

# Does terrorism affect foreign greenfield investments?

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## Abstract

This work assesses the impact of terrorism suffered by a country on the capacity to attract foreign greenfield investments. To this end, we estimate a theoretically consistent structural gravity equation which accounts for several well-known estimation biases such as ‘home bias’, endogeneity and multilateral resistance. This specification makes it possible to identify the effect of a country-specific time-varying characteristic such as terrorism. We exploit a dataset that covers domestic and foreign investment of 182 countries in the period 2006-2016 on both the extensive and intensive margins. Our study finds that foreign investors are reluctant to invest in countries affected by terrorism and also reduce the amount of their investments in such cases. Sensitivity to terrorism is higher for foreign than for domestic investors. Terrorist attacks have a more intense impact on foreign investors’ decision-making when they are international or when these violent acts hurt governments. However, our results also evidence that good governance appears to be an effective tool for counterbalancing these damages in the eyes of foreign investors.

Key words: Home bias, gravity equation, terrorism, FDI, foreign greenfield investments, institutions.  
JEL classification: C23, F21, F23, O17

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## Introduction

Terrorism is a dramatic event that prevents society from enjoying the peace and stability needed to prosper (Olson, 1993). Terrorism usually has a political, religious or ideological objective. Violence is used to intimidate a large audience, creating fear in order to exert pressure on governments (Enders and Sandler, 2000). Even if damaging the economy is not always terrorists' final goal, terrorist violence increases the political risk of countries and hinders economic prospects (Abadie and Gardeazabal, 2003; Jensen and Young, 2008). Overall, the literature has extensively studied the impact of political violence on several outcomes such as growth and trade (see Ouyang and Rajan (2017) for a review), and to a lesser extent on foreign direct investment (FDI). Nevertheless, the effect of terrorism *per se* on disaggregated bilateral capital flows remains largely unexplored.

There are several channels through which terrorism may discourage foreign investors to invest (extensive margin) or make them reduce the amounts of their investments (intensive margin). Firstly, terrorism may increase the risks and costs of investments, for example, when foreign assets and employees constitute direct targets but also when infrastructures are dramatically damaged. Investors may need to divert resources from productive investments due to incurring costs related to curtailing violence (Asongu and Nwachukwu, 2017). Secondly, terrorism may bring about some general equilibrium effects similar to those described by Egger and Gassebner (2015) for trade. Indeed, terrorism may cause the diversion of domestic and foreign investments to a third country and of public funds to antiterrorism measures. Furthermore, terrorism may hamper countries' market potential and economic prosperity, and thus deter FDI.

Despite these powerful arguments, the empirical evidence regarding the negative effect of terrorism on FDI is mixed. The negative effects only appear clearly under certain circumstances and some authors find a non-significant relationship (Li, 2006; Arif et al., 2021), or even a positive one (Skovoroda et al., 2019).

This paper expands the previous empirical evidence on the effect of terrorism on FDI in several directions. Firstly, the analysis looks into the case of foreign greenfield investments (FGI), the main mode of FDI into developing countries (UNCTAD, 2021), which are the countries that suffer the most from terrorism.<sup>2</sup> Secondly, our study differs significantly from previous research by dealing with bilateral investment flows for a large panel of countries for the period 2006-2016. Furthermore, we delve into the nature of terrorism by disentangling attacks according to targets, and we also pay special attention to the quality of host countries' institutions. Finally, an important novelty of our approach consists of estimating a structural gravity model to gauge the effect of terrorist attacks on both the extensive and intensive margins of FDI.

The structural gravity model explicitly takes into account domestic investment. We consider the amount of domestic capital flow for domestic investment in the intensive margin (Heid and Márquez-Ramos, 2019), and the creation of domestic private firms for the domestic extensive margin. This methodology is especially accurate to study the FDI-terrorism nexus. In line with recent developments in the gravity literature (Beverelli et al., 2018; Heid and Márquez-Ramos, 2019; Heid et al., 2021; Yotov, 2021), this empirical strategy allows us isolate the impact of time-varying country-specific variables

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<sup>2</sup> According to the data from the Global Terrorist Database (LaFree, 2010), during the period 2006-2016 developing countries suffered from 96% of the terrorists attacks that occurred globally. We employ UNCTAD's country classification to distinguish between developed and developing countries.

such as terrorist attacks on FGI. Capturing the effect of terrorism on investments is similar to the issue raised by Heid et al. (2021) concerning the challenge of estimating non-discriminatory trade policies. These authors identify the potential effect of these measures on international trade relative to their effect on domestic trade, using a structural gravity equation.

Our empirical strategy reduces three potential biases that can appear in the analysis of the effect of violence on FDI: omitted variable bias, simultaneity and ‘home bias’. Firstly, we introduce country-pair fixed effects to address omitted variable bias at the country-pair level (Baier and Bergstrand, 2007). We also introduce multilateral resistance terms in the form of time dummies interacted with source-country and destination-country fixed effects. Thus, we control for remoteness, third-country effects (the relative attractiveness of alternative host countries), and unobservable time-varying heterogeneity at the country level. However, we cannot completely guarantee that our variables of interest are not correlated with an omitted country-pair time-varying variable.

Secondly, we control for simultaneity bias in several ways. We capitalize on the domestic data to create an exogenous international border dummy, which we interact with terror attacks. The interaction measures the effect of violence on FGI relative to domestic investment and sweeps away endogeneity in a diff-in-diff fashion under certain assumptions (Beverelli et al., 2018). To make sure that our results are not biased due to anticipation effects, we alternatively regress the lagged stock of terror attacks against contemporaneous FGI flows.

Thirdly, the use of domestic investment flows allows us to tackle the final bias – ‘home bias’ (McCallum, 1995) and hence the effect of globalisation. On the one hand, ‘home bias’ stands for the fact that international borders impose costs on international relative to intra-national transactions. This is particularly relevant in our setting because terrorism may well create an incentive for domestic investors to invest abroad or, in turn, disincentivize foreign investors more heavily from investing in countries suffering attacks. On the other hand, as argued by Bergstrand et al. (2015), the time-varying international dummy captures most of the globalization effect. Furthermore, our data allows us to analyse both the extensive margin (firm creation) and the intensive margin (capital investment).

Surprisingly, the empirical literature remains relatively silent about the effect of terrorism on domestic investment. Abadie and Gardeazabal (2008)’s theoretical model shows that in the presence of terrorism, the output level in the economy is determined by its capital mobility because terrorism negatively affects the rate of return on capital. With perfect mobility, (foreign) investors would search for safer alternative locations, leading to a decrease of inward FDI. However, the model also suggests that domestic investments should decrease, or could be redirected to safer countries. Accurately disaggregating economic impacts from terrorist attacks is relevant for policymakers to better target recovery efforts.

Our results suggest that terrorism affects FGI more than domestic investment, both in the extensive and intensive margin. This effect is larger on the intensive margin. The impact is particularly intense when terrorist attacks are international, when there are fatalities from the investing multinational enterprises’ (MNE) country, and when the target in the host country is the government. This latter finding is novel in the literature, and highlights the role governments can potentially have on limiting the negative economic consequences of terrorism. Along these lines, our results show that countries with worse institutions are more likely to be negatively affected by terrorism in terms of FDI. Conversely, terrorism does not seem to deter FGI in countries that enjoy the highest levels of institutional quality.

