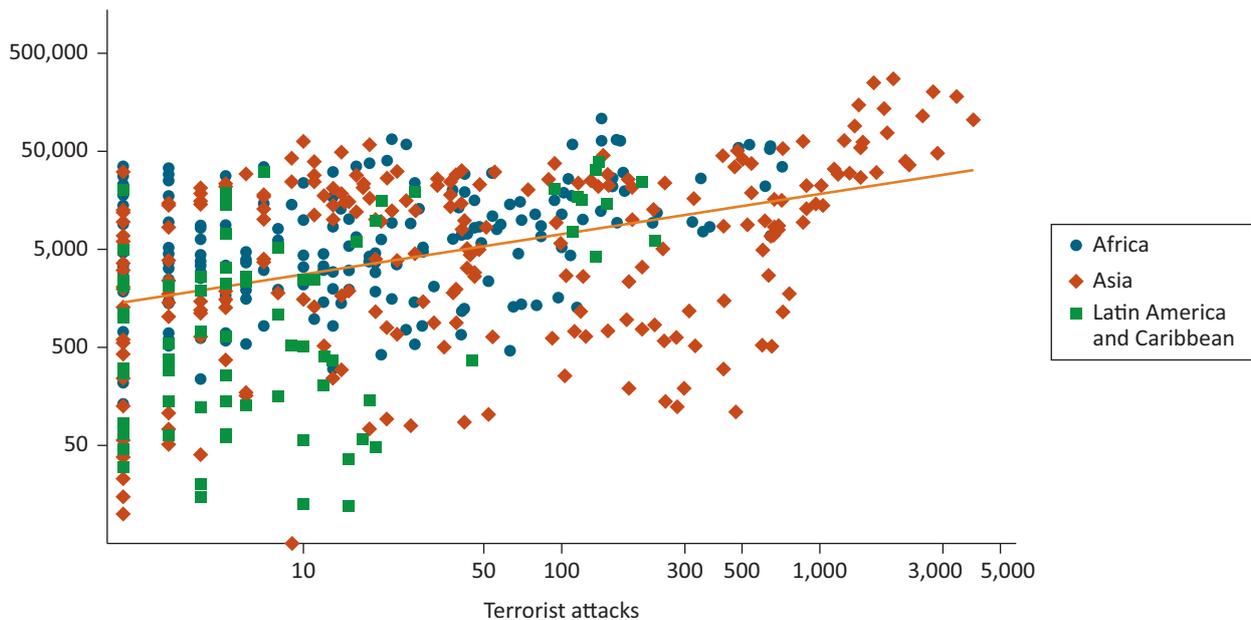


Figure 4. Correlation between asylum applications and terrorist attacks, 2009–2018. Source: Authors’ own elaboration based on the Global Terrorism Database and asylum applications data from UN High Commissioner for Refugees.

pair fixed effects. Therefore, column (1) of Table 1 includes the usual gravity variables to control for constant country-pair heterogeneity. It is nonetheless infor-

mative to observe that these variables have the expected signs. The estimated coefficients of distance, contiguity, common language, and colonial ties reveal that asylum

Table 1. Determinants of the number of asylum applications, including domestic IDP. Structural gravity model.

