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Foreign direct investment, aid, and terrorism

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This paper constructs a theoretical model to investigate the relationship between the two major forms of terrorism and foreign direct investment (FDI). We analyze with various estimators how these relationships are affected by foreign aid flows by focusing on 78 developing countries for 1984–2008. Both types of terrorism are found to depress FDI. Aggregate aid mitigates the negative consequences of domestic and transnational terrorism, but this aid appears more robust in ameliorating the adverse effect of domestic terrorism. However, when aid is subdivided, bilateral aid is effective in reducing the adverse effects of transnational terrorism on FDI, whereas multilateral aid is effective in curbing the adverse effects of domestic terrorism on FDI. For transnational terrorism, there is evidence in the literature that donor countries earmark some bilateral aid to counterterrorism. Aid's ability to curb the risk to FDI from terrorism is important because FDI is an important engine of development.

JEL classifications: D74, F21, F35.

1. Introduction

Ever since the four airplane hijackings on 11 September 2001 (henceforth 9/11), the world has been acutely aware of the dangers of terrorism. Terrorism is the premeditated use or threat to use violence by individuals or subnational groups against noncombatants to obtain a political or social objective through the intimidation of a large audience beyond that of the immediate victims. The economic dimension of terrorism concerns losses in foreign direct investment (FDI), damaged infrastructure, output losses, security costs, reduced economic growth, reduced tourism, trade losses, and higher insurance premiums (Keefer and Loayza, 2008). Terrorists are well aware of the potential economic harms that their attacks can cause and view these consequences as pressuring besieged governments to concede to their demands. Sandler and Enders (2008) indicate that developing countries are particularly prone to the economic ramifications of terrorism.

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The purpose of the current study is to present the first dynamic panel investigation of the effect of terrorism on FDI for developing countries. In a recent study, Abadie and Gardeazabal (2008) quantify the effect of terrorism risk on FDI in a cross-sectional study involving up to 186 countries. They find that a significant increase in this risk can reduce the net FDI position by approximately 5% of GDP. The current study is particularly important because FDI is a major source of savings for developing countries to support their economic growth.

A crucial distinction for our article is between domestic and transnational terrorism. Domestic terrorism is homegrown—the perpetrators, victims, supporters, and targets are all from the venue country. Such incidents may dissuade FDI through enhanced risks associated with political instability. Moreover, these incidents can disrupt or destroy infrastructure, thereby limiting output from a given set of inputs. Terrorist attacks raise the cost of doing business, which also reduces the output from a given amount of inputs. Through its victims, targets, supporters, or perpetrators, transnational terrorist incidents concern at least two countries. A terrorist bombing that destroys the offices of a foreign company is a transnational terrorist incident. As in the case of domestic terrorism, transnational terrorism can divert FDI owing to heightened risks and reduced output. The relative impact of the two forms of terrorism on FDI is an empirical question, as shown in the theory section. There are, however, grounds for anticipating a greater marginal impact of transnational terrorism on FDI in the country (venue) of the attack, because foreign personnel and assets may be targeted directly. Moreover, the venue country's counterterrorism efforts are likely less effective against transnational than domestic terrorists, because transnational terrorists typically have assets partly based abroad, which are harder for the targeted country to destroy.

We find that both domestic and transnational terrorism have a sizable negative effect on FDI/GDP in the venue country, where the attack takes place. Depending on the econometric specification for the fully specified models, a one standard deviation increase in domestic terrorist incidents per 100,000 persons reduces net FDI between US$323.6 and US$512.94 million for an average country, whereas a one standard deviation increase in transnational terrorist incidents per 100,000 persons reduces net FDI between US$296.49 and US$735.65 million for an average country. Notably, aggregate aid has a mitigating influence on these reductions: on average, aggregate aid can curtail these FDI losses down to US$113.44 and US$45.24 million for domestic and transnational terrorism, respectively, for the lower estimates. A host of models—feasible generalized least squares (FGLS), difference-generalized method of moments (GMM), and system-GMM—are presented with myriad controls. Nevertheless, the key findings remain qualitatively and quantitatively similar.

Next, we split aggregate aid into bilateral and multilateral aid. By doing so, we show that bilateral aid reduces the adverse effect of transnational terrorism on FDI/GDP, while multilateral aid primarily limits the adverse effect of domestic terrorism on FDI/GDP. This agrees with some bilateral aid being tied to counterterrorism

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action against a resident terrorist group in the case of transnational terrorism (Fleck and Kilby, 2010; Dreher and Fuchs, 2012). This may occur when the donor country's assets (including its FDI) are at risk in the aid-recipient country. In contrast, multilateral aid is not generally tied to counterterrorism measures, but may reduce domestic terrorism by raising the opportunity cost of would-be terrorists as the economy develops.

2. Theoretical model

Along the lines of Asiedu *et al.* (2009), we consider a foreign firm operating in a developing host nation and producing output $f(k)$ from capital, k, which it rents at a given rate r. This firm suffers from damages or lost output caused by terrorism, which reduces its revenue. The profit of the foreign firm is

$$\pi = (1-\tau)f(k) - rk, 0 < \tau < 1, f' > 0, f'' < 0, \tag{1}$$

where τ represents the fraction of output lost by the firm due to terrorism-related damages. These damages arise out of both domestic and transnational terrorist incidents that affect the firm's operations in its host country. Let D and R be the fractions lost to domestic and transnational terrorism, respectively, so that

$$\tau = D + R. \tag{2}$$

Both types of terrorism may be reduced by the host government's counterterrorism effort (E) along the following lines:

$$D \equiv D(\lambda, E), \text{ where } D_\lambda > 0,\ D_E < 0, \text{ and } D_{EE} > 0; \text{ and} \tag{3a}$$

$$R \equiv R(\phi, E), \text{ where } R_\phi > 0,\ R_E < 0, \text{ and } R_{EE} > 0, \tag{3b}$$

for which λ and ϕ are the respective shift parameters for domestic and transnational terror risks for the firm. In eq. (3a), an increase in λ raises the level of terrorism for any given level of E. Moreover, eq. (3a) indicates that domestic terrorism declines with counterterrorism effort, but at a declining rate. Similarly, in eq. (3b), transnational terrorism increases with ϕ and declines with E, albeit at a different decreasing rate than that of domestic terrorism. Substituting eqs (3a) and (3b) into eq. (2), we have

$$\tau = D(\lambda, E) + R(\phi, E) = \tau(\lambda, \phi, E) \Rightarrow \tau_\lambda = D_\lambda > 0, \tau_\phi = R_\phi > 0, \text{and}$$

$$\tau_E = D_E(\lambda, E) + R_E(\phi, E) < 0, \tau_{EE} = D_{EE}(\lambda, E) + R_{EE}(\phi, E) > 0. \tag{4}$$

Equation (4) implies that total terrorism increases with λ and ϕ and declines with counterterrorism effort, but at a decreasing rate.

The host government puts a weight θ on the revenues of the foreign firm. This weight may derive from a tax-revenue collection motive (Asiedu *et al.*, 2009), or from other equally relevant motives associated with FDI (e.g., positive technological spillovers to domestic firms from more sophisticated foreign firms or local employment generation). For simplicity, we assume that this weight, which

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captures these various potential benefits, is exogenously given.[1] We also assume that the host government, whose soil is the venue for the terrorist attacks, receives aid A from the foreign nation. With constant marginal cost of counterterrorism effort set at unity, the host government's payoff is

$$V = \theta(1-\tau)f(k) + A - E. \tag{5}$$

A substantial focus of recent US aid flows is related to counterterrorism efforts (see, e.g., Fleck and Kilby, 2010). In a follow-on paper, Dreher and Fuchs (2012) show that aid increased after the declared War on Terror in October 2001. To capture this terrorism-induced increase in aid, we assume that the host or venue nation receives aid in two forms: general aid and counterterrorism-tied aid. This is represented as:

$$A = \beta + \gamma E,\ \beta > 0,\ 0 < \gamma < 1, \tag{6}$$

where β is general aid and γE is counterterrorism-tied aid. Using eqs (1), (4), and (6) in eq. (5), we get

$$V = \theta[1-\tau(\lambda,\phi,E)]f(k) + \beta + (\gamma-1)E. \tag{7}$$

We consider a two-stage game, where the host government chooses E in stage 1 and the foreign firm chooses k in stage 2. We solve the model by backward induction; accordingly, we describe stage 2 first.