The remainder of the article is organized as follows: the next section presents a short literature review; Section III describes the empirical model and data; Section IV reports the results; and Section V offers some concluding remarks.

## Literature review

There is a broad theoretical consensus on the negative effects of terrorism. On one hand, the risk of terrorist attacks reduces the expected returns and increases the risk associated with this investment relative to alternative locations (Enders and Sandler, 1996; Abadie and Gardeazabal, 2008). Enders and Sandler (1996) argue that attacks directed at foreign investments and workers (which are considered transnational attacks) may increase the perception of risk. Similarly, they underline that attacks on symbolic institutions (country's official military, airports) would also threaten investors. Osgood and Simonelli (2020) review different mechanisms through which terrorism raises the costs that MNEs have to incur when they invest, such as the costs to ensure their security, insurance and recruitment. Gaibullov and Sandler (2009) and Johns and Wellhausen (2016) mention the risk of disruption of supply chains. Powers and Choi (2012) argue that MNEs would be especially concerned by attacks affecting business while they would be less sensitive to attacks affecting non-business activities. However, terrorism increases uncertainty regarding several outcomes such as governments' spending (e.g. counter-terrorism measures) and countries' economic performance. Consequently, terrorism increases countries' risk ratings, which are taken into account by international investors (Gaibullov and Sandler, 2019).

Therefore, most empirical studies find that terrorism harms aggregated FDI inflows (Abadie and Gardeazabal, 2008; Bandyopadhyay et al., 2014; Filer and Stanišić, 2016).<sup>3</sup> However, some recent studies have provided more detailed analysis suggesting a non-direct relationship between terrorism and FDI. Li (2006) concludes that neither predictable nor unexpected terror attacks are significantly associated with reduced FDI inflows, and Witte et al. (2017) fail to evidence any significant relationship between political violence and FDI. Powers and Choi (2012) argue that terrorist attacks only negatively affect net inflows of FDI stocks when the targets are businesses. Bandyopadhyay et al. (2014) conclude that domestic and transnational terrorism depress FDI, but that this negative effect can be curbed with foreign aid.

Further, sectorial analysis reveals a high heterogeneity in the response of FDI to conflict. In some cases, foreign investors could take advantage of political instability or conflicts that may reduce the bargaining power of local authorities. Several authors have underlined that such opportunist behaviours are likely to occur in the case of resource-seeking FDI (Biglaiser and DeRouen, 2007; Burger et al., 2016 ; Li et al., 2017; Skovoroda et al., 2019; Witte et al., 2017). Likewise, Osgood and Simonelli (2020) shows that MNEs may remain and cope with the additional costs generated by terrorism if firms lack viable alternative hosts.<sup>4</sup>

In comparison with less developed countries, large and wealthy countries suffer fewer economic consequences from terrorism, and FDI is not an exception. High-income countries can assign more financial resources to fight terrorism (Gaibullov and Sandler, 2008). In this respect, Galović et al.

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<sup>3</sup> In the following, we have chosen not to refer to the violence-FDI link which is a different question in order to keep the focus on the terrorism-FDI relationship. To conserve space, we do not detail the results of papers dealing with specific source countries or regions or specific destinations that are less comparable with our studies.

<sup>4</sup> To this end, they use data on intra-firm exports to the United States from 138 host markets.

(2018) and Saeed et al. (2018) demonstrate that the impact of terrorism on FDI inflows and outflows in developed countries is significantly weaker than in developing countries.

Institutional quality may also mitigate the economic impact of terrorism on inward FDI (Oh and Oetzel, 2017; Ouyang and Rajan, 2017). The link between institutions and FDI is twofold. First, higher institutional quality implies a reduction in the costs of doing business, and this is expected to foster inward FDI (see Bailey (2018) for an overview of the literature). Second, when institutions work better, governments may give effective and sufficient responses to terrorism by protecting property or increasing investment in counter-terrorism. This implies that government intervention can significantly reduce the negative economic implications of terrorism from MNEs' perspective.

A particular concern of the empirical literature is reverse causality. Filer and Stanišić (2016) acknowledge that inflows of foreign capital can provide additional targets and possibly greater resentment, hence creating motivation for attacks. Conversely, the benefits of FDI in terms of growth and employment may mitigate these feelings. As mentioned by these authors, the hypothesis of reverse causality is usually rejected by this literature. For instance, Li (2006) refutes the hypothesis that 'globalization' would increase the number of terrorist attacks through international trade, FDI, and portfolio investment. Asongu and Biekpe (2018) also invalidate the hypothesis that economic globalization would foster terrorism. However, Osgood and Simonelli (2020) explicitly consider in their theoretical model the possibility that terrorism could aim to minimize MNEs' presence or to maximize MNEs' pain. Nonetheless, they still find a negative effect of terrorism on FDI after using instrumental variables to control for the endogeneity.

## Methodology

This study applies the structural gravity model approach to estimate the effect on inward FDI of the degree of terrorism suffered by host countries. Intuitively, the gravity equation builds on the idea that bilateral flows are directly proportional to home and host countries' economic size, and inversely proportional to economic barriers or frictions. The gravity model has solid theoretical foundations for trade (Anderson and Van Wincoop, 2003) and FDI flows (e.g. Head and Ries, 2008; Kox and Rojas-Romagosa, 2020).

The Gravity gold standard includes controls for the structural forces predicted by theory with a complete set of fixed effects, namely country-pair, source-time, and destination-time dummies (Anderson and Yotov, 2012). The full inclusion of fixed effects makes it possible to reduce the omitted variable bias, and to isolate the effect of the independent variables of interest – in our case terrorism – on FDI.

Country-pair fixed effects enable controlling for unobservable heterogeneity and time-invariant determinants of FDI (e.g. geographic distance or colonial ties) at the country-pair level, thus reducing omitted variable bias (Baldwin and Taglioni, 2006). These fixed effects reduce the endogeneity bias in the gravity estimates of time-varying country-pair variables, like bilateral treaties (Baier and Bergstrand, 2007; Bergstrand and Egger, 2013).

Source and host country time-varying fixed effects control for multilateral resistance terms (MRTs) and control for third-country effects in trade (Anderson and Van Wincoop, 2003) and FDI (Anderson et al., 2019). In this way, the structural gravity equation controls for the relative capacity of investing abroad from a given country (source-fixed effects) and the relative capacity to attract FDI (host-fixed effects). In our context, the inclusion of the country fixed effects allows us to control for the fact that MNEs can choose different locations. In the investment decision, firms face a trade-off between the pull factors

(e.g. market size or natural resources) and the deterrents factors (e.g. low institutional quality or violence) of a destination, compared to third-country alternatives (Osgood and Simonelli, 2020).

Initially, source and host fixed effects were included as time-invariant country dummies. However, researchers quickly realized that unbiased estimates of the gravity model with panel data require the inclusion of home- and host-country fixed effects to be time-varying (Head and Mayer, 2014). Time-invariant country dummies are collinear with the country-pair fixed effects, and, therefore, introduce bias at this level. Additionally, in a panel setting, prices vary with time and so MRTs should be dynamic.