	(1)	(2)	(3)	(4)	(5)	(6)
Total terrorist attacks in t-1 to t-3	0.063 (0.101)	0.315*** (0.062)	0.167*** (0.057)	-0.098 (0.092)	0.352** (0.175)	0.300* (0.160)
Voice and Accountability	-0.718** (0.291)	-0.065 (0.243)	-0.313 (0.203)	-0.019 (0.312)	-0.012 (0.589)	0.258 (0.519)
Border	7.840*** (1.340)			3.737*** (0.794)		
Refugee population t-3	-0.005 (0.086)	-0.121 (0.107)	0.026 (0.049)	0.458*** (0.034)	0.002 (0.032)	-0.000 (0.033)
GDPpc (origin)	-0.341 (0.546)	-0.219 (0.483)	-0.295 (0.221)			
GDPpc (destination)	0.481 (0.615)	0.389 (0.611)				
Population (origin)	10.095*** (2.071)	9.144*** (1.849)	3.706** (1.531)			
Population (destination)	-5.197 (3.423)	-4.004 (3.175)				
Distance	-1.582*** (0.311)			-0.656*** (0.138)		
Contiguity	0.611* (0.337)			0.022 (0.254)		
Common language	0.097 (0.341)			-0.078 (0.237)		
Common legal origins	0.204 (0.237)			0.114 (0.148)		
Colonial ties	1.522*** (0.533)			1.043** (0.454)		
Religious affinity	-0.059 (0.712)			-0.597 (0.582)		
Regional trade agreement	1.420*** (0.292)	0.454 (0.450)	0.225 (0.165)	1.188*** (0.331)	-0.054 (0.184)	-0.036 (0.180)
Border 2012-2014						-0.753** (0.327)
Border 2015-2018						-0.530 (0.443)
Observations	48086	45539	45159	47525	45035	45035
Origin FE	Yes					
Destination FE	Yes					
Country pair FE		Yes	Yes		Yes	Yes
Year FE	Yes	Yes				
Origin-year FE				Yes	Yes	Yes
Destination-year FE			Yes	Yes	Yes	Yes
IDP	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent includes IDP; the variables terrorist attacks in t-1 to t-3 and Voice and Accountability are interacted by a dummy that takes 1 whenever the flow is international; standard errors are multi-way clustered at the origin country and destination country levels are in parentheses; *, **, and *** represent statistical significance at the 1%, 5%, and 10% levels, respectively.

seekers more commonly apply to geographically close countries with a common language and colonial ties. Common legal origins and religious affinity do not appear to be significant drivers of asylum (always relative to IDP).

As in Figueiredo et al. (2016), the positive and statistically significant coefficient of regional trade agreement indicates that economic ties, and more specifically trade, are important determinants in the decision to seek asylum. However, the non-significant coefficients of GDPpc suggest that income is not relevant, or that its effect is absorbed as a fixed country cost. On the other hand, the estimated population coefficients are positive and significant for the population at the origin and negative the destination, suggesting that country size plays an important role. Displaced people of larger countries tend to cross borders much more than those of smaller countries. This makes sense because moving within a large country might be as costly as moving to a foreign country.

Along with economic and cultural factors, the quality of the institutions in the origin is also an important determinant of asylum applications. In particular, the variable “voice and accountability” coefficient is negative, suggesting that the greater the difficulties in participating in the selection of their government or where there are limitations to citizen’s freedom of expression, freedom of association, and the media, the higher is the number of asylum applicants relative to IDP.

In sum, the estimates of the control variables paint a picture of asylum seekers that matches the economic intuition of gravity models. However, our variable of interest (terrorist attacks) does not appear statistically significant in Column (1) of Table 1. One plausible reason is that the omission of the country pair-fixed effects is a source of considerable bias for the estimates of asylum applications. Column (2) of Table 1 includes these time-invariant structural characteristics of country pairs that absorb most of the other variables. Only terror and population surface as the single most relevant determinants of asylum flows. Including destination-year fixed effects in Column (3) of Table 1 does not change their significance, albeit a lower magnitude. In Column (4) of Table 1, we do not include country pair fixed effects to re-estimate the border effect with destination-year fixed effects. The border coefficient reveals that there are 42 (= $\exp[3.73]$) internally displaced people for every asylum seeker. Hence, the border effect of forced migration is still greater than the typical border effect of trade.

The last two columns of Table 1 introduce the specification with the most demanding combination of fixed effects: country-pair, origin-year, and destination-year (see equation (1)). We are still able to estimate the impact of terrorist attacks on the number of asylum seekers relative to IDP using the interaction term between the variable of terrorist attacks (terror_{it}) and the international indicator variable that takes one whenever forced migration is international (I_{ij}).

Column (5) of Table 1 suggests that terrorist attacks is the only variable that significantly impacts forced migra-

tion. This result holds in Column (6) of Table 1 when including the time-varying border. Our preferred estimate reveals that a 10% increase in the number of terrorist attacks in the source country leads to an increase in asylum applicants by 3% over IDP, on average. This estimate supports the hypothesis that terrorist attacks raise the number of asylum applications relative to IDP.

The coefficients of the border estimates for the 2012–2014 and 2015–2018 periods are shown at the end of Column (6) of Table 1. The estimates of the international border variables reveal that the effects of borders have fallen over 2012–2014, relative to 2009–2011. The effects of borders on forced migration in 2012–2014 have become 52% ($\exp[-1.25]-1 = -0.529$) smaller compared to the 2009–2011 period. While the international border effect fell again in 2015–2018, the estimated coefficient is not statistically different from zero.

