Hit and (they will) run: The impact of terrorism on migration

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ABSTRACT

We analyze the influence of terrorism on migration for 152 countries during 1976–2000. We find robust evidence that terrorism is among the 'push factors' of skilled migration, whereas it is not robustly associated with average migration.

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1. Introduction

Several recent studies suggest that terrorism constrains economic development by, e.g., impeding investment and tourism and diverting the international flow of goods and capital (e.g. Neumayer, 2004; Abadie and Gardeazabal, 2008; Gaibulloev and Sandler, 2008; Sandler and Enders, 2008). Beyond its negative economic consequences, terrorism also produces social costs that are reflected in, e.g., reduced life satisfaction (Frey et al., 2009) and political costs in the form of, e.g., government instability (Gassebner et al., 2008, forthcoming).

These negative effects of terrorist activity – in addition to the direct threat to one's life – tend to worsen individual living and working conditions, so that they ought to impact individual migration decisions. Here, the desire and possibility to emigrate are expected to differ depending on the individual levels of education, given that the (direct and opportunity) costs of education are substantial. In times of terror, the returns to education decrease by, e.g., increasing socioeconomic insecurity and constraining entrepreneurial activity. From a skilled individual's perspective the remaining skill premium may be considered too low to recoup the costs of a previous high-level education. Given that human-capital investment is irreversible, we therefore expect skilled workers to be particularly keen to emigrate in order to protect their human capital from devaluation and to yield a sufficient return to education, so that a 'brain drain' may indeed occur. This outcome is reinforced by the fact that potential host countries increasingly resort to quality-selective immigration policies and prefer skilled over medium and low skilled immigrants (e.g., Docquier et al., 2007), thus making it relatively easy only for skilled workers to leave their terror-ridden home countries. By contrast, for individuals with average or low levels of human-capital terrorist activity in their home country may result in additional costs and restrictions to emigration, e.g., due to increasing travel costs or the introduction of specific restrictions for immigrants from terror-rich countries in the destination country.

Based on these considerations, our hypothesis is that terrorism is among the drivers of skilled migration, while its effect on average migration may be less clear. As discussed in Eggert et al. (2010), previous studies on the 'brain drain' tend to emphasize the role

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Table 1
FGLS panel estimates of the effect of terrorism on skilled migration.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
terror	0.011	0.011	0.009	0.009	0.010	0.011	0.013
	(3.05)***	(2.76)***	(2.53)**	(2.52)**	(2.78)***	(3.09)***	(3.25)***
pop	−0.044	−0.039	−0.041	−0.040	−0.042	−0.041	−0.043
	(7.76)***	(7.23)***	(7.29)***	(6.96)***	(7.33)***	(6.98)***	(7.35)***
gdp	−0.037	−0.031	−0.039	−0.038	−0.038	−0.036	−0.037
	(11.64)***	(9.48)***	(11.45)***	(11.31)***	(11.78)***	(11.08)***	(11.54)***
democracy	0.000	0.001	0.000	0.000	0.000	0.000	0.001
	(3.38)***	(3.62)***	(3.18)***	(3.18)***	(3.29)***	(3.09)***	(3.99)***
democracy2	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(6.03)***	(5.72)***	(5.90)***	(5.84)***	(6.17)***	(5.41)***	(6.20)***
trade	−0.000	0.003	0.003	0.003	0.001	−0.001	0.003
	(0.07)	(1.04)	(0.98)	(1.22)	(0.55)	(0.42)	(1.24)
regime change		0.012					
		(3.39)***					
civil war (low)			0.000				
			(6.87)***				
civil war (high)				0.000			
				(1.70)*			
genocide					0.003		
					(0.96)		
gov						0.005	
						(1.97)**	
growth							0.000
							(3.42)***
Mean VIF	1.40	1.42	1.39	1.39	1.39	1.40	1.38
No. of observations	692	692	692	692	692	692	692
No. of countries	152	152	152	152	152	152	152

Notes: Results from FGLS models with AR(1) disturbance, fixed effects and *skilled migration* as dependent variable. Absolute, robust t-values in parentheses. Period dummies included in all specifications.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

of 'pull factors' of individual migration and education decisions, especially with respect to income differentials between home and target countries. By contrast, our approach explicitly focuses on a potential 'push factor'. In this sense, our analysis complements Docquier et al. (2007) who find that political instability is positively related to skilled migration. We provide panel evidence on the determinants of skilled and average migration, also properly taking account of serial correlation, heterogeneity and endogeneity. Given that political instability and terror are closely related (Campos and Gassebner, 2009), we also control for instability. To preview our findings, independent of the statistical methods we detect a robust positive relationship between terrorism and skilled migration, controlling for a variety of variables. By contrast, terrorism is not robustly associated with average migration, indicating that the effect of terrorism on migration depends on individual levels of education.