Moreover, this set of fixed effects absorbs any country-specific variables and controls for any unobservable specific home and host countries' time-varying characteristics, reducing the omitted variable bias. Therefore, with structural gravity, we control for several factors that may affect countries' capacity to attract FDI in the context of suffering from terrorism: level of development (Galović et al., 2018), received foreign aid (Bandyopadhyay et al., 2011; Bandyopadhyay et al. 2014; Lee, 2017), military expenditure (Saeed et al. 2018) or natural resource endowment (Witte et al., 2017).

However, dynamic MRTs would also absorb our variable of interest – terrorist attacks – which is a country-specific variable and therefore collinear with host and home time-varying country dummies. We estimate the country-specific effects of terrorism by following the procedure outlined in Beverelli et al. (2018), Heid and Márquez-Ramos (2019) and Heid et al. (2021). We estimate the interaction of terrorism with a border dummy, which captures whether the investment is domestic or international. Since the interacted term is not collinear with the country-fixed effects, this method allows us to identify the effect of terrorism within structural gravity.

To follow this procedure, it is necessary to include domestic investment in our dataset, which brings several additional benefits for reducing estimation bias, as outlined by Yotov (2021). Firstly, domestic data allow us to control for the 'border effect' (or 'home bias'). In the trade literature, McCallum (1995) is the first to identify the border effect, showing that in spite of the trade liberalization between USA and Canada, trade within Canadian provinces is 22 times larger than trade with USA states. Accordingly, the home bias quantifies the preference for (and ease of) domestic in comparison with international trade. Relative to domestic products, foreign goods and services face additional bilateral costs compared with national transactions. These costs arise from consumers' preferences that are biased towards domestic goods, as well as from technological differences and formal or informal barriers to foreign goods (Anderson and Van Wincoop, 2003; Martínez-San Román et al., 2016).

Similarly to trade, MNEs are likely to face constrictions relative to domestic investment. For example, relative to domestic investment, MNEs' investment decisions could be hampered by formal restrictions, such as the need to encounter a local partner; and informal restrictions, such as the collusion of consumers, workers and/or domestic firms against foreign firms, or technological differences that limit the capacity to develop the MNE's economic activity in the host country. On this issue, UMBER et al. (2014) demonstrate that for EU15 countries, domestic M&As are six times larger than cross-border ones.

Secondly, controlling for the border effect and its evolution involves controlling for the impact of globalization on international trade (i.e. the declining unobserved costs of international trade relative to intra-national trade), and thus reduces potential bias (Bevevelli et al., 2018; Bergstrand et al., 2015). In addition, the evolution of the border effect controls for other unobserved factors of countries that are related with their border. In the case of terrorism, factors related to countries' borders can affect the degree of international terrorism that they suffer. Thus, the border effect controls for the degree to which terrorism might be correlated with the process of globalization. This is important, since not controlling for this dimension can bias the estimate on the link between FDI and terrorism.

In sum, structural gravity that accounts for a full set of fixed effects and time-varying international border only leaves room for omitted variable bias of country-pair time-varying factors. To limit this, in our specification we introduce control variables that appear frequently in the literature, such as Free Trade Agreements and Bilateral Investment Treaties.

However, the inclusion of numerous fixed effects does not directly tackle the endogeneity that stems from simultaneity. Indeed, since MNEs are often targets of terrorism, the higher number of terrorist attacks suffered by a country can be determined by the presence of MNEs if terrorists aim to minimise the presence of MNEs (Osgood and Simonelli, 2020). Under the assumption that this form of reverse causality similarly affects domestic and international investment, the interaction between the international border dummy and terror should not be affected by this. The interacted coefficient measures the effect of terrorism on FDI relative to domestic investment. This coefficient captures the difference in differences between domestic and international investment. Therefore, the interaction between our variable of interest becomes a diff-in-diff estimation, which reduces considerably the endogeneity bias (Beverelli et al., 2018). Nizalova and Murtazashvili (2016) outline an econometric proof for this claim, showing that the interaction of a potential endogenous variable and a strictly exogenous variable is likely to be exogenous.

Pulling all these gravity strings together, we estimate the following structural gravity equation for both extensive and intensive margins:

$$FDI_{ijt} = e^{\left( \frac{terror_{jt} \times Int_{ij} + rulelaw_{jt} \times Int_{ij} + FTA_{ijt} + BIT_{ijt}}{Int_{ijt} + \alpha_{ij} + \alpha_{it} + \alpha_{jt}} \right)} \times \varepsilon_{ijt} \quad (1)$$

where  $FDI_{ijt}$  is the number of greenfield projects (extensive margin) or capital flows (intensive margin) from home country  $i$  to host country  $j$  in year  $t$ , including domestic investment.  $terror_{jt}$  is a count variable that indicates the number of terrorist attacks suffered by the host country  $j$ , and  $rulelaw_{jt}$  is an index expressing the level of compliance of rule of law.  $FTA_{ijt}$  and  $BIT_{ijt}$  are dummies that take value one whenever a pair of countries has signed a bilateral Free Trade Agreement or a Bilateral Investment Treaty, respectively. The fixed effects include source-year ( $\alpha_{it}$ ), host-year ( $\alpha_{jt}$ ) and country-pair ( $\alpha_{ij}$ ) fixed effects.

Note that the variable  $terror_{jt}$  has no bilateral dimension but varies across host countries and year. Therefore, the source of variation in the bilateral relationship between home country  $i$  and host country  $j$  over time comes from the variation of  $FDI_{ijt}$ ,  $FTA_{ijt}$  and  $BIT_{ijt}$ , and aims to capture the relocation effect that terrorism may induce among host countries after controlling for country-pair characteristics. The source of variation also comes from the interacted term as explained below.

In addition, equation (1) includes  $Int_{ijt}$ , a border dummy that takes the value of one whenever the investment is international in year  $t$ , and zero otherwise.  $Int_{ijt}$  controls for the evolution of the border effect relative to a given base year. Furthermore, in equation (1), we interact the countries' unilateral time-varying characteristics of interest (i.e. terrorism and institutional quality) with  $Int_{ij}$ , which is an indicator variable that takes one when investment is international. Accordingly, the framework of the structural gravity (Beverelli et al., 2018; Heid et al., 2021; Heid and Márquez-Ramos, 2019; Gil-Pareja et al., 2022) allows us to identify the impact of terrorism and institutional quality along with destination-year fixed effects. As mentioned earlier, the interaction between the border dummy ( $Int_{ij}$ ) and country-level variables (e.g.  $terror_{jt}$ ) is not collinear with the destination-year ( $\alpha_{jt}$ ) fixed effects. Without this interaction, country-level time-varying variables would be collinear with the destination-year fixed effects (see Heid et al. (2021) for an in-depth description).

We have to bear in mind that the econometric interpretation of the estimated elasticities in equation (1) is different from the interpretation of a specification without domestic investment. The country-

specific variable (in our case *terror*) is interacted with a bilateral variable (international border). Therefore, the interacted variable  $\mathit{terror}_{jt} \times \mathit{Int}_{ij}$  is bilateral and captures the effect of the host-specific terrorism on bilateral FDI flows, relative to domestic investment, the omitted category in  $\mathit{Int}_{ij}$ .