Table 2 presents the estimates of our preferred specification restricting the analysis sample to forced international migration flows of countries from Africa, Asia, or Latin America to the rest of the world. Thus, the analysis includes destination countries within and across continents. The results highlight that regional heterogeneity is significant in the impact of terrorism on asylum migration. The impact of terrorism on forced migration is positive and large in the three continents, with elasticities of 0.319 in Africa, 0.715 in Asia, and 2.341 in South America. However, in the case of Africa, it fails to be significant. It is worthwhile pointing out that the impact of terrorism by continent is not correlated with the volume of terrorism. As shown in Figure 3, Asian countries (Iraq, Afghanistan, Pakistan, and India) concentrate most of the attacks from 2009 to 2018. Latin America is the region with the lowest stock of terror and yet the highest impact. The larger effect of terrorism on forced international migration relative to IDP in Latin America is likely due to several factors. Firstly, as illustrated in Figure 5, terrorism in this region is concentrated in Colombia, while the number of terrorist attacks in other countries has been relatively low. For more than one century, Colombia has suffered from terrorism (Feldmann & Hinojosa, 2009). During our period of analysis, the Revolutionary Armed Forces of Colombia were behind most of the attacks. According to the Global Terrorism Database, during 2009–2018, 768 out of 1083 terror attacks were perpetrated by the Revolutionary Armed Forces of Colombia. This feature of Colombian terrorism probably explains why direct and indirect victims may seek to leave their country instead of migrating internally. As a result, Colombia is the primary source of asylum seekers in Latin America during our period of analysis (22% of the total). Secondly, as presented in Table 2, contrary to Africa and Asia, Latin America has a decreasing border effect over our period of analysis, indicating an increasing preference for international migration rather than internal. This should not be surprising since most Latin American countries share a common history, language, religion, and culture. In fact, during our period of analysis, asylum applications from

Table 2. Effect of terrorism on asylum applications by continent.

	(1) Africa	(2) Asia	(3) Latin America
Total terrorist attacks in t-1 to t-3	0.319 (0.205)	0.715** (0.342)	2.341*** (0.878)
Voice and Accountability	1.595** (0.671)	0.857 (0.723)	-0.573 (2.784)
Stock refugee population t-3	-0.032 (0.061)	-0.018 (0.051)	0.048 (0.100)
Regional trade agreement	-0.125 (0.192)	0.354** (0.145)	-0.261 (0.298)
Border 2012–2014	0.499* (0.300)	-0.873* (0.490)	-2.206*** (0.500)
Border 2015–2018	1.050*** (0.392)	-0.703 (0.756)	-1.743* (0.988)
Observations	20220	15951	5087
Origin-year FE	Yes	Yes	Yes
Destination-year FE	Yes	Yes	Yes
Origin-destination FE	Yes	Yes	Yes
IDP	Yes	Yes	Yes

Notes: The dependent variable includes IDP; the Voice and accountability and terrorist attacks variables are interacted by a dummy that takes 1 whenever the flow is international; standard errors are multi-way clustered at the origin country, and destination country level are in parentheses; *, **, and *** represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Latin American countries to other Latin American countries, the USA, and Canada, represented 87% of the total. The neighbour countries, Ecuador and Venezuela, received 64% of the Colombian applications.

Table 3 reports different robustness checks by employing alternative measures of terrorism. The table only reports results for the target variable. First, we replace the number of terrorist attacks with the number of deceased and the number of property losses result-

ing from terrorist attacks during the periods t-1 and t-3. Moreover, to account for the fact that the implications of terrorism across countries may vary depending on the size of the country, we also estimate our preferred specification with three different per capita indicators (number of terrorist attacks, number of deceased, and number of damaged properties per capita). In addition, we test whether the impact of terrorism on forced international migration depends on the intensity of the