Based on eq. (1), the first-order condition for the firm's profit maximization in stage 2 is

$$(1-\tau)f'(k) - r = 0, \tag{8}$$

where the strict concavity of $f(k)$ ensures that the second-order condition is satisfied. Suppressing r from the functional form, eq. (8) defines

$$k = k(\tau),\ \frac{dk}{d\tau} = k_\tau = \frac{f'}{(1-\tau)f''} < 0. \tag{9}$$

Thus, terrorism reduces the volume of FDI, k.

Next, we turn to the aid-recipient government's choice of counterterrorism in stage 1. Substituting eqs (4) and (9) into eq. (7), we get

$$V(E;\theta,\lambda,\phi,\beta,\gamma) \equiv \theta[1-\tau(\lambda,\phi,E)]f\big\{k[\tau(\lambda,\phi,E)]\big\} + \beta + (\gamma-1)E. \tag{10}$$

Suppressing θ in the functional form, we find the optimal choice of counterterrorism effort:

$$\frac{\partial V}{\partial E} = V_E(E;\lambda,\phi,\gamma) = \theta\tau_E\big[(1-\tau)f'k_\tau - f\big] + \gamma - 1 = 0, \tag{11}$$

[1] Asiedu *et al.* (2009) endogenize this weight, which reflects the host government's optimal tax rate. In contrast, we focus on an optimal choice of the counterterrorism effort for a given weight applied to FDI, which simplifies the analysis and allows the comparative static effects related to terrorism to be more informative. Moreover, there are other reasons than the tax-revenue motive for a host government to care about FDI. Because explaining the desirability of FDI is not our focus, it is reasonable to treat this effect through an exogenous parameter.

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where second-order conditions can be shown to be satisfied. Equation (11) implicitly defines

$$E = E(\lambda, \phi, \gamma). \tag{12}$$

By substituting eqs (4) and (12) into eq. (9), we have

$$k = k\big[\tau\{\lambda, \phi, E(\lambda, \phi, \gamma)\}\big] = k(\lambda, \phi, \gamma). \tag{13}$$

Given eq. (13), we can explore how an exogenous rise in domestic or transnational terrorism (i.e., a rise in λ or ϕ, respectively), or an exogenous rise in counterterrorism aid (i.e., a rise in γ) affects FDI. We can also analyze how the marginal effects of the domestic and transnational terrorism parameters on FDI (i.e., $k_\lambda = \frac{\partial k}{\partial \lambda}$ and $k_\phi = \frac{\partial k}{\partial \phi}$) are affected by a rise in the foreign aid parameter γ. The latter throws light on the possibility that foreign aid may ameliorate the damaging effects of domestic and transnational terrorism on FDI.

The comparative-static analysis (available from the authors on request) provides the following results:

$$k_\lambda = k_\tau(\tau_\lambda + \tau_E E_\lambda) < 0, \text{ iff } D_{E\lambda} > \frac{D_\lambda \tau_{EE}}{\tau_E}, \text{ where } E_\lambda = \frac{\partial E}{\partial \lambda}. \tag{14a}$$

Given that k_τ is negative, the sign of k_λ critically depends on the term in parentheses on the right-hand side of the first equality. This term captures the total effect of λ on the terror risk τ, and is composed of a direct effect, τ_λ, and an indirect effect, $\tau_E E_\lambda$. From eq. (4), we know that the direct effect is positive, signifying an increase in terror risk; however, the indirect effect may work toward reducing the terror risk. If, in particular, enforcement rises in response to an increase in λ (i.e., if $E_\lambda > 0$), it helps to contain the risk of terrorism. When the direct effect dominates, the risk of terrorism must rise with λ, leading to a fall in FDI. The condition for dominance of the direct effect is outlined in eq. (14a) and is necessarily satisfied when $D_{E\lambda} \geqslant 0$ (because from eq. (4), we have that $\frac{D_\lambda \tau_{EE}}{\tau_E} < 0$). The intuition for this result is the following. Using eq. (4), we can see that $D_{E\lambda}$ measures how the marginal effectiveness of enforcement in containing domestic terrorism is affected by the shift parameter λ. If $D_{E\lambda} \geqslant 0$, this marginal effectiveness is then reduced by λ, leading to a relatively weak enforcement response to a rise in λ. This allows the direct effect τ_λ to dominate the indirect effect, thereby leading to a reduction in FDI. On the other hand, if $D_{E\lambda} < 0$, the enforcement response is stronger, and there is no guarantee that the direct effect will dominate. In this case, the dominance condition is satisfied only when

$$|D_{E\lambda}| < \frac{D_\lambda \tau_{EE}}{|\tau_E|}. \tag{14b}$$

Similarly, for transnational terrorism, we have

$$k_\phi = \frac{dk}{d\phi} = k_\tau\big(\tau_\phi + \tau_E E_\phi\big) < 0 \text{ iff } R_{E\phi} > \frac{R_\phi \tau_{EE}}{\tau_E}, \text{ where } E_\phi = \frac{\partial E}{\partial \phi}. \tag{15}$$

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Analogous to the case of domestic terror, FDI is necessarily reduced in the case of transnational terror if $R_{E\phi} \geqslant 0$. If $R_{E\phi} < 0$, FDI is then reduced only if $\left|R_{E\phi}\right| < \frac{R_\phi \tau_{EE}}{|\tau_E|}$. These findings are qualitatively similar to eqs (14a) and (14b), and the intuition is analogous.

Comparing the effects of domestic and transnational terror on FDI, we can show that a necessary condition for transnational terrorism to have a stronger deleterious effect is

$$R_\phi > D_\lambda \text{ or } R_{E\phi} > D_{E\lambda}. \tag{16}$$

If both inequalities of eq. (16) are satisfied, it constitutes a sufficient condition for transnational terrorism to have a stronger marginal effect. The first inequality of eq. (16) is a condition that requires that transnational terrorism raises the foreign firm's threat perception in the venue country at a faster rate compared to domestic terrorism. This may be the case if transnational groups go after foreign assets, which corresponds to the notion of transnational terrorism. The second inequality requires that the marginal effectiveness of enforcement is either reduced to a greater degree by transnational terrorism (i.e., when $R_{E\phi} > D_{E\lambda} > 0$), or raised to a lesser degree by transnational terrorism (when $|R_{E\phi}| < |D_{E\lambda}|$ for $R_{E\phi} < 0$, and $D_{E\lambda} < 0$). This condition would agree with situations in which a venue country has a difficult time in counterterrorism efforts against a transnational group that has assets (operatives and bases) abroad. Whether these conditions hold is ultimately an empirical question.

Turning to the effect of the aid parameter, γ, we get

$$k_\gamma = \frac{dk}{d\gamma} = k_\tau \tau_E E_\gamma > 0, \text{ where } E_\gamma = \frac{\partial E}{\partial \gamma} > 0. \tag{17}$$

Equation (17) indicates that a greater motivation for enforcement through tied aid will benefit FDI through a reduction in the risk of terrorism. Finally, when we consider the effect of the aid parameter on k_λ (assuming it is negative), we get

$$\frac{d|k_\lambda|}{d\gamma} = -(\tau_\lambda + \tau_E E_\lambda) k'_\tau \tau_E E_\gamma - k_\tau D_{\lambda E} E_\gamma - k_\tau \frac{d(\tau_E E_\lambda)}{d\gamma}, \text{ where } k'_\tau = \frac{dk_\tau}{d\tau}.^2 \tag{18a}$$

Assuming that eq. (14a) is satisfied, the first term on the right-hand side of eq. (18a) is negative. However, $D_{\lambda E}$ can be negative, positive, or 0, implying that the second term can be of either sign. Analysis of the last term also leads to sign ambiguity. In the special case where $D_{\lambda E} = 0$, and where we take a second-order approximation of the $V(\cdot)$ function, eq. (18a) reduces to

$$\frac{d|k_\lambda|}{d\gamma} = \left(f k'_\tau - f' k'^2_\tau\right) Z < 0, \text{ where } Z = \frac{\theta \tau_{EE} E_\gamma D_\lambda \tau_E}{V_{EE}} > 0. \tag{18b}$$

Equation (18b) shows that under certain conditions, aid reduces the adverse effect of domestic terrorism on FDI flows. The analysis of the effect of aid on transnational

[2] Using eqs (8) and (9), we have $k'_\tau = \frac{2f'}{(1-\tau)^2 f''} < 0$.