The empirical equation is estimated using the Poisson Pseudo Maximum Likelihood (PPML) estimator. Silva and Tenreyro (2006) show that PPML makes it possible to overcome two main limitations of estimating the gravity equation with Ordinary Least Squares: not accounting for the zeros present in bilateral statistics and heteroskedasticity problems. Robust standard errors are clustered by pair of countries. We use the PPML high-dimensional fixed effects estimators proposed by Correia et al. (2020) that can computationally absorb the high number of fixed effects.

We use an additional specification to further remove endogeneity concerns from our baseline equation (1). Instead of using the contemporaneous flow of terror attacks, we introduce the lagged stock of attacks from the last three years. The use of lags and stocks reduces the simultaneity bias. We borrow this procedure from the literature that studies the effect of migration on FDI (Cuadros et al., 2016). The main idea is that we can practically eliminate the effect of the contemporaneous flow of FDI on the past stock of terror attacks. This second specification also allows us to discuss the effects of persistence in terror attacks.

We have applied state-of-the-art procedures to be relatively confident that our empirical strategy identifies the effect of terrorism on FDI. However, we cannot completely guarantee that our variables of interest are not correlated with an omitted country-pair time-varying variable. Therefore, we test the effect of several alternative measures of terrorism. Furthermore, as per Bandyopadhyay et al. (2018), in our robustness analysis we run placebo tests to further rule out the possibility that our results are not driven by the model specification and that the assumed direction of causality is correct.

## Data overview

The present analysis covers 155 source countries and 182 destination countries during the period 2006-2016. Country sample and statistics and further details for the variables used are available in the appendix. The bilateral FGI data on the capital flows and number of projects are retrieved from fDiMarkets (2017). fDiMarkets tracks cross-border investment in a new physical project that creates new jobs and capital investment.<sup>5</sup>

fDiMarkets does not track domestic investment. Therefore, like in Gil-Pareja et al., (2022) domestic investment flows are approximated by the Gross Capital Formation (GKF) net of FGI, retrieved from the World Bank’s World Development Indicators. For the extensive margin, we employ the World Bank’s Doing Business project statistics on the creation of private firms.

GKF consists of the new investment on fixed assets plus net changes in the level of inventories of an economy. We consider this measure a good approximation of the domestic equivalent of FGI. Most likely, a significant share of the FGI performed by an MNE will result in GKF. As can be gathered in Graph 1, globally, FDI flows and FGI flows over GKF have similar magnitudes, and both represent a small share of the total investment. Graph 1 also illustrates the number of FGI projects as a share of firms created globally. In this case, the creation of foreign subsidiaries is substantially lower than the creation of domestic firms: on average, during the period of analysis, foreign subsidiaries represent 0.28% of the total creation of firms. We acknowledge that GKF and firm creation might not be a perfect counterpart to FGI. Ideally, data on domestic firms’ investment in new subsidiaries would be more

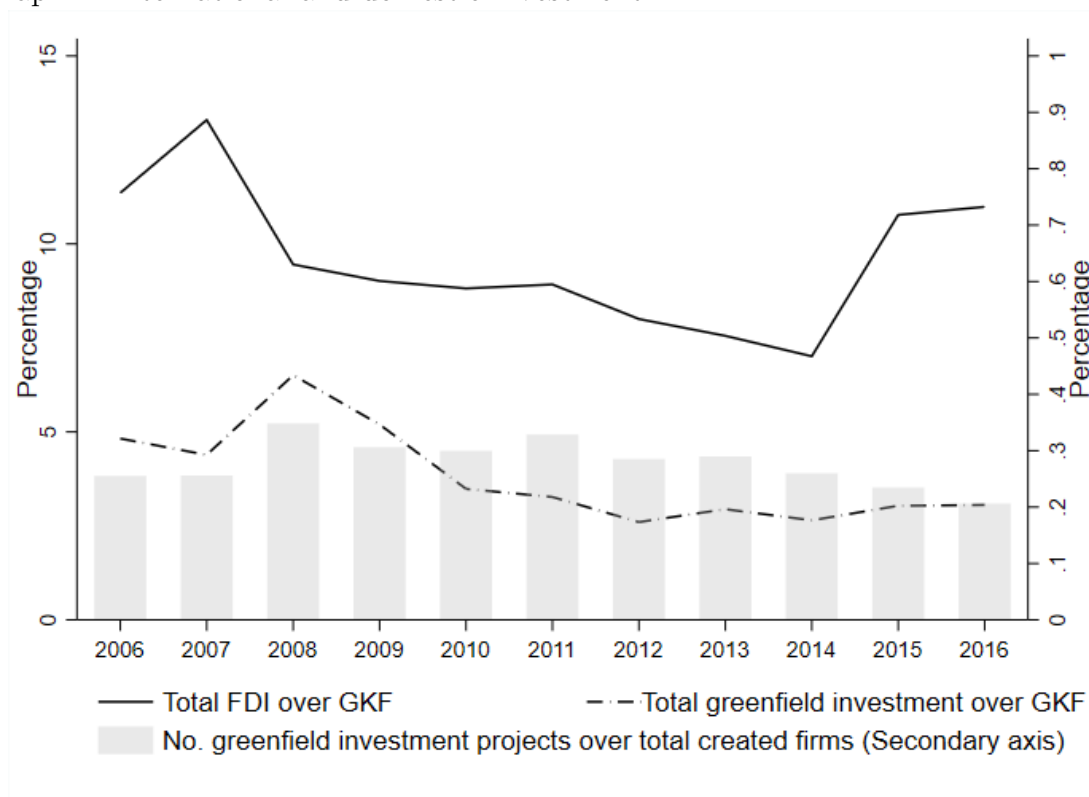
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<sup>5</sup> See the appendix for further details on fDiMarkets.



appropriate, but these statistics are not available. All in all, we show that our results are robust to alternative measures of domestic investment.

Graph 1: International and domestic investment



Source: Authors' calculations based on data from fDiMarkets for FGI, UNCTAD for FDI flows and World Bank for gross capital formation (GKF) and the number of created firms.