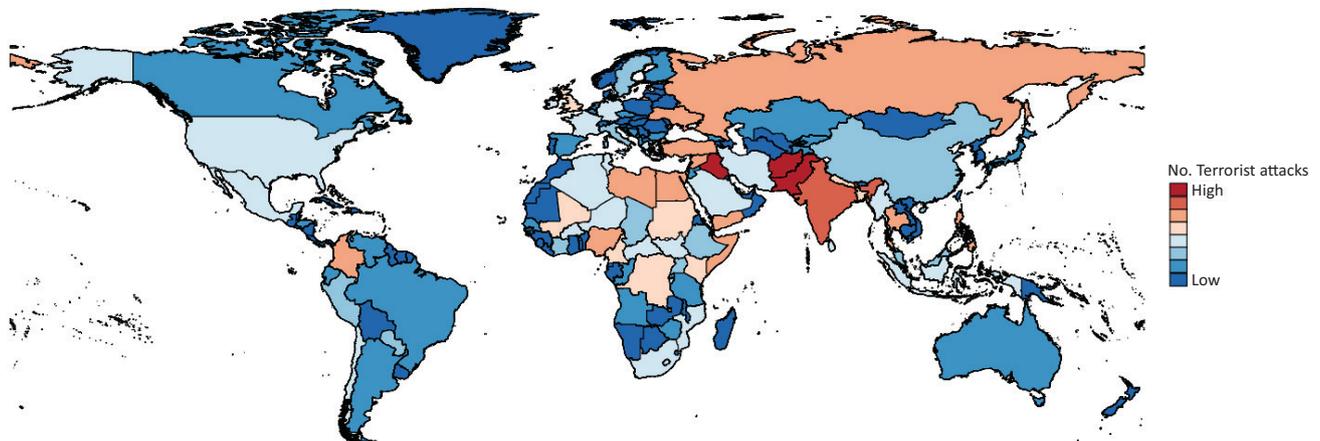


Figure 5. Geographic distribution of terrorism, 2009–2018. Notes: Total number of terrorist attacks during the period 2009–2018. Legend: High +15000 attacks, 10000–15000, 5000–10000, 1000–5000, 500–1000, 100–500, 50–100, 10–50, 0–10 Low. Source: Authors’ own elaboration based on the Global Terrorism Database.

Table 3. Different measures of terrorism.

	Whole sample	Africa	Asia	Latin America
Panel A: Levels				
Total terrorist attacks in t–1 to t–3	0.300* (0.160)	0.319 (0.205)	0.715** (0.342)	2.341*** (0.878)
No. Obs.	45035	20220	15951	5087
Total deceased in t–1 to t–3	0.233** (0.107)	0.281** (0.131)	0.333 (0.274)	0.574*** (0.104)
No. Obs.	45035	20220	15951	5087
Total property in t–1 to t–3	0.296** (0.150)	0.401** (0.198)	0.701* (0.363)	1.537*** (0.386)
No. Obs.	45035	20220	15951	5087
Panel B: Per capita				
Total terrorist attacks in t–1 to t–3 per capita	0.314** (0.160)	0.326 (0.209)	0.699** (0.336)	2.288** (0.890)
No. Obs.	45035	20220	15951	5087
Total deceased in t–1 to t–3 per capita	0.239** (0.107)	0.284** (0.133)	0.317 (0.269)	0.545*** (0.102)
No. Obs.	45035	20220	15951	5087
Total property in t–1 to t–3 per capita	0.309** (0.151)	0.409** (0.202)	0.676* (0.356)	1.464*** (0.395)
No. Obs.	45035	20220	15951	5087
Panel C: Intensity restricted sample				
No. Deceased per terrorist attack	0.383* (0.233)	0.188 (0.123)	0.758 (0.535)	0.540* (0.283)
No. Obs.	26465	11007	12064	1323
No. Property per terrorist attack	0.432* (0.262)	0.080 (0.092)	0.910* (0.484)	1.050*** (0.222)
No. Obs.	26125	10299	11879	1648

Notes: The dependent variable includes IDP; the Voice and Accountability and terrorist attacks variables are interacted by a dummy that takes 1 whenever the flow is international; standard errors are multi-way clustered at the origin country and destination country level are in parentheses; *, **, and *** represent statistical significance at the 1%, 5%, and 10% levels, respectively.

attack. To this end, we calculate the average number of deceased per terrorist attack and the average number of damaged properties per attack. Overall, results confirm the positive effect of terrorism on forced international migration relative to IDP.