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terrorism is identical and therefore suppressed. The alleviating effects of aid correspond to the interaction terms in the empirical representation in Section 4.

3. Description of variables and data

Our data set includes 78 developing countries over the period 1984–2008 (see Appendix 1). The sample countries include most developing countries for which data for foreign aid and our control variables are available. We exclude four outliers—Afghanistan, Iraq, Palestine, and Western Gaza—owing to their large number of terrorist events, ongoing conflicts, and data considerations. The sample period begins in 1984 because institutional data from International Country Risk Guide (ICRG) (2010) starts in that year. The dependent variable is the percentage of net FDI inflows to GDP (FDI/GDP), taken from World Development Indicators (WDI) (World Bank, 2010). For simplicity, we often refer to FDI/GDP as FDI, unless stated otherwise.

3.1 Variables of interest

Through disruptions, damage, and enhanced security, increased domestic and transnational terrorism reduce FDI in the country of the attack (Enders *et al.*, 2006), consistent with eq. (9) in our theoretical model.

We draw our terrorism data from the Global Terrorism Database (GTD), which is maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START, 2009). In particular, we use annual terrorism event data to quantify terrorism's impact on FDI. We use the Enders *et al.* (2011) partition of GTD into domestic and transnational terrorism. For our sample, there are 26,756 domestic terrorist incidents and 4,332 transnational terrorist incidents. Their breakdown allows us to estimate the separate impacts of domestic and transnational terrorism on FDI for the sample developing countries, which is a novel and important contribution.

The data for net aggregate disbursement of official development assistance, commonly known as foreign aid, are taken from the online database of Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD, 2010). The existing literature indicates contrasting effects of aid on FDI (e.g., Harms and Lutz, 2006; Selaya and Sunesen, 2008; Asiedu *et al.*, 2009). On the positive side, aid may raise the marginal productivity of capital by financing complementary inputs, such as infrastructure or human capital. Also, aid may help FDI by limiting terrorist attacks. On the negative side, aid may be fungible as it crowds out private investment. Alternatively, aid may generate wasteful rent-seeking activities by empowering politicians. The effect of aid on FDI may thus be positive or negative. One of our central objectives is to test whether aid can reduce the adverse effects of terrorism on FDI in recipient countries, which will correspond to the sign of the estimated coefficient on the interaction term of terrorism and aid.

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3.2 Control variables

While drawing control variables, we take guidelines from the empirical literature on the determinants of FDI; however, one limitation is that time-variant data for some variables, used in the past for developed countries, are not available for developing countries. This shortcoming is overcome by (i) applying a fixed-effects econometric model that controls for the geographic, strategic, or other time-invariant FDI influences; (ii) performing a careful sensitivity analysis by including a host of institutional variables that may affect FDI; and (iii) demonstrating robustness that derives from alternative estimation techniques.

All of our model specifications (beyond some baseline regressions) include both time-specific year dummies and country-specific fixed effects. The time-variant control variables for our benchmark specification are the GDP growth rate, trade openness, log inflation, the log numbers of telephones per 10 people in a country, a set of institutional variables, and lagged level of FDI/GDP. GDP growth captures the expected return on investment, inflation measures macroeconomic instability, and the number of telephones reflects infrastructure availability in a country.

The effect of trade openness, measured by the ratio of exports plus imports to GDP, is linked to the type of foreign investment in the host country (e.g., see Asiedu, 2002). Busse and Hefeker (2007) argue that although horizontal investment may be attracted by higher trade barriers, export-oriented or vertical investment may favor relatively more open economies. Nevertheless, past studies often find that trade openness has a positive influence on FDI. We include the lagged dependent variable, FDI/GDP, to check the persistence in foreign investment over time, which several studies find to be positively related to current FDI (e.g., Busse and Hefeker, 2007; Asiedu *et al.*, 2009; Asiedu and Lien, 2011). Because investors incur considerable sunk expenditures for starting a business in a host country, the persistence of FDI/GDP needs to be addressed. The presence of the lagged dependent variable means that all the estimated coefficients represent short-run effects; long-run effects of any variable can be derived by dividing its coefficient by 1 − the coefficient of the lagged dependent variable.

To determine whether the results of our primary variables are robust to the inclusion of other control variables, we include log adult literacy rate[3] and log exchange rate, measured as local currency per US dollar. The effect of the literacy rate on FDI is not clear. Because low education results in lower wage rates, a multinational firm may prefer operations in countries with lower literacy rates. Alternatively, multinational firms requiring skilled labor may choose countries with higher literacy rates. Depreciation of local currency may attract more FDI, insofar as this makes the country's exports more competitive at world prices. Data for all of the above control variables are taken from WDI (World Bank, 2010).

[3] There are missing values for adult literacy rate in WDI data, which are generated through interpolations. The basic results remain qualitatively the same if the literacy variable is dropped.

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We also include a number of variables reflecting institutional quality, which likely influence a foreign investor's decision, especially in developing countries (Blonigen, 2005). In particular, we draw data on investment profile, socioeconomic conditions, and democratic accountability from ICRG (2010). Investment profile assesses risks to investment and is based on three subcomponents: contract viability/expropriation, profits repatriation, and payment delays. Socioeconomic conditions represent pressures in society that might restrain government action or fuel social dissatisfaction, which may destabilize the political regime. These conditions' subcomponents are unemployment, consumer confidence, and poverty. Democratic accountability stands for a government's responsiveness to its citizens and the extent of political freedom and civil liberties. A higher value of these indices reflects lower investment risks, better socioeconomic conditions, and more freedoms. Democratic accountability is generally believed to promote economic growth and development (e.g., see Persson and Tabellini, 2007), thereby fostering FDI.

Finally, our sensitivity analysis also controls for political globalization and internal civil conflict in a country. Political globalization reflects political integration of a country with the rest of the world. A country's weighted index is measured loosely by the number of embassies it hosts, the number of international organizations it belongs to, the number of peacekeeping missions it participated in, and the number of international treaties it ratified. A higher value of this index implies more political openness, which should attract FDI. This data come from KOF Index of Globalization (Dreher, 2006; Dreher *et al.*, 2008). The index of internal civil conflicts is based on the acts of civil violence, civil war, ethnic violence, and ethnic war in a country, where higher index values reflect more civil unrest (Global Report, 2009), which should negatively affect FDI.

We use nonoverlapping three-year data averaging to increase the variation in our data over time, which is essential for the econometric models that implement fixed-effects model specifications. In our study, the necessity of data averaging stems from terrorism in most countries being a low-probability event with little variation. This issue is exacerbated by our examination of the independent effect of domestic and transnational terrorism on FDI. Similarly, data for institutional variables also exhibit little variation as institutions change only gradually over time. Descriptive statistics, presented in the supplementary material, reveal that we transform our terrorism variables to the number of incidents per 100,000 persons in a country. This transformation accounts for terrorism relative to the country's population to provide a better reflection of the perceived threat to foreign investors in a country. Although a few countries also experienced negative net FDI inflows (i.e., Botswana, Cameroon, Gabon, Iran, Libya, Mali, Panama, Sierra Leone, and Yemen), some exhibit relatively high net FDI inflows (i.e., Angola, Bahrain, Bolivia, Guyana, Lebanon, Malta, Republic of Congo, Panama, and Vietnam). In our sample, net FDI/GDP averages around 2.5 percentage points with a standard deviation of 3.2 percentage points. The majority of countries over the sample period are clustered around net FDI/GDP that ranges from 0.01% to 5% of their GDP.