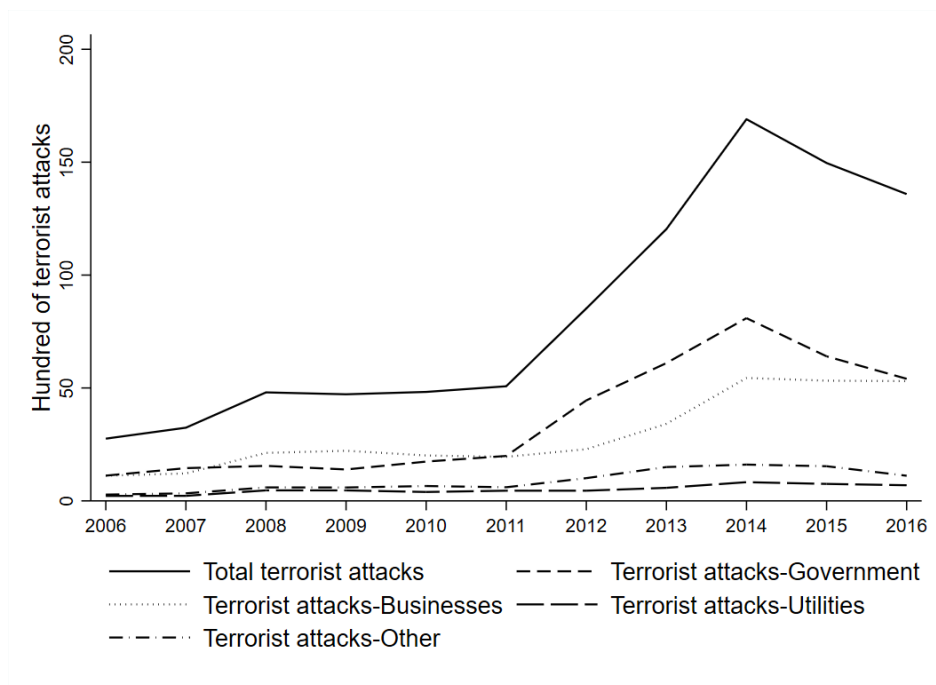
Countries' GDP and GDP per capita are also retrieved from World Bank's World Development Indicators. Data on geographic distance, colonial ties, religious affinity, sharing a geographical border (contiguity), common legal origins and common language are obtained from CEPII (Head and Mayer, 2014; Head et al., 2010). FTA and BIT dummies are, respectively, from Hofmann et al. (2017) and UNCTAD's International Investment Agreement database.

As a measure of countries' institutional quality, we use the rule of law index from the World Bank's Worldwide Governance Indicators (Kaufmann et al., 2011). The rule of law index represents a country's quality of contract enforcement, property rights, judicial system and likelihood of crime. The choice of this indicator is guided by its wide country coverage, and its relevance as a determinant of FDI, as shown by previous literature (e.g. Bénassy-Quéré et al., 2007; Carril-Caccia et al., 2019). The index ranges from -2.5 to 2.5, from low to high rule of law, respectively.

Terrorist attacks suffered by a country are retrieved from the Global Terrorism Database (GTD) provided by the Department of Homeland Security-supported START (LaFree, 2010; START, 2018). With this database, we measure the number of terrorist attacks, casualties (incidents with injuries

and/or deaths) and destroyed property suffered by host countries. We distinguish whether the terrorist attack is international or domestic. To this end, we use the classification available in the GTD, which considers an attack to be international when: (1) the perpetrator group differs from the location of the attack; (2) the nationality of the perpetrator group differs from the nationality of the victim or target; (3) the nationality of the victims or targets are different than the location of the attack. In particular, attacks targeting foreign firms are considered to be transnational terrorism. Also, we identify whether the attack resulted in victims from the investing MNE nationality and we distinguish between targets (government, business, utilities and other). As can be gathered from Graph 2, the number of terrorist attacks at the world level has drastically increased between 2006 and 2016. On average, the number of terrorist attacks is considerably higher in developing countries than in developed countries (55.8 against 7.5 per country and year). This surge in terrorism particularly affected governments and businesses. Graph 3 describes the logistics of terrorism, and highlights that the growth of terrorism is driven by both domestic and international terrorism.<sup>6</sup> In our empirical analysis, we include the count of terrorist attacks expressed in hundreds.

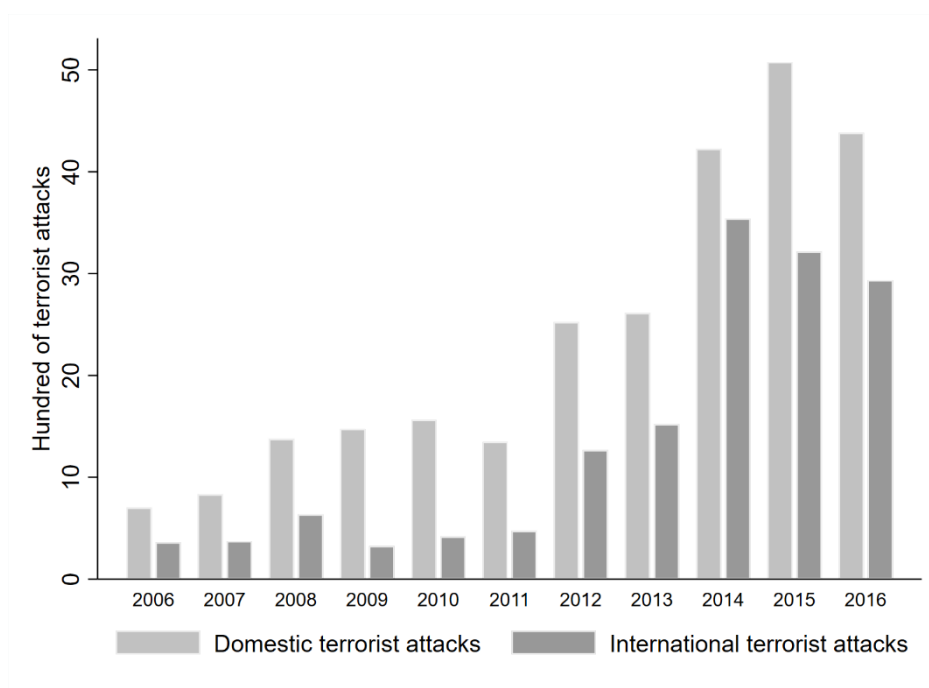
Graph 2: Global terrorist attacks and targets



Source: Authors' calculations based on data from the Global Terrorism Database.

<sup>6</sup> Unfortunately, due to lack of data availability, 55% of the terrorist attacks recorded by the GTD database cannot be classified into domestic or international.

Graph 3: Domestic and international terrorism



Source: Authors' calculations based on data from the Global Terrorism Database.

## Results

### *The overall impact of terrorism on FGI*

The results reported in Table 1 for the extensive margin suggest that terrorism significantly reduces the number of FGI projects relative to domestic firm creation. The specification in column (1) of Table 1 includes the complete set of fixed effects and domestic firm creation. This is our preferred specification since it reduces omitted variable bias and reduces the potential endogeneity issue between FDI and terrorism. The estimated coefficient of terrorism suggests that FGI projects decrease by 0.034% if a country suffers from one additional terrorist attack, relative to the number of created domestic firms. Likewise, if a country suffers fifty-six attacks – the average number of terror attacks per year and host country (see Table B in the appendix) – we would expect FGI projects to be reduced by 1.9% more than domestic firm creation. Fortunately, terrorist attacks are generally rare (half of the host-years in our sample do not suffer any attacks). However, during our period of analysis 29 countries suffered from more than 100 terrorist attacks in at least one year, and 20% of our sample register more than 8 incidents per year.

The rest of the control variables do not appear to be significant in this specification. The non-significance of FTA in the extensive margin (and the lack of significance of BIT in the extensive and intensive margins) is not new in this literature. The effect of FTA (or BIT) on FDI depends on several factors such as signatory countries' level of development (Berger et al., 2011; Jang, 2011) and/or institutional quality (Bhagwat et al., 2021). The influence of these bilateral agreements is also related to the provisions included (Berger et al., 2013; Bütthe and Milner, 2014), the sector of investment (Colen et al., 2016), and the level of FDI before the signature of the agreement (Paniagua et al., 2015).