Table 4 assess the relevance of including IDP as part of the dependent variable. It replicates the results obtained in Table 1 with structural gravity, but we do not include IDP in the dependent variable. The results indicate that omitting IDP biases the results in those specifications that do not include country-pair and origin-year fixed effects. In Columns (1–3) of Table 4, the impact of terror is not statistically significant. We obtain a positive and significant result of terror when introducing all possible fixed effects in Column (4) of Table 4. Even in this case, the magnitude is lower than in the preferred estimate

(0.132 vs. 0.300). However, these elasticities should be interpreted with caution because the effect of our preferred specification is relative to terror's effect on IDP, and the results of Table 4 are not. Therefore, on the one hand, the coefficient associated with terrorism in Table 4 tells us how terrorism affects forced migration from i to j . On the other hand, the associated coefficient to the variable of terrorism in Table 1 reveals the extent to which terrorism affects forced international migration relative to IDP.

We also replicated Table 2 (continents) and Table 3 (robustness) without IDP, obtaining the same pattern: omitting IDP biases the effect of terrorism downwards. These results are not reported for brevity but are available on request.

Table 4. Determinants of the number of asylum applications. Standard gravity model without IDP.

	(1)	(2)	(3)	(4)
Total terrorist attacks in t–1 to t–3	0.003 (0.105)	0.101 (0.069)	0.066 (0.058)	0.132*** (0.047)
Voice and Accountability	-1.066*** (0.213)	-0.823*** (0.234)	-0.907*** (0.225)	-0.468** (0.228)
Stock refugee population t–3	0.292** (0.115)	-0.114** (0.046)	0.454*** (0.054)	0.070 (0.054)
GDPpc (origin)	-1.283*** (0.481)	-0.849** (0.335)	-1.002*** (0.299)	-0.489** (0.200)
GDPpc (destination)	1.142 (0.749)	0.904 (0.723)		
Population (origin)	4.097*** (1.316)	2.552* (1.511)	2.250* (1.304)	1.994* (1.081)
Population (destination)	-4.789* (2.695)	-5.403** (2.160)		
Distance	-0.962*** (0.143)		-0.575*** (0.158)	
Contiguity	0.584 (0.409)		0.555* (0.321)	
Common language	0.309 (0.219)		0.122 (0.227)	
Common legal origins	-0.080 (0.151)		0.018 (0.159)	
Colonial ties	0.487 (0.494)		0.612 (0.446)	
Religious affinity	-0.258 (0.595)		-0.491 (0.560)	
Regional trade agreement	0.842* (0.493)	0.043 (0.215)	1.030** (0.437)	0.093 (0.167)
Observations	47380	44843	46356	43921
Origin FE	Yes		Yes	
Destination FE	Yes			
Country pair FE		YES		YES
Year FE	Yes	Yes		
Origin-year FE				
Destination-year FE			YES	YES
IDP	No	No	No	No

Notes: Standard errors are multi-way clustered at the origin country and destination country level are in parentheses; *, **, and *** represent statistical significance at the 1%, 5%, and 10% levels, respectively.

6. Conclusions

In this article, we investigate the effect of terrorism on asylum migration with the lens of structural gravity. The article is novel in constructing a dataset that includes both IDP and forced international migration to identify the country-specific effect of terrorism attacks.

The main takeaway from the empirical exercise is that terrorism in origin countries is a robust driver of bilateral asylum migration. The results presented in the article highlight that terrorism's effect is not homoge-

neous across regions, having a larger impact on Latin America than on Asia and Africa.

In addition, we also quantify an unexplored trait of asylum migration: the border effect. The results indicate that the border effect is significant in forced migration and higher than usual estimates of the border effect for traded goods.

The study presents evidence that could drive better-informed policies. For example, policies focused on ameliorating terrorism could be more effective if combined with asylum policies. Further, by acknowledging

the border effect, policymakers have the opportunity to design better national and international interventions. Finally, the article opens exciting avenues for new research. The study showcases the importance of adopting theoretically driven empirical methods to understand forced international migration with terrorism. Studies that apply this methodology revisiting the literature's findings and opening new paths are undoubtedly welcome.

Acknowledgments

This article has benefited from very helpful comments from two anonymous reviewers and the Academic Editor Inmaculada Martínez. The authors would like to acknowledge the financial support from Junta de Andalucía (SEJ 413), from Generalitat Valenciana (GV Prometeo 2018/102 and GV/2020/012), the Spanish Ministry of Science, Innovation and Universities (RTI2018–100899-B-I00, co-financed with FEDER), and the Kellogg Institute for International Studies (University of Notre Dame).