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4. Empirical model, methodology, and estimation results

4.1 The empirical model and methodology

Our dynamic panel data model for analyzing the effect of terrorism, foreign aid, and their interaction term on the net FDI position of a country takes the following form:

$$FDI_{it} = \alpha + \sigma T_{it} + \upsilon A_{it} + \delta(T \times A)_{it} + \rho FDI_{i,t-1} + X'_{it}\psi + \eta_i + \kappa_t + \varepsilon_{it}. \quad (19)$$

In eq. (19), i refers to the country and t refers to the time period. *FDI* is expressed as a share of GDP; lagged FDI/GDP (denoted by $FDI_{i,t-1}$) captures the persistence of FDI; T denotes incidents of domestic or transnational terrorism per 100,000 persons; A stands for net aggregate disbursement of aid as a share of GDP; and X is the vector of all other control variables. η_is denote time-invariant, country-specific fixed effects that absorb the influence of any unobservable factors on FDI, κ_ts are year-specific effects that account for any time-varying common shocks, and ε_{it} is the usual disturbance term. The other terms in eq. (19) are coefficients.

The interaction term of terrorism and foreign aid, $(T \times A)_{it}$, is introduced to examine how aid alters the marginal effect of terrorism on FDI/GDP. That is, the estimated coefficient, δ, of the interaction term indicates whether the flow of aid reduces the adverse effect of terrorism on FDI. We calculate the partial effect of terrorism both at the average as well as at the median values of foreign aid in our sample. The latter is implemented to deal with the problem of a skewed distribution of aid across countries and time. Our main hypothesis postulates a significantly positive coefficient for δ. In short, we hypothesize that $\sigma < 0$, $\delta > 0$, and $\sigma + \delta > \sigma$. The hypothesis regarding the sign of σ follows from the comparative statics in our theoretical model—see eq. (9).

To ensure that our estimation results are not spurious, we apply alternative econometric methodologies on the data. We initially employ the FGLS estimation technique because it allows for the presence of heteroskedasticity across panels and autocorrelation within panels, which provides panel-corrected standard errors.

Terrorism inflicts a loss of output on the foreign firm, which can be mitigated by counterterrorism efforts of the host government. This raises endogeneity concerns between FDI and terrorism; such concerns may also apply to other right-hand side variables (e.g., foreign aid, interaction term of terrorism and foreign aid, and GDP growth rate). A conventional solution for endogeneity is to employ the instrumental variable approach; however, any chosen instruments must display variation over time to be appropriate in a fixed-effects model specification. Moreover, any candidate instrument must be highly correlated with the instrumented variable but uncorrelated with the error term. Thus, the difficulty of finding such instruments for multiple endogenous variables in our FDI setting is insurmountable. In addition, the possibility of correlation of unobservable panel-level effects with the lagged dependent variable in the dynamic panel-data model, as in eq. (19), risks inconsistent estimates.

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In view of the foregoing limitation, we turn to the GMM estimation technique, which has been favored by several recent studies on FDI (e.g., Busse and Hefeker, 2007; Asiedu *et al*., 2009; Asiedu and Lien, 2011). The difference-GMM (DGMM) estimator takes the first difference of the data and uses lagged values of the first difference of endogenous variables as instruments (Arellano and Bond, 1991). In a panel study of the effect of openness on financial development, Baltagi *et al*. (2009) argue that DGMM not only eliminates any endogeneity that may be due to the correlation of time-invariant, country-specific effects and other explanatory variables, but first differencing helps ensure that all regressors are stationary. They further point out that (p. 287), ''Because of this correlation, dynamic panel data estimation suffers from the Nickell (1981) bias, which disappears only if T tends to infinity. The preferred estimator in this case is GMM suggested by Arellano and Bond (1991), which basically differences the model to get rid of country specific effects or any time-invariant country specific variable.''

Thus, the first differencing of eq. (19) in the GMM estimator eliminates the time-invariant, country-specific fixed effects, which, then takes the following form:[4]

$$\begin{aligned} FDI_{it} - FDI_{i,t-1} = \alpha &+ \sigma\left(T_{it} - T_{i,t-1}\right) + \upsilon\left(A_{it} - A_{i,t-1}\right) \\ &+ \delta\left[(T \times A)_{it} - (T \times A)_{i,t-1}\right] + \rho\left(FDI_{i,t-1} - FDI_{i,t-2}\right) \\ &+ \left(X'_{i,t} - X'_{i,t-1}\right)\psi + (\kappa_t - \kappa_{t-1}) + \left(\varepsilon_{it} - \varepsilon_{i,t-1}\right). \end{aligned} \tag{20}$$

Concerning endogeneity, Arellano and Bover (1995) point out that the lagged levels, as used in DGMM, are often poor instruments for the first differences. To mitigate this problem, Blundell and Bond (1998) introduce the system-GMM (SGMM) estimator, which uses additional moment conditions. For robustness, we report regression results applying DGMM and SGMM estimators. Some researchers, however, raise concern that because SGMM uses more instruments than DGMM, SGMM may suffer from an instrument proliferation problem. A few past studies suggest that in a GMM model the number of instruments, i, should ideally be less than the number of cross-sections, n, which are countries in our study (i.e., Asiedu and Lien, 2011; Roodman, 2009). Therefore, we report the countries-to-instruments ratio, $r = n/i$, which is above 1 for each regression. For every regression, we also test for autocorrelation and implement the Sargan test for testing overidentifying restrictions, which confirm the absence of second-order serial correlation and the validity of instruments, respectively. Moreover, we implement the two-step GMM estimator for each regression, which is considered asymptotically efficient and robust to all kinds of heteroskedasticity (i.e., Asiedu and Lien, 2011).

[4] We treat all time-variant explanatory variables in the model as endogenous and only use the internal instruments generated by the model.

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4.2 Estimation results: domestic terrorist incidents

In columns (1)–(4) of Table 1, we report the results when we regress FDI/GDP on our primary variables of interest, that is, domestic (transnational) terrorism incidents per 100,000 persons, aggregate aid/GDP, their interaction term, and the lagged dependent variable. In columns (5)–(8), we drop the lagged dependent variable. For each specification, we report these findings without and with accounting for time and country fixed effects. The statistical significant effects of domestic terrorism and its interaction term in all fixed-effects regressions suggest that unobserved heterogeneity needs to be accounted for in the FDI models. Although the effect of transnational terrorism is also negative and significant in three out of four regressions, its interaction term is significant in only one of four regressions. However, the results for the first differenced regressions in columns (9) and (10) show that the negative effects of domestic and transnational terrorism and the positive effects of their interaction terms are significant at the 1% level. Note that the first differencing of the variables wipes out the country-specific fixed effects. The baseline regressions suggest that estimations that account for unobserved heterogeneity and the dynamic nature of the FDI model perform better. In what follows, we introduce alternative sets of control variables and apply alternative econometric techniques to the data to ensure that our results are not spurious.

In Table 2, columns (1)–(4) report the results for the FGLS estimates, where along with our primary variables of interests, we include the standard control variables (GDP growth rate, trade/GDP, log inflation, and lagged FDI/GDP). As anticipated, the coefficient on the terrorism term is negative and statistically significant at the 1% level. The magnitude of its estimated impact indicates that a 1 standard deviation (SD = 0.319) increase in domestic terrorism incidents per 100,000 persons induces a fall in net FDI/GDP of 0.465% (=1.457 × 0.319). This FDI loss amounts to US$323.6 million for the average sample country, whose GDP is US$69,598 million. We also calculate this FDI loss at the median value of GDP (US$10,417.66 million), which is US$48.44 million. Given that FDI is an important source of savings, growth, and development, this finding is disconcerting for developing countries. The negative and significant coefficient on aggregate aid indicates that the negative rent-seeking effect of aid dominates the positive infrastructure effect. Asiedu *et al.* (2009) also find a negative effect of aid on FDI for sub-Saharan Africa and a few other developing countries.