The remaining columns for the extensive margin in Table 1 gauge the bias that stems from relaxing certain assumptions of the structural gravity. Column (2) of Table 1 does not include international-year fixed effects (i.e. the evolution of the border effect). As expected, the coefficient of terrorism is biased upwards (it doubles compared with specification 1); this is because, in specification 2, terrorism may capture some globalization force. The rest of the control variables also appear to be biased (their value and significance changes when the evolution of the border effect is not included).

The specification reported in column (3) does not include domestic investment<sup>7</sup> and relaxes the number of fixed effects in order to include a set of gravity variables standardly used in the literature of FDI. In this case, terrorism proves to be non-significant, confirming that methodology matters in evaluating the impact of terrorism on FDI. The remaining variables display the expected signs. The joint economic sizes of the source and host country (GDPsum), the difference in GDP per capita, and rule of law have a positive effect on FDI's extensive margin. Bilateral investment is lower as geographic distance increases between pairs of countries, and higher as they have more religious affinity, and share a colonial past, legal system, and language. BIT have no evident effect and FTA have a positive effect.<sup>8</sup>

Turning to the influence of terrorism on the intensive margin (Table 1, columns (4) to (6)), we find that in our preferred specification (column (4)), terrorism also reduces the amount of FGI. Since our specification guarantees that we take into account all the possible forwarded effects of terrorism in terms of investment deviation to third countries both for domestic and foreign investments, and the border effect, we are able to confirm that terrorism has a considerable destructive effect in terms of FGIs, both on the extensive and intensive margins. Likewise, our results confirm the negative impact found by previous studies (Filer and Stanišić, 2016; Galović et al., 2018; Hogetoorn and Gerritse, 2021).

Interestingly, the effect of terrorism is larger on the intensive than the extensive margin. When comparing the coefficients of terrorism of both margins, one must keep in mind that these coefficients indicate variations in comparison to domestic investment. The effect on the intensive margin compares the amount of greenfield capital with GKF. In the extensive margin, these coefficients gauge the impact of terrorism on the number of greenfield projects relative to the number of new domestic firms. On the extensive margin, our results indicate that terrorist attacks discourage more foreign investors than domestic ones but the effect is relatively small compared to the intensive margin (small differences between foreign and domestic decisions). Our conjecture is that both domestic and foreign investment decisions are taken having alternative choices: to invest in another place or not to invest. In contrast, if the decision to invest in a given country is already taken, the investor can still decide to reduce the amount of invested capital. In this regard, foreign investors have more mobility and more alternatives than domestic investors, and may be more sensitive to terrorism (for instance if it raises the costs of ensuring their safety and the risk of disruptions in supply chains).

The estimated coefficient of terrorism suggests that if a country suffers from 1 additional terrorist attack, the FGI volume decreases by 0.103% relative to domestic investment. For countries heavily hurt by terrorism, reducing the number of terrorist attacks by 10 would translate to an increase of FGI volume by 1.03% more than domestic investment.

With regard to the remaining independent variables, as in the extensive margin, the rule of law and the signature of a BIT are not significant. In contrast, the coefficient associated with FTA is positive

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<sup>7</sup> Since domestic investment is not included in the regression, it is not necessary to interact the terrorism variable with Int that takes value one whenever the investment is international.

<sup>8</sup> To conserve on space, alternative specifications with a relaxed number of fixed effects and without domestic investment are available in the appendix. In all cases, terrorism turns out to be non-significant.

and significant, showing that the signature of the agreement increases foreign investment amounts by a larger extent than domestic ones. As for the case of the extensive margin, in columns (5) and (6) we show that the omission of domestic investment and country-year fixed effects biases the results of our variable of interest.

Table 1: Impact of terrorist attacks on the extensive and intensive margin of FGI

	Extensive margin			Intensive margin		
	(1)	(2)	(3)	(4)	(5)	(6)
GDPsum			0.182*** (0.056)			0.425*** (0.088)
Diff. GDP pc			0.286*** (0.062)			0.444*** (0.097)
Terrorist attacks x Int	-0.034*** (0.012)	-0.065*** (0.010)		-0.103*** (0.037)	-0.177*** (0.033)	
Terrorist attacks			-0.001 (0.008)			-0.006 (0.014)
Rule of law x Int	0.042 (0.132)	-0.209* (0.127)		0.271 (0.283)	-0.304 (0.270)	
Rule of law			0.345*** (0.092)			0.323* (0.175)
Distance			-0.444*** (0.035)			-0.520*** (0.043)
Colony			0.542*** (0.062)			0.507*** (0.077)
Religion			0.957*** (0.094)			1.122*** (0.138)
Contiguity			-0.039 (0.064)			-0.136 (0.089)
Legal			0.170*** (0.045)			0.108* (0.061)
Language			0.399*** (0.060)			0.368*** (0.089)
FTA	-0.048 (0.053)	-0.097* (0.052)	0.212*** (0.056)	0.276** (0.116)	0.173 (0.122)	0.323*** (0.067)
BIT	-0.080 (0.072)	-0.122* (0.070)	0.009 (0.052)	-0.046 (0.153)	-0.090 (0.159)	-0.046 (0.068)
Observations	61513	61513	58789	62737	62737	59614
Source FE	No	No	Yes	No	No	Yes
Destination FE	No	No	Yes	No	No	Yes
Pair FE	Yes	Yes	No	Yes	Yes	No
Year FE	No	No	Yes	No	No	Yes
Source-year FE	Yes	Yes	No	Yes	Yes	No
Destination-year FE	Yes	Yes	No	Yes	Yes	No
International-year FE	Yes	No	No	Yes	No	No
Domestic investment	Yes	Yes	No	Yes	Yes	No

Note: The dependent variable includes domestic firm creation in columns 1 and 2, and domestic gross capital formation as domestic investment in columns 4 and 5. Int is the indicator variable that

takes one whenever the investment is international. Standard errors clustered at the source country and destination country level are in parentheses; \*, \*\*, and \*\*\* represent statistical significance at the 1%, 5%, and 10% levels, respectively.

### *Intensity, persistence and types of terrorist attacks*

In the present section, we explore whether the impact of terrorism on FGI depends on its intensity, persistence over time, and on the types of terrorism. For brevity, Table 2 reports the estimated coefficients of the variables of interest using our preferred specification (i.e. equation (1)).

To account for the intensity of attacks we replace the number of terrorist attacks by the number of casualties and number of destroyed properties as a consequence of terrorism. Interestingly, the estimates of the impact of the number of casualties report a small but positive and significant impact on the extensive margin, while not being significant in the intensive margin. In the case of destroyed property, it has a negative and significant effect only in the intensive margin, indicating that one destroyed property could lead to a drop of 0.31% greenfield invested capital relative to domestic investment. These results need to be taken with caution: the limited consistence of these results with the overall impact of terrorist attacks on FGI could be driven by a non-linear relationship between FGI relative to domestic investment, and the intensity of terrorist attacks. However, this empirical question is beyond the scope of the present paper.