In the next section, we introduce our methodology and data. Section 3 provides our empirical results, while Section 4 concludes.

2. Data and method

We compile data for 152 countries for the 1976–2000 period. Our main dependent variable (*skilled migration*) is defined as the (estimated) ratio of the number of skilled emigrants that are 25 or older to six major receiving countries (USA, UK, Germany, France, Canada and Australia) to the total number of skilled natives aged 25 or older.[3] To assess whether the effects of terrorism depend on education levels, we use an alternative dependent variable (*average migration*) which is defined as the ratio of the total number of emigrants aged 25 or older to these six countries to the total

number of natives aged 25 or older. The data are drawn from Defoort (2008).[4]

Raw data for the construction of our main explanatory variable (*terror*) are from the Global Terrorism Database (LaFree and Dugan, 2007). We use information on the total number of terrorist attacks in the country of interest and the victims (i.e., the number of the killed and wounded) of these attacks to construct a population-weighted terrorism index.[5] In some specifications, we use further indicators of political instability to assess the robustness of the effect of terrorism on skilled and average migration.[6]

As control variables, in our baseline specification we consider the effect of per capita income (*gdp*), population size (*pop*) and trade openness (*trade*), where all series are logged and drawn from the *PENN World Table* (Heston et al., 2009). We also take into account the sending country's level of political development (*democracy*) and its square (*democracy2*) from the *Polity4 Project* (Marshall and Jaggers, 2008). We expect a high level of socioeconomic development to be negatively related to migration because it reflects an adequate return to education that makes migration less likely. Population size is also anticipated to be negatively associated with

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[3] Skilled emigrants are those with a post-secondary certificate (Defoort, 2008).

[4] The dependent variables are available for five points in time (1980, 1985, 1990, 1995, 2000). We construct five-year averages of our explanatory variables to estimate their effect on migration.

[5] We adjust the index for population size to consider potential scale effects, where terrorism is expected to be more threatening for countries with smaller populations. Formally, the index for country i in year t is defined as $terror_{i,t} = \ln\left(e + \frac{attacks_{i,t}}{population_{i,t}} + \frac{victims_{i,t}}{population_{i,t}}\right)$.

[6] Specifically, we assess the independent influence of adverse regime changes (*regime change*) and genocides (*genocide*) on migration, where data are provided by the *Political Instability Task Force* (http://globalpolicy.gmu.edu/pitf/index.htm). We also use the (logged) number of battle deaths in civil wars (*civil war*) to indicate incidences of civil war, either using a low (at least 25 battle deaths per year) or high (at least 1000 battle deaths per year) threshold. The civil war data are from Lacina and Gleditsch (2005).

Table 2
Dynamic panel estimates of the effect of terrorism on skilled migration.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
terror	0.062	0.040	0.041	0.060	0.062	0.040	0.050	0.057	0.057	0.062
	(3.43)***	(1.97)**	(1.71)*	(2.48)**	(4.23)***	(1.56)	(2.12)**	(3.17)***	(3.29)***	(3.62)***
pop	−0.016	−0.017	−0.020	−0.020	−0.019	−0.019	−0.017	−0.011	−0.018	−0.019
	(1.67)*	(1.61)	(1.78)*	(2.21)**	(2.02)**	(1.83)*	(1.73)	(1.20)	(1.89)*	(1.92)*
gdp	−0.043	−0.043	−0.040	−0.040	−0.040	−0.035	−0.042	−0.035	−0.040	−0.052
	(4.59)***	(4.76)***	(4.49)***	(4.57)***	(4.61)***	(2.86)***	(4.56)***	(3.68)***	(4.31)***	(5.27)***
democracy	0.004	0.003	0.004	0.004	0.003	0.003	0.003	0.004	0.004	0.004
	(2.37)**	(2.02)**	(2.58)***	(2.55)**	(2.66)***	(1.81)*	(1.77)*	(3.08)***	(2.61)***	(2.51)**
democracy2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.78)	(0.96)	(0.94)	(1.08)	(1.29)	(0.19)	(1.20)	(0.80)	(0.73)	(0.81)
trade	0.064	0.055	0.038	0.060	0.051	0.040	0.034	0.064	0.060	0.063
	(3.03)***	(1.84)*	(1.39)	(3.88)***	(2.97)***	(1.69)	(1.43)	(2.97)***	(2.88)***	(3.01)***
regime change		0.017								
		(0.55)								
civil war (low)			−0.000							
			(0.46)							
civil war (high)				0.000						
				(0.46)						
genocide					−0.011					
					(0.87)					
gov						0.16				
						(0.46)				
growth							−0.000			
							(0.16)			
common language								0.070		
								(2.78)***		
religious fractionalization									0.160	
									(3.20)***	
landlocked										−0.066
										(1.72)*
Mean VIF	1.40	1.42	1.39	1.39	1.39	1.40	1.38	1.42	1.39	1.42
No. of instruments	23	28	28	28	28	28	28	24	24	24
M1/M2 test (Pr > z)	0.00/0.42	0.03/0.28	0.00/0.30	0.00/0.44	0.00/0.42	0.00/0.32	0.00/0.42	0.00/0.37	0.00/0.37	0.00/0.22
Hansen test (Pr > z)	0.53	0.15	0.31	0.41	0.50	0.15	0.02	0.53	0.48	0.54
No. of observations	692	692	692	692	692	692	692	692	692	692
No. of countries	152	152	152	152	152	152	152	152	152	152