Next, we consider the interaction term between terrorism and aggregate aid. The partial effect, $(\partial FDI/\partial T = \sigma + \delta \times A)$, implies that σ and δ are parameters of interest. The results show that the coefficient on the interaction term is positive and significant at the 1% level, supporting our hypothesis that increased aid ameliorates the adverse effect of terrorism on FDI. For an average level of aid in our sample countries, we calculate and report this partial effect of terrorism in the next-to-last line of Table 2. This shows that the negative

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Table 1 Baseline regressions

Independent variables	without FE (1)	with FE (2)	without FE (3)	with FE (4)	without FE (5)	with FE (6)	without FE (7)	with FE (8)	first difference (9)	first difference (10)
Domestic terrorism (per 100,000 persons)	−0.691** (0.014)	−1.262*** (0.000)			−0.948*** (0.008)	−0.863*** (0.001)			−1.313*** (0.000)	−10.282*** (0.000)
Transnational terrorism (per 100,000 persons)			−1.976 (0.314)	−8.412*** (0.000)			−4.811** (0.017)	−10.456*** (0.000)		
Aggregate aid/GDP	−0.010 (0.000)	−0.017* (0.080)	−0.003 (0.703)	−0.013 (0.242)	−0.028*** (0.002)	−0.011 (0.247)	−0.026** (0.012)	−0.012 (0.253)	−0.035*** (0.000)	−0.033*** (0.002)
Domestic terrorism × Aggregate aid/GDP	0.035 (0.365)	0.116*** (0.000)			0.054 (0.193)	0.078*** (0.010)			0.133*** (0.002)	
Transnational terrorism × Aggregate aid/GDP			−0.008 (0.978)	0.104 (0.664)			0.176 (0.578)	0.590** (0.020)		0.749*** (0.003)
FDI/GDP, lagged	0.686*** (0.000)	0.322*** (0.000)	0.687*** (0.000)	0.326*** (0.000)						
Wald chi-square	387.5	2448.1	356.6	2445.8	22.1	1110.1	12.9	1549.6	169.8	237.8
# of observations	529	529	529	529	606	606	606	606	527	527
# of countries	78	78	78	78	78	78	78	78	78	78
Time effects	no	yes	no	yes	no	yes	no	yes	yes	yes
Country fixed effects	no	yes	no	yes	no	yes	no	yes		

Notes: Dependent variable: FDI/GDP. In all feasible generalized least squares (FGLS) regressions, we allow for any heteroskedasticity across panels and autocorrelation within panels, which gives us panel-corrected standard errors. *P*-values are given in parentheses. Significance: ***0.01, **0.05, and *0.10.

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Table 2 The effect of domestic terrorist incidents and aggregate aid on FDI

Estimation technique→ Independent variables↓	FGLS (1)	FGLS (2)	FGLS (3)	FGLS (4)	DGMM (5)	DGMM (6)	DGMM (7)	DGMM (8)	SGMM (9)	SGMM (10)
Domestic terrorism (per 100,000 persons)	−1.457***	−1.324***	−1.163***	−1.349***	−2.098***	−2.046***	−1.978***	−2.311***	−2.090***	−2.141***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.004)	(0.000)	(0.000)	(0.001)
Aggregate aid/GDP	−0.027**	−0.020	−0.018	−0.033**	−0.056***	−0.054***	−0.048***	−0.061***	−0.075***	−0.068***
	(0.012)	(0.145)	(0.207)	(0.029)	(0.000)	(0.001)	(0.010)	(0.006)	(0.000)	(0.000)
Domestic terrorism × Aggregate aid/GDP	0.147***	0.127***	0.111***	0.118***	0.225**	0.230**	0.237**	0.273**	0.258**	0.305***
	(0.000)	(0.000)	(0.008)	(0.004)	(0.033)	(0.032)	(0.038)	(0.026)	(0.012)	(0.005)
GDP growth rate	0.035**	0.025	0.022	0.032*	0.027	0.031*	0.027	0.038	0.044***	0.059***
	(0.023)	(0.132)	(0.196)	(0.067)	(0.127)	(0.090)	(0.142)	(0.118)	(0.009)	(0.008)
Trade/GDP	0.019***	0.020***	0.021***	0.013***	0.034***	0.035***	0.034***	0.036***	0.021***	0.023***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (Inflation)	−0.080*	−0.036	−0.029	−0.014	−0.047	−0.016	0.026	0.071	−0.073	0.064
	(0.092)	(0.471)	(0.584)	(0.796)	(0.559)	(0.860)	(0.784)	(0.510)	(0.260)	(0.395)
FDI/GDP, lagged	0.300***	0.282***	0.281***	0.322***	0.308***	0.268***	0.279***	0.436***	0.453***	0.559***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (1 + Phones)		−0.466***	−0.473***	−0.107		−0.126	−0.093	0.050		−0.094
		(0.000)	(0.001)	(0.413)		(0.707)	(0.771)	(0.900)		(0.628)
Ln (Adult literacy)		0.371	0.391	0.497**		0.467	0.531	0.564		−0.127
		(0.299)	(0.207)	(0.036)		(0.593)	(0.501)	(0.482)		(0.744)
Ln (Exchange rate)		−0.075	−0.043	0.038		0.007	0.022	0.053		0.019
		(0.134)	(0.369)	(0.492)		(0.903)	(0.664)	(0.388)		(0.552)
Investment profile		0.029	0.014	0.049		0.064	0.0002	−0.045		0.023
		(0.418)	(0.746)	(0.256)		(0.193)	(0.998)	(0.452)		(0.684)
Democratic accountability			0.042	0.157***			0.282***	0.343***		0.280***
			(0.390)	(0.001)			(0.004)	(0.000)		(0.000)
Socioeconomic conditions			0.054	0.064			0.115*	0.144**		0.037
			(0.231)	(0.175)			(0.074)	(0.043)		(0.608)

(continued)

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Table 2 Continued

Estimation technique→ Independent variables↓	FGLS (1)	FGLS (2)	FGLS (3)	FGLS (4)	DGMM (5)	DGMM (6)	DGMM (7)	DGMM (8)	SGMM (9)	SGMM (10)
Political globalization				0.002				0.022		0.010
				(0.799)				(0.184)		(0.427)
Internal civil conflicts				0.143***				0.031		0.048
				(0.001)				(0.696)		(0.557)
All FDI values included?	all	all	all	positive	all	all	all	positive	all	positive
Wald chi-square	2830.9	2353.2	1900.8	2019.7						
# of observations	503	493	493	465	411	403	403	387	503	465
# of countries, *n*	78	77	77	76	78	77	77	76	78	76
# of instruments, *i*					34	38	40	42	40	48
Instruments ratio, $r = n/i$					2.29	2.03	1.93	1.81	1.95	1.58
Sargan test[a]					0.433	0.419	0.490	0.619	0.398	0.342
Autocorrelation test[b]					0.542	0.470	0.452	0.843	0.694	0.785
Time effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes						
ME at the mean of aid	−0.512	−0.508	−0.483	−0.591	−0.652	−0.568	−0.455	−0.556	−0.432	−0.181
ME at the median of aid	−1.094	−1.011	−0.889	−1.057	−1.542	−1.477	−1.392	−1.636	−1.452	−1.387

Notes: Dependent variable: FDI/GDP. ME: marginal effect. In all feasible generalized least squares (FGLS) regressions, we allow for any heteroskedasticity across panels and autocorrelation within panels, which provides panel-corrected standard errors. We employ two-step estimation for the difference and the system-GMM regressions. This procedure is asymptotically efficient and robust to all kinds of heteroskedasticity. *P*-values are given in parentheses as well as for Sargan and autocorrelation tests. Significance: ***0.01, **0.05, and *0.10.