Frequent terrorist attacks hamper productive investment and limit economic growth (Abadie and Gardeazabal, 2003; Gaibulloev and Sandler, 2008; Singh, 2013). Therefore, we estimate the impact of the stock of terrorist attacks in the past three years in order to compare the incidence with that of the current number of attacks. Estimates reported in Table 2 show that the persistence of terrorism has the same qualitative effect as current terrorist attacks, but with quantitative differences. In particular, on the intensive margin, persistent attacks have a lower adverse effect (-0.024) than current attacks (-0.103). This result may suggest a sort of myopic behaviour of foreign firms, where contemporaneous attacks have a higher impact than persistent attacks for foreign investors, compared with domestic ones. Alternatively, this finding may also indicate an adaptation effect where contemporary decisions on current investments have already taken into account previous incidents, as suggested by Filer and Stanišić (2016), who find some similar results. Finally, Gaibulloev and Sandler (2011) find that terrorist events have a small impact on income per capita growth in Africa, which they attribute to a high degree of resilience of these countries. Hence it is also plausible that companies investing in countries suffering attacks more often are also prepared to maintain their investments despite the conditions.

The nature of the attacks (domestic vs. international) appears to be a relevant source of heterogeneity.<sup>9</sup> International terrorism has a higher impact than domestic terrorism. One additional international attack reduces the number of greenfield projects by 0.3% and the volume of investment by 0.56% on average, compared with domestic investment. Domestic attacks have a negative and significant impact only on the intensive margin, with a lower coefficient (-0.159). One possible explanation for this is that terrorist attacks affecting MNE are classified as transnational attacks. Domestic and transnational terrorism both raise the cost of doing business by increasing risks, political instability or damage to infrastructure (Bandyopadhyay et al., 2014, for instance). However, transnational terrorism is expected to have a larger marginal effect than domestic terrorism on FDI because assets and workers of MNEs may be targeted directly (Power and Choi, 2012). Additionally, transnational terrorist events make countries' policies more interdependent (Gaibulloev and Sandler, 2019). Finally, domestic events are

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<sup>9</sup> Due to the limited data availability for classifying terrorist attacks into international or domestic, this specification only includes 45,263 observations. Missing data on the type of terrorist attacks leads us to exclude 383 destination years from the analysis out of a total of 1,800 destination years.

often fuelled by civil wars (Findley and Young, 2012), which make them more predictable than transnational terrorism.

Next, we explore whether terrorist attacks with at least one victim from the investor's country of origin have higher effects on FDI. For both the extensive and intensive margins, estimates confirm the negative effect of terrorism on FGI compared with domestic investment. In the extensive margin, this effect is statistically the same whether terrorist attacks result in casualties from the FGI source country or not. In the intensive margin, attacks that affect at least one victim from the investor's country have a larger negative effect.

Finally, we consider whether the impact of terrorism on FGI depends on the target, namely: government, business, utilities, and others. In the extensive margin, the results show that terrorist attacks targeted at the government and other targets have a significant negative effect. In the intensive margin, terrorist attacks on government, business and other types of targets significantly reduce the volume of foreign capital invested by MNEs. Conversely, in both margins, attacks on utilities do not have a significant effect. This could be surprising, in that electricity, gas, water constitute basic inputs for all sectors. Notwithstanding, the lack of significance should be taken with caution due to the low number of attacks on utilities registered in the database (see Graph 2).

Table 2: Impact of terrorism's intensity, persistence, logistics, victim and target on FGI

		Extensive margin	Intensive margin	Model
Current	Terrorist attacks	-0.034*** (0.012)	-0.103*** (0.037)	1
	Number of casualties	0.008** (0.004)	0.002 (0.010)	1a
	Number of destroyed property	-0.032 (0.031)	-0.313*** (0.083)	1b
Persistence	Stock terrorist attacks t-1 to t-3	-0.022*** (0.004)	-0.024* (0.013)	1c
	Domestic terrorist attacks	-0.027 (0.021)	-0.159*** (0.060)	1d
Logistic	International terrorist attacks	-0.299*** (0.096)	-0.562** (0.204)	
Victim	Terrorist attacks	-0.034*** (0.013)	-0.117** (0.048)	1e
	x Terrorist attacks with victims from country i	0.002 (0.010)	-0.058* (0.033)	
	Government	-0.107*** (0.026)	-0.226*** (0.068)	
Target	Business	-0.038 (0.032)	-0.259** (0.106)	1g
	Utilities	0.172 (0.109)	-0.169 (0.369)	1h
	Other	-0.143* (0.082)	-1.047*** (0.276)	1i

Note: The table summarizes the results of the estimates from 9 different specifications of Model (1). Estimates include Rule of law interacted with the international dummy (Int), FTA and BIT as control variables, and source-year fixed effects, destination-year fixed effects, country-pair fixed effects, and border-year fixed effects. The different variables of terrorism are interacted with the international dummy (Int). Standard errors clustered at the source country and destination country level are in parentheses; \*, \*\*, and \*\*\* represent statistical significance at the 1%, 5%, and 10% levels, respectively.

### *The role of institutions*

The analysis ends by exploring the role of institutions in the FDI-terrorism relationship. To this end, we rely on alternative measures of institutional quality from the World Governance Indexes: rule of law, lack of corruption, regulatory quality, government effectiveness, and voice and accountability. We also create an indicator variable (*High*) that takes 1 whenever the destination country has a high level (top one-third of the sample) on the institutional quality index. The *High* dummy is interacted with



the terrorist attacks and border variables to capture the possible mitigating effect of institutions on the terrorism-FDI nexus.<sup>10</sup>

The estimates reported in Table 3 consistently show that terrorism hampers FDI's extensive margin in countries with low institutional quality. On average, one additional terrorist attack leads to a drop in around 0.04% of FDI projects compare with domestic ones. In contrast, terrorism has a lower effect in countries with high institutional quality. In line with the institutional literature, the quality of institutions plays an important role in hedging adverse domestic situations, particularly terrorism, in the eyes of foreign investors.

The results of the intensive margin are qualitatively similar to those obtained for the extensive margin. On average, one additional terrorist attack in countries with low institutional quality reduces FDI volumes between 0.11% and 0.12% more than domestic investment. Again, the coefficient associated with institutional quality interaction is positive and significant, suggesting that the quality of institutions offsets the negative effect of terrorism.

Concerning the nature of the institutions, we observe high heterogeneity in the effect of the variables used to control for institutional quality. The results for the extensive margin show that changes in the rule of law and regulatory quality do not significantly affect FDI. However, the coefficients of lack of corruption and government effectiveness are negative and significant. Keeping in mind that these values reflect the impact of institutional quality improvement on FGIs compared with domestic investment, the results tend to indicate that domestic institutional quality would have a larger effect on domestic firms.<sup>11</sup> However, the coefficient of voice and accountability is positive and significant, suggesting that democratic values would have a larger effect on foreign firms. This result confirms previous findings regarding a positive link between FDI and democracy (e.g. Carril-Caccia et al., 2019), and strengthens the argument that democratic systems are more open to globalization and thus to MNEs (Guerin and Manzocchi, 2009).

Estimates reveal that rule of law, lack of corruption, government effectiveness, and voice and accountability are not significant in the intensive margin. Regulatory quality is weakly negative and significant, suggesting that any improvements might have a larger impact on domestic firms.

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<sup>10</sup> The possible endogeneity of institutions should be reduced by the diff-in-diff strategy outlined in the Method section.