Conflict of Interests

The authors declare no conflict of interest.

Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

References

- Anderson, J. E. (2011). The gravity model. *Annual Review of Economics*, 3(1), 133–160.
- Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170–192.
- Anderson, J. E., Larch, M., & Yotov, Y. V. (2019). Trade and investment in the global economy: A multi-country dynamic analysis. *European Economic Review*, 120, 103–111.
- Bandyopadhyay, S., Sandler, T., & Younas, J. (2018). Trade and terrorism: A disaggregated approach. *Journal of Peace Research*, 55(5), 656–670.
- Bergstrand, J. H., Larch, M., & Yotov, Y. V. (2015). Economic integration agreements, border effects, and distance elasticities in the gravity equation. *European Economic Review*, 78, 307–327.
- Bertoli, S., & Fernández-Huertas Moraga, J. (2013). Multilateral resistance to migration. *Journal of Development Economics*, 102, 79–100.
- Beverelli, C., Keck, A., Larch, M., & Yotov, Y. V. (2018). *Institutional quality, trade and development: A quantitative analysis* (Working Paper No. 6920). CESifo.
- Carril-Caccia, F., Milgram-Baleix, J., & Paniagua, J. (2019). *Does terrorism affect foreign direct investment?* (Working Paper No. 1913). University of Valencia.
- Correia, S., Guimarães, P., & Zylkin, T. (2020). Fast Poisson estimation with high-dimensional fixed effects. *The Stata Journal*, 20(1), 95–115.
- Davenport, C., Moore, W., & Poe, S. (2003). Sometimes you just have to leave: Domestic threats and forced migration, 1964–1989. *International Interactions*, 29(1), 27–55. <https://doi.org/10.1080/03050620304597>
- Dreher, A., Krieger, T., & Meierrieks, D. (2011). Hit and (they will) run: The impact of terrorism on migration. *Economics Letters*, 113(1), 42–46.
- Egger, P., & Gassebner, M. (2015). International terrorism as a trade impediment? *Oxford Economic Papers*, 67(1), 42–62.
- Egger, P., & Larch, M. (2008). Interdependent preferential trade agreement memberships: An empirical analysis. *Journal of International Economics*, 76(2), 384–399.
- Egger, P., & Tarlea, F. (2015). Multi-way clustering estimation of standard errors in gravity models. *Economics Letters*, 134, 144–147.
- Feldmann, A. E., & Hinojosa, V. J. (2009). Terrorism in Colombia: Logic and sources of a multidimensional and ubiquitous phenomenon. *Terrorism and Political Violence*, 21(1), 42–61.
- Figueiredo, E., Lima, L. R., & Orefice, G. (2016). Migration and regional trade agreements: A (new) gravity estimation. *Review of International Economics*, 24(1), 99–125.
- Fourie, J., Rosselló-Nadal, J., & Santana-Gallego, M. (2020). Fatal attraction: How security threats hurt tourism. *Journal of Travel Research*, 59(2), 209–219.
- Giménez-Gómez, J. M., Walle, Y. M., & Zergawu, Y. Z. (2019). Trends in African migration to Europe: Drivers beyond economic motivations. *Journal of Conflict Resolution*, 63(8), 1797–1831.
- Hatton, T. J. (2009). The rise and fall of asylum: What happened and why? *The Economic Journal*, 119(535), F183–F213.
- Hatton, T. J. (2016). Refugees, asylum seekers, and policy in OECD countries. *American Economic Review: Papers & Proceedings*, 106(5), 441–445.
- Hatton, T. J. (2020). Asylum migration to the developed world: Persecution, incentives, and policy. *Journal of Economic Perspectives*, 34(1), 75–93.
- Head, K., & Mayer, T. (2014). Gravity equations: Toolkit, cookbook, workhorse. In G. Gopinath, E. Helpman, & K. Rogoff (Eds.), *Handbook of international economics* (Vol. 4, pp. 131–195). Elsevier.
- Heid, B., Larch, M., & Yotov, Y. V. (2021). Estimating the effects of non-discriminatory trade policies within structural gravity models. *Canadian Journal of Economics*, 54(1), 376–409.
- Hogetoorn, B., & Gerritse, M. (2020). The impact of terrorism on international mergers and acquisitions: Evidence from firm-level decisions. *Journal of Peace Research*, 58(3), 523–538.
- Kang, Y. D. (2020). Refugee crisis in Europe: Determi-