[a]The null hypothesis is that the instruments are not correlated with the residuals.

[b]The null hypothesis is that the error term exhibits no second-order serial correlation.

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independent effect of higher terrorist incidents per 100,000 persons on FDI/GDP goes from −1.457% to −0.512% when net aid flows to a country make up 6.427% of its GDP. For a 1 standard deviation increase in domestic terrorism per 100,000 persons, aid decreases the estimated negative consequences from 0.465% to 0.163%. This reduces the loss in net FDI from US$323.6 million to US$113.44 million for the average sample country, and from US$48.44 million to US$16.98 million for the median sample country. Because donors increasingly link aid to encouraging enforcement efforts against terrorism (Azam and Thelen, 2010), aid's greater flow signals lower future threat perception, which appears to boost investors' confidence (see Bandyopadhyay *et al.*, 2011).

The estimated coefficient of lagged FDI/GDP is 0.300, whereas that of domestic terrorism is −1.457. Thus, the long-run effect of domestic terrorism per 100,000 persons on FDI/GDP is 2.081% [= −1.457/(1 − 0.300)]. This means that a 1 standard deviation increase in domestic terrorism causes a reduction in net FDI/GDP position of a country by 0.664% (= 2.081 × 0.319) in the long run, which is 0.198% greater than its short-run effect. The partial effect of terrorism at the average level of aid then becomes −0.731% [= −0.512/(1 − 0.300)], implying that for a 1 standard deviation increase in domestic terrorism per 100,000 persons, aid decreases terrorism's negative effect on FDI/GDP from 0.664% to 0.223% in the long run. The harmful effect of terrorism on FDI/GDP is relatively larger (smaller) in the long run (short run), whereas the ameliorating effect of aid is relatively smaller (larger) in the long run (short run).

As anticipated, GDP growth rate and trade openness exhibit positive and significant effects on FDI/GDP, and log inflation negatively affects FDI/GDP. The effect of lagged FDI/GDP on its current rates is positive and significant, indicating persistence in FDI over time.

We next check whether the results of our primary variables are robust to the inclusion of other control variables that may influence FDI. Initially, we add log telephones, log adult literacy rate, log exchange rate, and investment profile. In column (2) of Table 2, the signs and significance of our main variables remain intact; however, the coefficient on the terrorism variable declines somewhat and aggregate aid is no longer significant. In column (3), we also include democratic accountability and socioeconomic conditions because they may have distinct effects on FDI. The simultaneous inclusion of institutional variables does not pose any statistical problem because correlations between these variables are modest. The findings of our primary variables remain robust to the inclusion of these variables, but these institutional variables are insignificant determinants of FDI in column (3).

In column (4), apart from adding the variables of political globalization and internal civil conflicts, we derive results by using only the observations of net FDI/GDP that exhibit positive values. This strategy addresses concerns associated with the skewed distribution of our dependent variable. These findings further confirm

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that the results of our main variable of interest are robust. Adult literacy, democratic accountability, and internal civil conflict are now positive and significant. The first two variables have the anticipated positive sign, and conflicts has an unanticipated positive sign. The relatively large coefficients on literacy and democratic accountability imply that foreign investors prefer locating operations where the population is literate and governments grant more political and civil freedoms.

An obvious problem with the foregoing results is that they do not per se address the potential issue of endogeneity. In columns (5)–(8) of Table 2, we therefore report findings based on the DGMM estimator. We adopt the same strategy of sequentially adding different control variables and then using only positive observations of FDI/GDP in column (8). The results for all specifications further confirm that terrorism negatively affects FDI, and that aid mitigates this negative impact. A 1 standard deviation (SD = 0.319) increase in domestic terrorism incidents per 100,000 persons depresses FDI/GDP from 0.737% (for the fully specified model in column (8)) to 0.669% (for the baseline model in column (5)); however, domestic terrorism's partial effect on FDI/GDP, calculated for an average level of aid, ranges from a fall of 0.177% to 0.208%, respectively. For the average (median) country, this amounts to a loss in FDI of US$512.94 (US$76.77) million for the fully specified model, and US$465.61 (US$69.69) million for the baseline DGMM model; however, aid greatly reduces this loss down to US$123.19 (US$18.44) and US$144.76 (US$21.67) million, respectively.

The estimated coefficient of lagged FDI/GDP is 0.308 for the baseline DGMM model, and it is 0.436 for the fully specified DGMM model, indicating that the long-run effect of domestic terrorism per 100,000 persons on FDI/GDP is 3.032% $[= -2.098/(1 - 0.308)]$ and 4.098% $[= -2.311/(1 - 0.436)]$ for the baseline and fully specified models, respectively. In the long run, a 1 standard deviation increase in domestic terrorism causes a reduction in a sample country's net FDI/GDP position by 0.967% $(= 3.032 \times 0.319)$ and 1.307% $(= 4.098 \times 0.319)$ for the two models, respectively. For the fully specified model, the partial effect of terrorism at the average level of aid then becomes 0.986% $[= -0.556/(1 - 0.436)]$. This indicates that for a 1 standard deviation increase in domestic terrorism per 100,000 persons, foreign aid decreases terrorism's effect on FDI from 1.307% to 0.315% in the long run.

In columns (9) and (10) of Table 2, our results are based on the SGMM estimator for the baseline and the fully specified model, respectively. In terms of signs and significance, these results are close to those for the DGMM estimator. Of all the institutional variables, only the coefficient of democratic accountability is consistently significant (except for column (3)), confirming that foreign investors locate where governments value political and civil liberties. This is consistent with the findings of a recent study by Asiedu and Lien (2011). For the DGMM and the SGMM regressions, the *P*-values for the Sargan and autocorrelation tests confirm

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the validity of our internal instruments and the absence of serial correlation in each regression, respectively.[5]

4.3 Estimation results: transnational terrorist incidents

We now investigate the influence of transnational terrorist incidents on the FDI share of GDP. Owing to its direct impact on foreign personnel and their assets, we postulate that transnational terrorism will have a larger adverse effect than domestic terrorism on the investment decision of foreign investors for an equal increase in terrorist incidents. Moreover, the marginal effectiveness of counterterrorism enforcement is less likely for transnational terrorism because of safe havens abroad—see eq. (16).

In Table 3, we adopt our previous estimation strategy, where we run different model specifications based on the FGLS, DGMM, and SGMM estimators. All regressions show that transnational terrorism negatively affects FDI/GDP. For the respective fully specified models in columns (4), (8), and (10), a 1 standard deviation (SD = 0.084) increase in transnational terrorist incidents per 100,000 persons decreases FDI/GDP by 1.057%, 0.426%, and 0.431%, respectively. For the average (median) country, this amounts to a FDI loss of US$735.65 (US$110.10), US$296.49 (US$44.37), and US$299.97 (44.90) million, respectively. These losses are somewhat less than those for domestic terrorism for the DGMM and SGMM estimators, because a standard deviation increase involves many fewer incidents for transnational than for domestic terrorism.

Notably, the coefficient on the interaction term between transnational terrorism and aid is statistically significant for only 3 out of 10 regressions—those for the fully specified DGMM model and for the baseline and fully specified SGMM models. This suggests that the role of aid in mitigating the negative effect of transnational terrorism on FDI is somewhat weaker than that for domestic terrorism. This may stem from the inability of aid-recipient countries to address their transnational terrorism; that is, developing countries have little ability to be proactive against terrorists using foreign bases to launch cross-border terrorist attacks. Moreover, many transnational terrorist groups take refuge in failed states.