<sup>11</sup> In fact, in estimations without domestic investment, estimates on the link between FGI's extensive and intensive margins appear to be positive for rule of law (see Table 1), although these estimates should be taken with caution, since they are probably biased.

Table 3: Impact of terrorism and institutional quality on the extensive and intensive margin

	Rule of law	Lack of corruption	Regulatory quality	Government effectiveness	Voice and accountability
Extensive margin	(1)	(2)	(3)	(4)	(5)
Terrorist attacks	-0.042*** (0.011)	-0.041*** (0.012)	-0.041*** (0.011)	-0.045*** (0.012)	-0.043*** (0.012)
x High	0.218*** (0.048)	0.285*** (0.048)	0.207*** (0.047)	0.204*** (0.048)	0.216*** (0.047)
Institution	0.023 (0.131)	-0.519*** (0.098)	0.162 (0.109)	-0.405*** (0.102)	0.412** (0.161)
Intensive margin	(6)	(7)	(8)	(9)	(10)
Terrorist attacks	-0.109*** (0.037)	-0.116*** (0.037)	-0.118*** (0.037)	-0.114*** (0.037)	-0.115*** (0.037)
x High	0.307** (0.137)	0.313** (0.142)	0.334** (0.134)	0.338** (0.142)	0.313** (0.137)
Institution	0.272 (0.284)	0.045 (0.248)	-0.311* (0.189)	0.194 (0.223)	0.296 (0.310)

Note: Estimates include FTA and BIT as control variables, and source-year fixed effects, destination-year fixed effects, country-pair fixed effects, and border-year fixed effects. The terrorism variable is interacted with the international dummy as well as the different institutional variables. Standard errors clustered at the source country and destination country level are in parentheses; \*, \*\*, and \*\*\* represent statistical significance at the 1%, 5%, and 10% levels, respectively.

## Robustness analysis

We test whether our results are robust to an alternative measure of domestic investment. To this end, we combine data on FGI with data on cross-border M&As retrieved from Eikon Thomson Reuters<sup>12</sup>, and calculate the share of FGI over FGI plus M&As for each country-year. With this share, we adjust the extensive and intensive margins domestic investment to the relative relevance of FGI over total FDI. The results are reported in columns (1) and (2) from Table 4, and are identical with those reported in columns (1) and (4) from Table 1. This finding is in line with Campos et al. (2021), who demonstrate for the case of trade that estimates of the structural gravity model are not significantly affected by the manner in which domestic trade flows are measured.

Furthermore, we run some placebo tests to show that our results are not driven by the model specification and that the assumed direction of causality is correct. Following Bandyopadhyay et al. (2018), we randomly reshuffle the terrorism data among country pairs, while the remaining independent variables of the model are not changed. If the proposed specification were to be correct, terrorism should rarely have a significant effect on FGI in these simulations.

<sup>12</sup> In accordance with the definition of FDI, we exclude those M&As that represented less than 10% of the ownership of the target firm (OECD, 2008).

To this end, first we randomly divide our sample into three groups of country pairs. Second, we replace the terrorism data of each group with the data from a different group.<sup>13</sup> Results are reported in Table 4, columns (3) to (6). In three cases, terrorist attacks do not have a significant effect, while in one it has a small negative significant effect.

Lastly, acknowledging that OECD countries usually enjoy better institutional quality than non-OECD countries, we test whether the impact of terrorism is lower for those destination countries that belong to the OECD. In line with the results from Tables 3, Table 4 columns (7) and (8) show that terrorist attacks have a significantly lower effect for the OECD countries. This result is aligned with some of the previous works that show that the negative effect of terrorism on FDI is lower for developed countries (Galović et al., 2018; Saeed et al., 2018). Developed countries might be able to better absorb the shock of terrorism due to the availability of financial resources to fight terrorism (Gaibulloev and Sandler, 2008) and their institutional quality (Johnston and Nedelescu, 2006; Tingbani et al., 2019). In contrast, those developing countries that have weak institutions and attract FDI seeking low labour costs are probably the most sensitive to terrorism.

Table 4: Sensitivity analysis

	(1) Alternative measure of domestic investment		(3) Placebo test A		(5) Placebo test B		(7) OECD and non- OECD	
	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive
Terrorist attacks x Int	-0.040*** (0.011)	- 0.095*** (0.033)	0.001 (0.006)	0.001 (0.010)	-0.010** (0.005)	-0.012 (0.010)	-0.049*** (0.011)	- 0.114*** (0.038)
X OECD							0.166*** (0.037)	0.165* (0.096)

Note: Estimates include Rule of law interacted with the international dummy (Int), FTA and BIT as control variables, and source-year fixed effects, destination-year fixed effects, country-pair fixed effects, and border-year fixed effects. In columns (7) and (8) the terrorism variable is interacted with a dummy that takes one if a destination country is an OECD member. Standard errors clustered at the source country and destination country level are in parentheses; \*, \*\*, and \*\*\* represent statistical significance at the 1%, 5%, and 10% levels, respectively.

## Conclusions

This study looks into the effect of terrorism and institutional quality on the extensive and intensive margins of FDI using a structural gravity model, that is, with numerous fixed effects and domestic

<sup>13</sup> In Placebo Test A, we replace the data of terrorist attacks from Group 1 with the data from Group 2, the data of Group 2 with that from Group 3, and the data of Group 3 with that of Group 1. In Placebo Test B, we replace the data of terrorist attacks from Group 1 with the data from Group 3, the data from Group 2 with the data of Group 1, and the data from Group 3 with the one from Group 2.

investment. This method allows us to identify the effect of terror attacks at the host level on FGI, while controlling for unobservable time-varying country-specific factors. In this way, we obtain theoretically consistent estimates with a very low risk of incurring biases related to gravity estimates (e.g. endogeneity and home bias).

The empirical analysis confirms the accuracy of the structural gravity approach for FDI. Omitting important features of structural gravity such as domestic investment and multilateral resistance may explain why many studies fail to evidence a sizeable and significant effect of terrorism on FDI.

As expected, foreign investments display a higher mobility than domestic investments and react more strongly to terrorist attacks. The results suggest that terrorism hurts both the number of foreign projects and their volumes. This is important because it demonstrates that terrorism not only discourages new projects, a common hypothesis of the literature, but also reduces the amount of invested foreign capital. This is probably because firms have to incur additional costs to protect their assets and their workers, and to cope with all the disruptions in infrastructure and administrative processes derived from a violent environment.

Not surprisingly, inward FGI appear to be more sensitive to international than domestic terrorism. Our study points out new channels in the FDI-Terrorism relationship. FGI is also more sensitive to current attacks than to persistent attacks, which can denote myopic behaviour, adaptation or resilience of investors. FGI projects are particularly deterred by terrorist attacks that are directed towards the government and toward businesses. Our analysis also robustly shows that terrorist attacks particularly negatively affect those countries with low levels of institutional quality. All in all, foreign investors are especially concerned by the capacity of institutions to control the situation.

**DATA AVAILABILITY STATEMENT** The data that support the findings of this study are available from FDIMarkets (The FinancialTimes Ltd). Restrictions apply to the availability of these data used under license for this study. Data are available from <https://www.fdimarkets.com>

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