Notes: Results from two-step system-GMM models. *Skilled migration* as dependent variable. Absolute, robust *z*-values in parentheses. GMM type: terror, democracy, democracy2, trade (further controls). IV type: gdp, pop. Period dummies included in all specifications.

* *p* < 0.1.
** *p* < 0.05.
*** *p* < 0.01.

migration, given that internal migration is likely to increase with country size, making international migration less attractive. Trade openness is anticipated to be positively related to migration, indicating, e.g., a country's travel restrictions and its international socioeconomic integration. Finally, we consider a non-linear relationship between a country's level of political development and skilled migration. Authoritarian governments may easily impose migration restrictions (impeding migration), while repression may also foster politically motivated flights (increasing migration). For democratic countries the situation is expected to be the other way around, so that the link between political openness and migration may be non-monotonic. In some specifications, we also control for the effect of (logged) government size (*gov*) and the rate of economic growth (*growth*) on migration. Both data series are drawn from the *PENN World Table*.[7]

Initial tests indicate that serial correlation and heteroscedasticity may bias our statistical analysis. We thus run a series of feasible generalized least squares (FGLS) regressions with a common AR(1) process, heteroskedasticity–robust standard errors and the inclusion of country-specific effects to analyze the effect of terrorism on migration. We also acknowledge that reverse causation may be an issue. For instance, skilled migration may exacerbate socioeconomic and political crises in sending countries and consequently amplify terrorist activity. Thus, we furthermore run a series of system-GMM estimations that account for potential endogeneity to provide more robust evidence.

3. Empirical results

The results from the FGLS estimations of the effect of terrorism on skilled migration are reported in Table 1. They indicate that skilled migration is more common in small, poor and semi-open countries. With respect to our main variable of interest, we find that terrorist activity is indeed robustly and positively associated with skilled migration. This finding survives the inclusion of further controls, in particular those indicating other forms of political instability.[8] Our analysis thus indicates that terrorism

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[7] Note that we generally include country-fixed effects in our empirical analysis to account for certain time-invariant factors that may also be considered as potential determinants ('pull factors') of migration. When we exclude the fixed effects in our estimations to consider these time-invariant factors, we find that a variety of them (distance, common languages, colonial ties, landlocked, resource endowments and religious fractionalization) are associated with migration. Our main empirical findings are not affected by the exclusion of the country-specific effects.

[8] According to Campos and Gassebner (2009) there may also be indirect linkages at work, e.g., from terrorism via general political instability to skilled migration. However, the qualitative and quantitative effect of terrorism remains similar when we control for other types of instability. Our findings are also qualitatively unchanged when we run pooled OLS estimations or regressions with Newey–West standard errors.