We focus on the regression results for the fully specified DGMM and SGMM models for which the coefficient of the interaction term is significant (columns (8) and (10)). The partial effect of terrorism, calculated for the average level of aid, shows that the negative independent effect of a transnational terrorist incident per 100,000 persons on FDI/GDP goes from −5.702% to −1.814% (DGMM) and from −5.127% to −0.776% (SGMM). For a 1 standard deviation increase in transnational terrorism per 100,000 persons, this reduces the estimated impact from 0.479% to 0.152% and from 0.431% to 0.065%, respectively. This limits the loss in net FDI to US$105.79 (US$15.83) and US$45.24 (US$6.77) million for the average

[5] Although the number of countries is more than the number of instruments in the DGMM and SGMM regressions, we nevertheless check and confirm that our results are qualitatively the same to a reduction in instrument count.

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Table 3 The effect of transnational terrorist incidents and aggregate aid on FDI

Estimation technique→ Independent variables↓	FGLS (1)	FGLS (2)	FGLS (3)	FGLS (4)	DGMM (5)	DGMM (6)	DGMM (7)	DGMM (8)	SGMM (9)	SGMM (10)
Transnational terrorism (per 100,000 persons)	−10.133***	−10.269***	−10.591***	−12.588***	−4.725***	−4.522***	−4.266***	−5.702***	−4.447**	−5.127***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.008)	(0.009)	(0.004)	(0.020)	(0.003)
Aggregate aid/GDP	−0.027**	−0.021	−0.018	−0.042***	−0.045***	−0.039***	−0.038**	−0.052**	−0.065***	−0.059***
	(0.024)	(0.161)	(0.240)	(0.010)	(0.001)	(0.009)	(0.038)	(0.017)	(0.000)	(0.001)
Transnational terrorism × Aggregate aid/GDP	0.153	0.148	0.183	0.274	0.217	0.216	0.204	0.605***	0.287*	0.677***
	(0.554)	(0.596)	(0.515)	(0.338)	(0.258)	(0.272)	(0.279)	(0.008)	(0.086)	(0.005)
GDP growth rate	0.059***	0.058***	0.056***	0.077***	0.029	0.032	0.029	0.048**	0.033*	0.053**
	(0.000)	(0.001)	(0.001)	(0.000)	(0.134)	(0.104)	(0.156)	(0.037)	(0.072)	(0.013)
Trade/GDP	0.023***	0.024***	0.024***	0.014***	0.038***	0.039***	0.038***	0.039***	0.024***	0.027***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (Inflation)	−0.053	−0.014	−0.023	0.003	−0.025	−0.012	0.021	0.091	−0.086	0.033
	(0.247)	(0.769)	(0.653)	(0.953)	(0.710)	(0.881)	(0.801)	(0.336)	(0.142)	(0.641)
FDI/GDP, lagged	0.282***	0.284***	0.274***	0.304***	0.320***	0.287***	0.291***	0.458***	0.444***	0.553***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (1 + Phones)		−0.431***	−0.430***	−0.023		−0.051	−0.043	0.123		0.041
		(0.001)	(0.002)	(0.862)		(0.879)	(0.893)	(0.762)		(0.830)
Ln (Adult literacy)		0.690**	0.697**	0.673***		0.221	0.321	0.484		−0.299
		(0.038)	(0.020)	(0.009)		(0.810)	(0.705)	(0.552)		(0.516)
Ln (Exchange rate)		−0.068	−0.038	0.053		0.022	0.035	0.054		0.053*
		(0.156)	(0.413)	(0.343)		(0.700)	(0.496)	(0.344)		(0.095)
Investment profile		−0.011	−0.018	−0.010		0.058	0.003	−0.040		0.042
		(0.762)	(0.675)	(0.817)		(0.219)	(0.950)	(0.478)		(0.396)
Democratic accountability			0.034	0.171***			0.259***	0.339***		0.274***
			(0.467)	(0.000)			(0.007)	(0.000)		(0.001)

(continued)

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Table 3 Continued

Estimation technique→ Independent variables↓	FGLS (1)	FGLS (2)	FGLS (3)	FGLS (4)	DGMM (5)	DGMM (6)	DGMM (7)	DGMM (8)	SGMM (9)	SGMM (10)
Socioeconomic conditions			0.009	0.044			0.079	0.126*		0.010
			(0.839)	(0.331)			(0.248)	(0.063)		(0.885)
Political globalization				0.008				0.022		0.010
				(0.286)				(0.201)		(0.449)
Internal civil conflicts				0.186***				0.049		0.095
				(0.000)				(0.526)		(0.225)
All FDI values included?	all	all	all	positive	all	all	all	positive	all	positive
Wald chi-square	2355.7	2262.3	2238.5	2481.1						
# of observations	503	493	493	465	441	403	403	387	503	465
# of countries, *n*	78	77	77	76	78	77	77	76	78	76
# of instruments, *i*					34	38	40	42	40	48
Instruments ratio, $r = n/i$					2.29	2.03	1.93	1.81	1.95	1.58
Sargan test[a]					0.441	0.460	0.493	0.631	0.413	0.412
Autocorrelation test[b]					0.512	0.468	0.441	0.850	0.643	0.790
Time effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes						
ME at the mean of aid								−1.814	−2.602	−0.776
ME at the median of aid								−4.206	−3.738	−3.453

Notes: Dependent variable: FDI/GDP. ME: marginal effect. In all feasible generalized least squares (FGLS) regressions, we allow for any heteroskedasticity across panels and autocorrelation within panels, which provides panel-corrected standard errors. We employ two-step estimation for the difference and the system-GMM regressions. This procedure is asymptotically efficient and robust to all kinds of heteroskedasticity. *P*-values are given in parentheses as well as for Sargan and autocorrelation tests. Significance: ***0.01, **0.05, and *0.10.

[a]The null hypothesis is that the instruments are not correlated with the residuals.

[b]The null hypothesis is that the error term exhibits no second-order serial correlation.

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(median) level of aid, respectively. To save space, we do not report these calculations for the long run.

4.4 At what level does aid completely offset the negative effect of terrorism?

To answer this question, we evaluate the partial effect of both domestic and transnational terrorism at the 10th, 25th, 50th, 75th, and 90th percentile levels of aid in our sample, which most closely correspond to the average values of aid received by Argentina, India, Lebanon, Togo, and Tanzania, respectively. For this exercise, we use the estimates of domestic (transnational) terrorism and their interaction term with aid from columns (8) and (10) in Table 2 (3), based on the DGMM and the SGMM estimators. These calculations are reported in Table 4, where we note that increases in aid lower the harmful effect of both domestic and transnational terrorism on FDI/GDP, and the critical values of aid that totally offset the negative effect of domestic (transnational) terrorism on FDI/GDP corresponds to 8.47% (9.43%) and 7.02% (7.57%) of GDP for the regressions that employ the DGMM and the SGMM, respectively. Given that the average (median) level of aid is 6.427% (2.472%) of GDP in our sample, these calculations imply that a substantial amount of aid is required to offset the negative effect of terrorism on FDI. A relatively lower level of aid can completely offset the deleterious effects of domestic terrorism on FDI. Table 4 also lists the number of countries that lie above and below these critical values of aid.

4.5 Further robustness checks

In this section, we conduct a variety of robustness checks on the data. All regression specifications include a full set of control variables; however, to conserve space, we

Table 4 Marginal effect of terrorist incidents evaluated at the various values of aggregate aid

Value Aid/GDP	Percentile Aid/GDP	Corresponding aid recipient Country	Domestic terrorism		Transnational terrorism	
			DGMM	SGMM	DGMM	SGMM
0.083	10^{th}	Argentina	−2.288	−2.116	−5.652	−5.071
0.455	25^{th}	India	−2.187	−2.002	−5.427	−4.819
2.472	50^{th}	Lebanon	−1.636	−1.387	−4.206	−3.453
9.241	75^{th}	Togo	0.212	0.678	−0.111	1.129
16.591	90^{th}	Tanzania	2.218	2.919	4.336	6.105
6.427	Mean	Congo, Republic	−0.556	−0.181	−0.522	−0.776
Critical value of Aid/GDP			8.465	7.020	9.425	7.573
No. of countries > Critical value of Aid/GDP			22	26	20	26
No. of countries < Critical value of Aid/GDP			56	52	58	52

Note: These calculations are based on the estimations in columns (8) and (10) of Tables 2 and 3, respectively.