- nants of asylum seeking in European countries from 2008–2014. *Journal of European Integration*, 43(1), 33–48.
- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The worldwide governance indicators: Methodology and analytical issues. *Hague Journal on the Rule of Law*, 3(2), 220–246.
- LaFree, G. (2010). The global terrorism database (GTD) accomplishments and challenges. *Perspectives on Terrorism*, 4(1), 24–46.
- Moore, W. H., & Shellman, S. M. (2004). Fear of persecution: A global study of forced migration, 1952–1995. *Journal of Conflict Resolution*, 48(5), 723–745.
- Moore, W. H., & Shellman, S. M. (2006). Refugee or internally displaced person? To where should one flee? *Comparative Political Studies*, 29(5), 599–622.
- Neumayer, E. (2005). Bogus refugees? The determinants of asylum migration to Western Europe. *International Studies Quarterly*, 49(3), 389–409.
- Nitsch, V., & Schumacher, D. (2004). Terrorism and international trade: An empirical investigation. *European Journal of Political Economy*, 20(2), 423–433.
- Paniagua, J., Peiró-Palomino, J., & Picazo-Tadeo, A. J. (2021). Asylum migration in OECD countries: In search of lost well-being. *Social Indicators Research*, 153(3), 1109–1137.
- Piermartini, R., & Yotov, Y. (2016). *Estimating trade policy effects with structural gravity* (Working Paper ERSD-2016-10). World Trade Organization.
- Powers, M., & Choi, S. W. (2012). Does transnational terrorism reduce foreign direct investment? Business-related versus non-business-related terrorism. *Journal of Peace Research*, 49(3), 407–422.
- Salehyan, I., & Gleditsch, K. S. (2006). Refugees and the spread of civil war. *International Organization*, 60(2), 335–366.
- Santana-Gallego, M., & Fourie, J. (2020). Tourism falls apart: How insecurity affects African tourism. *Tourism Economics*. Advance online publication. <https://doi.org/10.1177/1354816620978128>
- Santana-Gallego, M., & Paniagua, J. (2020). Tourism and migration: Identifying the channels with gravity models. *Tourism Economics*. Advance online publication. <https://doi.org/10.1177/1354816620972597>
- Schmeidl, S. (1997). Exploring the causes of forced migration: A Pooled time-series analysis, 1971–1990. *Social Science Quarterly*, 78(2), 284–308.
- Silva, J. M. C., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4), 641–658.
- Simsek, Y. (2006). *Impact of terrorism on migration patterns in Turkey* [Doctoral thesis, The University of Virginia Commonwealth]. VCU Scholars Compass. <https://doi.org/10.25772/6C8A-YV37>
- The National Consortium for the Study of Terrorism and Responses to Terrorism. (2018). *The global terrorism database (GTD)* [Data set]. <https://www.start.umd.edu/gtd>
- UN High Commissioner for Refugees. (2020). *Global trends: Forced displacement in 2019*. The UN Refugee Agency.

About the Authors



Federico Carril-Caccia is an assistant professor from the Department of Spanish and International Economics at the University of Granada (Spain). He obtained his PhD in Economics from University of Granada, in 2019. His research focuses on the drivers of migration and the determinants and effects of foreign direct investment. His work has been published in various international journals such as *PLoS ONE*, *World Economy*, and *Empirical Economics*.



Jordi Paniagua is assistant professor at the Department of Applied Economics II at the University of Valencia (Spain) and a visiting fellow at the Kellogg Institute (University of Notre Dame). Jordi holds a MA in Telecommunications and a PhD in Economics. His academic and applied specialization in foreign direct investment stems from his prior professional experience in multinational corporations as an engineer and in Valencia’s public Investment Promotion Agency as chief economist. His policy-focused academic research, published in leading economics and business journals, and consulting efforts have been proven relevant for several development institutions that promote economic development and institutional reform, such as NATO, the World Bank, the Asian Development Bank, and UNCITRAL.



Francisco Requena is a full professor from the Department of Applied Economics II at the University of Valencia. He obtained his PhD in Economics from the London School of Economics, in 2001. His research focuses on applied international trade, with recent interest in the role of firm heterogeneity in export supply. His most recent work has been published in *Review of World Economics*, *The World Economy*, and *Small Business Economics*.