Table 3
FGLS and system-GMM panel estimates of the effect of terrorism on average migration.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
terror	−0.001	−0.001	−0.001	−0.001	−0.019	−0.013	−0.014	−0.012
	(2.10)**	(2.08)**	(1.30)	(1.83)*	(1.69)*	(1.04)	(1.20)	(0.84)
pop	−0.016	−0.017	−0.015	−0.014	−0.008	−0.007	−0.008	−0.006
	(12.61)***	(13.51)***	(11.01)***	(9.59)***	(2.07)**	(2.28)**	(1.96)**	(1.96)**
gdp	−0.006	−0.008	−0.006	−0.006	0.003	0.003	0.003	0.004
	(14.90)***	(19.68)***	(12.37)***	(13.52)***	(0.80)	(1.06)	(0.85)	(1.18)
democracy	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
	(2.38)**	(2.27)**	(2.48)**	(1.67)*	(1.27)	(1.31)	(1.29)	(0.97)
democracy2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(3.03)***	(1.92)*	(2.47)**	(1.15)	(2.26)**	(2.49)**	(2.16)**	(2.19)**
trade	0.001	0.000	0.001	−0.000	−0.06	−0.013	−0.016	−0.010
	(2.07)**	(0.66)	(2.47)**	(0.32)	(1.92)*	(1.84)*	(1.85)*	(1.73)*
regime change		−0.001				−0.002		
		(1.88)*				(0.49)		
civil war (high)			−0.000				−0.000	
			(5.69)***				(0.72)	
gov				0.001				−0.005
				(2.28)**				(0.73)
Mean VIF	1.40	1.42	1.39	1.40	1.40	1.42	1.39	1.40
No. of instruments					27	32	32	32
AB test (Pr > z)					0.01/0.03	0.01/0.02	0.01/0.02	0.01/0.03
Hansen test (Pr > z)					0.66	0.71	0.88	0.73
No. of observations	692	692	692	692	692	692	692	692
No. of countries	152	152	152	152	152	152	152	152

Notes: *Average migration* as dependent variable. Results from FGLS models with AR(1) disturbance, fixed effects in specifications (1) to (4). Absolute, robust t-values in parentheses. Results from two-step System-GMM models in specifications (5)–(8). Absolute, robust and Windmeijer-corrected z-values in parentheses. GMM type: terror, democracy, democracy2, trade (further controls). IV type: pop, gdp, period dummies. Separate instruments for each period until collapsed. Period dummies included in all specifications.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

makes it less attractive for the highly skilled to stay in their home countries, potentially due to diminishing returns to education. This may be a consequence of the constraining effect of terrorism on socioeconomic activity, opportunities and security. Quantitatively, doubling the incidence of terror according to our index increases the share of skilled emigrants in total migration by about 0.01. This amounts to an elasticity of about 0.08. While there are no empirical studies that provide results that can be directly compared to ours, our findings are qualitatively in line with earlier studies arguing that political instability and violent conflict are among the drivers of (skilled) international migration (e.g. Hatton and Williamson, 2003; Docquier et al., 2007).

The results from the system-GMM estimations that account for potential reverse causation are reported in Table 2. Again, we find that skilled migration is associated with small country size and low levels of socioeconomic development. While we now also find that higher levels of trade openness lead to more migration, we find no evidence of a non-linear relationship between political development and the brain drain. Rather, more politically open countries are found to experience stronger skilled migration. Considering the impact of terrorism, we again find that stronger terrorist activity leads to an increase in skilled migration. Once again, this finding is robust to the inclusion of other indicators of political instability and time-invariant factors. The system-GMM findings thus reinforce those from the FGLS estimations and provide additional support for our main hypothesis.

Finally, in Table 3 we focus on the effect of terrorism on average migration and present assorted FGLS and system-GMM findings. With respect to the controls, we find that average migration is more common in small, less developed and democratic countries. As concerns our main variable of interest, we find that terrorism is not robustly associated with average emigration.[9] Our empirical findings thus indicate that the effect of terrorism on migration depends on individual levels of education. In particular, the highly skilled have the incentives and means to migrate, while they are also preferred to the less skilled by their host countries.

4. Conclusion

We empirically assessed the influence of terrorism on skilled migration for 152 countries over the 1976–2000 period. We found robust evidence that terrorism increases skilled emigration, suggesting that terrorism affects the cost-benefit considerations of the highly educated in ways that make emigration more attractive. We found no robust evidence that average emigration is related to terrorism, which indicates that the effect of terrorism on migration depends on the level of education.

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[9] The FGLS results provide some evidence that average migration and terrorism are negatively related. Potentially, this may indicate that terrorism increases the costs of migration by, e.g., making traveling more difficult, so that the wealthiest (i.e., the skilled) are most likely to migrate. However, the system-GMM results provide no evidence of a robust association between terrorism and average migration, so that the FGLS results may be driven by, e.g., reverse causation.

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