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only report the results of our primary variables based on the DGMM and the SGMM estimators.

The empirical analysis is based on aggregate aid, which is the sum of bilateral and multilateral assistance. Does the mitigating effect of aid on terrorism-induced reductions in FDI/GDP differ across these two types of aid, since the donors' motives for providing each type of aid might differ (Maizels and Nissanke, 1984; Younas, 2008)? Because donor countries have more control over bilateral aid, prime-target countries may, in particular, tie some of this aid to counter transnational terrorism, thereby bolstering FDI/GDP. Multilateral aid may be more geared to improving the general well-being of the recipient population, thereby assuaging grievances that fuel domestic terrorism.

Table 5 presents the estimation results for both kinds of aid for only the fully specified models, where all and positive FDI values are included. The interaction terms show that bilateral aid has a significant effect in reducing the negative effect of transnational terrorism for the SGMM estimates, whereas multilateral aid has a significant effect in reducing the negative effect of domestic terrorism for all four specifications. These results are consistent with our priors.

Because Organization of the Petroleum Exporting Countries (OPEC) economies can generate high amount of foreign reserves, they do not generally depend on foreign aid for financing development projects or for shoring up the gap in foreign reserves. Most of the foreign aid that they receive falls under the category of humanitarian assistance or consists of soft loans. Therefore, we check robustness of our results by excluding OPEC countries from the regressions. In addition, we examine whether our primary findings remain robust to the exclusion of three transition economies, India, and Colombia from the regressions. Most of the foreign aid that transition economies received has been in support of their extensive economic and political transformation in the early 1990s. These economies experienced very few terrorist incidents during the sample period. Following Krueger and Malečková (2003), we exclude Colombia and India, which are outliers in terms of terrorist events. We also use the numbers of terrorist incidents in a country as an alternative measure for domestic and transnational terrorist events. These results conform to our earlier findings and are available in the supplementary material.[6]

5. Concluding remarks

This article investigates the impact of terrorism on FDI/GDP in 78 developing countries for 1984–2008. We apply alternative econometric techniques to ensure the robustness and consistency of our estimates. This study distinguishes the

[6] We also check whether our main results hold when we allow for the possibility of the effects of aid in lowering the harmful consequences of the high risk of FDI expropriation. Thus, we add the interaction term of investment profile and aid/GDP, as in Asiedu *et al.* (2009). Although we fail to find a significant effect for the interaction term, the results for our main variables of interest remain qualitatively the same.

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Table 5 The effect of terrorist incidents, bilateral and multilateral aid on FDI

	Domestic terrorism incidents				Transnational terrorism incidents			
Estimation technique→	DGMM	SGMM	DGMM	SGMM	DGMM	SGMM	DGMM	SGMM
Independent variables↓	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Terrorism (per 100,000 persons)	−1.347**	−1.257**	−1.642**	−1.084*	−5.043***	−5.830***	−5.572***	−5.020***
	(0.049)	(0.047)	(0.018)	(0.072)	(0.001)	(0.001)	(0.001)	(0.003)
Bilateral aid/GDP	−0.046	−0.078***	−0.071**	−0.079***	−0.064	−0.094***	−0.079*	−0.076*
	(0.147)	(0.005)	(0.019)	(0.004)	(0.108)	(0.008)	(0.063)	(0.063)
Multilateral aid/GDP	−0.088**	−0.106***	−0.067	−0.050	0.028	−0.005	0.051	0.008
	(0.032)	(0.001)	(0.186)	(0.196)	(0.671)	(0.915)	(0.450)	(0.875)
Terrorism × Bilateral aid/GDP	−0.062	−0.029	−0.034	−0.088	0.527	1.135**	0.688	0.925*
	(0.653)	(0.845)	(0.813)	(0.547)	(0.329)	(0.013)	(0.174)	(0.062)
Terrorism × Multilateral aid/GDP	1.216***	1.526***	1.334***	1.617***	−0.492	−0.990	−0.153	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.486)	(0.127)	(0.819)	(0.999)
All FDI values included?	all	all	positive	positive	all	all	positive	positive
# of observations	399	488	387	465	399	488	387	465
# of countries, *n*	76	76	76	76	76	76	76	76
# of instruments, *i*	44	50	44	50	44	50	44	50
Instruments ratio, $r = n/i$	1.73	1.52	1.73	1.52	1.73	1.52	1.73	1.52
Sargan test[a]	0.726	0.145	0.722	0.412	0.676	0.361	0.718	0.564
Autocorrelation test[b]	0.531	0.724	0.768	0.699	0.643	0.819	0.781	0.768
Time effects	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Dependent variable: FDI/GDP. All regressions include full set of control variables as in Tables 2 and 3. We employ two-step estimation for the difference and the system-GMM regressions. This procedure is asymptotically efficient and robust to all kinds of heteroskedasticity. *P*-values are given in parentheses as well as for Sargan and autocorrelation tests. Significance: ***0.01, **0.05, and *0.10.

[a]The null hypothesis is that the instruments are not correlated with the residuals.

[b]The null hypothesis is that the error term exhibits no second-order serial correlation.

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adverse FDI consequences of domestic terrorism from those of transnational terrorism. For a 1 standard deviation increase in incidents, the negative effect of domestic terrorism on FDI/GDP is somewhat greater than that of transnational terrorism because of the greater number incidents associated with domestic terrorism. At the margin, one incident of transnational terrorism causes far more adverse effect on FDI/GDP than does one incident of domestic terrorism. However, an interaction term between terrorism and aid indicates that aid greatly mitigates the adverse effect of both forms of terrorism on FDI/GDP—for an average country, this marginal effect falls to less than a third of its initial loss for many of the estimates. These results are robust to the introduction of the standard control variables, whose coefficients generally agree with those in the FDI literature.

A more nuisance result follows when bilateral and multilateral aid are distinguished. Bilateral aid reduces the adverse effects of transnational terrorism on FDI, whereas multilateral aid ameliorates the adverse effects of domestic terrorism on FDI. This apparently follows from bilateral donors being able to tie some aid to counterterrorism, while multilateral aid improves general welfare, thereby alleviating domestic grievances. Without data on counterterrorism-tied aid, we cannot explicitly test these underlying conjectures. Nevertheless, our findings show that the choice between bilateral and multilateral aid by the donor country hinges in part on its FDI interests in the recipient country. Bilateral aid is best when these interests are large and the donor ties the aid to counterterrorism efforts. Because FDI is an important source of savings for developing countries and, thus, an engine of growth, the interplay between terrorism, aid, and FDI is of paramount importance.

Supplementary Material

Supplementary tables are available online at the OUP website.

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Appendix 1

List of 78 developing countries in our study

Albania	Costa Rica	India	Namibia	Syria
Algeria	Cote d'Ivoire	Indonesia	Nicaragua	Tanzania
Angola	Dominican Republic	Iran	Niger	Thailand
Argentina	Ecuador	Jamaica	Nigeria	Togo
Bahrain	Egypt	Jordan	Pakistan	Trinidad and Tobago
Bangladesh	El Salvador	Kenya	Panama	Tunisia
Bolivia	Ethiopia	Lebanon	Papua New Guinea	Turkey
Botswana	Gabon	Libya	Paraguay	Uganda
Brazil	Gambia	Madagascar	Peru	Uruguay
Burkina Faso	Ghana	Malawi	Philippines	Venezuela
Cameroon	Guatemala	Malaysia	Saudi Arabia	Vietnam
Chile	Guinea	Mali	Senegal	Yemen
China	Guinea-Bissau	Malta	Sierra Leone	Zambia
Colombia	Guyana	Mexico	South Africa	Zimbabwe
Congo, D. Republic	Haiti	Morocco	Sri Lanka	
Congo, Republic	Honduras	Mozambique	Sudan	

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